

CINDE FIELD NOTES - 1987

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JUNE 22, 1987

THE SOUNDING THIS MORNING IS QUITE DRY. THE SOUNDING AT 1100 WAS ALSO DRY. SYNOPTICALLY, THERE IS A COLD FRONT THAT IS EXPECTED MAYBE TO COME THROUGH THE AREA BY 1800.

1500. WE STILL HAVE NO REAL ECHOES IN THE AREA. JUST BASICALLY ALOT OF CLEAR AIR OUT TO 70-80 KM. WE DID HAVE ONE FEATURE TO THE NORTHWEST WHICH WAS KIND OF IN THE MOUNTAINS AND NOW ABOUT 60 KM OFF THE MOUNTAINS. A LITTLE CONVERGENT LINE FEATURE. ONCE WE THOUGHT IT MIGHT BE THE FRONT, BUT WE STILL DON'T KNOW.

1736. BOTH RADARS ARE SCANNING THE NORTHERN LOBE. SOME VERY WEAK SHOWERS. ONE OF THE INTERESTING THINGS THAT HAS BEEN GOING ON IS THAT WE ARE ON THE VERY EASTERN EDGE OF THE NETWORK OUT IN THE CLEAR AIR ALONG THE CONVERGENCE LINE IS A NICE ROTATION THAT HAS BEEN ROTATING AROUND AND AROUND IN THE CLEAR AIR. WE HAVE A COLD FRONT NOW ABOUT 50 KM NORTH OF CP-3.

1750. THE RADAR STARTED A COUPLE OF MINUTES AGO DOING THE B-1 SCAN. THE COLD FRONT IS STILL ABOUT 10 KM NORTH OF DUAL LOBE. WE'RE JUST GETTING SET UP ON IT. THERE IS A FEILD OF CUMULUS IN FRONT OF IT THAT IS A POSSIBILITY OF GETTING A LITTLE MORE ACTION OUT OF IT WHEN IT GET'S TO IT.

1828. THE FRONT IS SLOWED DOWN. WE'RE STILL WAITING TO SEND UP SOUNDINGS ON EITHER SIDE, BUT IT STILL IS 10 KM AWAY FROM THE FIRST SOUNDER.

1900. THREE SOUNDINGS ARE BEING RELEASED ON EITHER SIDE OF THE BOUNDARY. OFF TO OUR EAST/NORTHEAST AT 70-90 KM. ALONG THESE BOUNDARIES STORMS ARE BLOWING UP NOW. HIGHEST REFLECTIVITIES ARE GOING UP IN THE 50'S. 55 MAXIMUM. IT LOOKS LIKE ESSENTIALLY THE MOISTURE JUST DIDN'T GET FAR ENOUGH TO US. MOISTURE IS FURTHER EAST AND ACTIVITY LOOKS LIKE A WHOLE LINE IS NOW GOING TO DEVELOPE A NORHT/SOUTH LINE. BUT IT WILL BE TOO FAR EAST. STORM AT 70 DEGREES. 85 KM IS SHOWING A NICE ROTATION.

1911. WE'RE CLOSING DOWN FOR THE DAY. AT THIS TIME, WE HAVE PRETTY MUCH A NORTHEAST/SOUTHWEST LINE OF THUNDERSTORMS THAT IS WELL EAST OF THE NETWORK.

JUNE 23

1409. RADAR HAS BEEN DOWN ALL THIS TIME FOR A PROCESSOR PROBLEM. WE HAVE ESSENTIALLY A CONVERGENCE LINE THAT IS SET UP JUST IN THE NORTHEAST SIDE- NORTH TO NORTHEAST SIDE OF THE NETWORK. RIGHT NOW WE HAVE A 70 DBZ STORM CENTERED JUST NORTH OF THE RADAR PRODUCING A BIG FLARE ECHO. SO OBVIOUSLY OVER ONE INCH. HAIL WILL COME OUT OF THIS STORM. WE'RE DEVELOPING ROTATION IN IT,

1418. THE NOAA RADARS ARE GOING TO SCAN JUST IN THE NORTHWEST PART OF LOBE WHERE WE HAVE EXTENSION OF THIS LARGE STORM.

1428. THE CELL UP TO THE NORTH DOESN'T HAVE THE CIRCULATION IT USED TO AT LOW LEVELS. THE CELL TO THE SOUTHWEST HAS A VERY NICE HOOK AND A VERY NICE VELOCITY COUPLER.

1433. THE ECHO TO THE SOUTHWEST HAS A NICE HAIL SPIKE ON IT ALSO.

1443. WE HAVE THE NOAA RADARS SCANNING THE NORTHERN PART OF THE NORTHERN LOBE, AND RIGHT NOW WE HAVE A NICE GULF IN THAT REGION, WITH GOOD VELOCITY SHEARS ALOFT. VERY NICE GULF. THE FOYER ON THE MAJOR CELL OF THE SOUTHWEST IS VERY EXTENSIVE.

1452. WE'VE MOVED THE NOAA RADARS TO SCAN A NEW STORM DEVELOPING ON THE NORTHEAST/SOUTHWEST CONVERGENCE LINE, AND RUNS THROUGH THE NORTHEASTERN PART OF OUR NORTHERN LOBE. THE CELL IS GROWING NICELY.

1507. LOOKS LIKE WE COULD MAYBE GET A TORNADO AT JUST ON THE NORTHERN SIDE OF OUR LOBE. NICE ROTATION AT THE SURFACE UP TO MID LEVELS AND A NICE HOOK.

1545. THE CELL THAT WAS A STRONG CELL AT THE SOUTHWEST IS NOW MOVED INTO OUR SOUTH LOBE. ALL ALONG THIS CELL HAS BEEN WELL IN FRONT OF THE CONVERGENCE LINE AND RIGHT NOW THERE IS A VERY STRONG CONVERGENCE LINE, BUT IT IS ON ITS NORTHWEST SIDE. I SIMPLY DON'T UNDERSTAND WHAT'S GOING ON WITH IT.

JUN 24

1130. THE SOUNDING TODAY IS VERY MOIST AT LOW LEVELS. WE'VE GOT MIXING RATIOS IN THE 10-11 AREA. FAIRLY GOOD MOISTURE AND THEN IT DRIES OUT, BUT ITS EXPLOSIVE. WE EXPECT LARGE DEEP THUNDERSTORMS TODAY. WE HAD SOME SORT OF A

SMALL CONVERGENCE LINE MOVE DOWN TO THE NORTH THROUGH THE NETWORK ALREADY. IT'S OUT OF THE MESONET NOW. WE HAVE THE AIRCRAFT ON ALERT BECAUSE WE WANT TO FOR WHATEVER IS EARLY BECAUSE LATER IT IS GOING TO BE TOO BIG TO HANDLE. THE SOUNDINGS, ALL THE CLASS SITES DID AN 1100 SOUNDING.

1342. WE HAVE A; I GUESS WE COULD CALL IT A CONVERGENCE LINE; IT DOESN'T SHOW VERY CONVERGENT. THERE IS SOME SORT OF FINE LINE FEATURE ABOUT 50 KM NORTH MOVING SOUTHWARD. WE ARE GETTING THE AIRPLANES READY, THEY'LL BE READY IN ABOUT 30 MINUTES. THERE ARE SOME ECHOES IN BACK OF THAT LINE AND MOSTLY WEAK, OCCASIONALLY YOU SEE THEM IN THE 40'S. ONCE WE GOT ONE INTO 50. THEY ARE GENERALLY WEAK.

1456. WE HAD A POWER FAILURE HERE, SOMETHING TO DO WITH THE GENERATOR. WE'VE BEEN DOWN FOR MAYBE 15-20 MINUTES. THE AIRCRAFT HAVE JUST TAKEN OFF TO WORK THIS, MORE OF WHAT I CALL A DRY LINE INSTEAD OF WHAT I CALL A CONVERGENCE LINE. THE AIRPLANE IS GOING TO GO BACK SINCE IT IS GOING TO TAKE US ANOTHER 20 MINUTES TO GET READY. WE'RE ESTIMATING THAT DRY LINE WILL REACH I-70 AT 1540. WE'RE NOT GOING TO HAVE MUCH TO WORK IT WITH THOUGH BECAUSE WE DON'T HAVE AIRPLANES AND WE STILL DON'T HAVE THE NOAA RADARS WORKING SATISFACTORY.

1630. WE SHUT DOWN OPERATIONS.

SUMMARY.

WE HAD A VERY UNSTABLE SOUNDING. ALOT OF LOW LEVEL MOISTURE. WE SEEM TO HAVE SOME SORT OF DRYING FEATURE WE JUST SEEM TO GET PULSES OF NORTH ERLY FLOW AND EACH ONE SEEMED TO BE DRYER THAN THE OTHER. WE NEVER GOT ANY ACTIVITY IN OUR AREA AT ALL OR A GOOD FINE LINE THAT WE COULD WORK. THINGS DID GO BIG TO THE SOUTHEAST AND EAST, IN FACT I JUST HEARD THER WAS A TORNADO UP NEAR LIMON. FOR CINDE THERE WAS NOTHING OF USE FOR THE DAY. WE STILL HAVE THE NOAA RADARS REALLY NOT OPERATIONAL. THE AIRCRAFT DID GET UP FOR A SHORT TIME, BUT WHEN THEY GOT UP WE HAD A MAJOR POWER FAILURE HERE AT CP-3. WE'RE NOT REALLY SURE WHY, IT HAD SOMETHING TO DO WITH THE GENERATOR, AND SO THEY WENT HOME BEFORE WE COULD DO ANYTHING WITH THEM. THERE WASN'T MUCH WE COULD HAVE DONE WITH THEM. ONE THING WE DID GET ACCOMPLISHED TODAY WAS THAT THE SIRES WORK STATION WAS COMPLETELY INSTALLED AND READY TO GO BY 1300 TODAY. THAT LOOKS LIKE IT WILL BE A VERY NEW EXCITING FEATURE.

JUN 25

THE SOUNDING TODAY RESEMBLED YESTERDAYS IN THAT WE HAVE QUITE A BIT OF MOISTURE IN THE LOWER LEVELS AND THEN VERY DRY. MOIST UP TO ABOUT 700MB, MIXING RATIO IS AROUND 10 IN THE MIXED LOWER LEVEL. THE EXCITING FEATURE IS THAT WE DO HAVE A DENVER CONVERGENCE LINE LYING THROUGH THE SOUTHERN LOBE. RIGHT NOW SKIES ARE CLEAR. TIME IS 1103. IN PAM, IT HAS MUCH OF THE APPEARANCE OF MORE THE CYCLONE THAN THE CONVERGENCE LINE. THE CONVERGENCE LINE RIGHT NOW GOES FROM ABOUT 190 AT 60 TO 70 DEGREES AT 50 KM. WHEN WE FIRST CAME IN AT 1000 IT WAS THERE. I DID SEE IT IN THE PAM DATA AS EARLY AS 0800.

1122. NOAA RADARS ARE GOING TO START AT 1130 SCANNING THE SOUTH LOBE OR WHAT WE SHOULD CALL THE DENVER CYCLONE. IN PAM, IT REALLY DOES LOOK LIKE A STRAIGHT ROTATING FEATURE. ON RADAR WE SEE CONVERGENCE BOTH IN THE SOUTH LOBE AND THEN AGAIN IN THE NORTHEASTERN PART OF THE NORTH LOBE.

1150. THE CLASS LAUNCHED AT 1000, AND NOW THEY'RE GOING TO LAUNCH AGAIN AT 1200. THE MOBILES ARE POSITIONED ONE WEST OF US, ONE EAST OF US, AND ONE ESSENTIALLY SOUTHEAST OF US. THE ONE SOUTHEAST IS ABOUT WHERE THE CONVERGENCE IS.

1204. BOTH AIRPLANES NOW ARE FLYING ALONG ABOUT OUR 45 DEGREE RADIAL, CROSSING MORE OR LESS A DIFUSE CONVERGENCE ZONE ASSOCIATED WITH THE DENVER CYCLONE. BOTH NOAA RADARS ARE SCANNING WITH SOME SUCCESS. THE CHAFF IS NOT BEING DROPPED YET. WE THINK THEY ARE SEEING SOME CLEAR AIR THOUGH. THE NOAA RADARS ARE ALSO DOING FULLL VAB'S EVERY SO OFTEN. THERE ARE AT THIS TIME NO REAL CLOUDS ASSOCIATED WITH THIS FEATURE.

1305. THERE HASN'T BEEN MUCH CHANGE. THERE HAS BEEN A VERY SLOW INCREASE IN THE CONVERGENCE IN THE SOUTHERN LOBE. THERE HAS BEEN A COUPLE OF STORMS DEVELOPE ABOUT 80 KM SOUTH OF US JUST DOWN IN THE MOUNTAINS. THERE HAS BEEN A FEW WEAK ONES TO THE WEST. THE AIRPLANES ARE STILL FLYING. THEY ARE MAKING CROSS SECTIONS ACROSS THE BOUNDARY IN THE SOUT LOBE.

1403. THE CONVERGENCE LINE IS STILL THERE AND HASN'T CHANGED MUCH. IN THE NORTHERN LOBE WE DO SEE A LITTLE BIT MORE EXTENSIVE CONVERGENCE GOING ON. THE PLANES ARE STILL FLYING IN THE SOUTHERN LOBE AND CLOUD DEVELOPEMENT-WISE THERE REALLY IS NOTHING IN THE WAY OF TOWERING CUMULUS. JUST SMALL CUMULUS.

1430. THE CONVERGENCE LINE IS STILL THERE AND HAS HARDLY MOVED ALL DAY LONG. THE CUMULUS ARE PRETTY SUPPRESSED, THERE IS ONE THAT TOWERED UP A LITTLE BIT. PLANES ARE STILL FLYING IN THE SOUTH LOBE. WE DID CHANGE THE NOAA RADARS TO SCAN WITH A LITTLE HIGHER RESOLUTION, THAT'S THE B1-L. WE HAD BEEN DOING B1-M. THE SOUNDINGS HAVE SHOWN THAT WE'RE GETTING FAIRLY GOOD WARMING STILL. THAT'S PROBABLY WHATS KILLING US.

1600. THE PLANES LANDED ABOUT 1550. THEY WORKED THE SOUTH LOBE THE WHOLE TIME. BY THIS TIME AND WITHIN THE LAST HALF HOUR, WE'VE HAD A FEW TOWERING CUMULUS GO UP ON THE CONVERGENCE LINE IN THE SOUTHERN LOBE. SOME OF THE ECHOES REACHED 20 TO 25 DBZ. THE SOUNDINGS DEFINITELY HAVE SHOWN WARMING AND JUST BARELY MUCH POSITIVE AREA. BUT THE SAME FEATURES BASICALLY HAVE STAYED THERE. WE HAVE THIS BIG MESOCYCLONE JUST ROTATING AROUND WITH THE STRONGEST CONVERGENCE IN THE SOUTHERN LOBE.

1645. WE'VE BEEN DOWN FOR APPROXIMATELY 15-25 MINUTES. WE HAD ANOTHER POWER OUTAGE BECAUSE WE WERE DRAWING TOO MUCH POWER. AS WE COME BACK WE SEE THAT ONE OF THE CELLS THAT IS DIRECTLY EAST OF US HAS GONE UP INTO THE 40'S. PROBABLY 45 DBZ.

1721. WE'VE HAD SEVERAL CELLS THAT GO INTO THE 40-50 DBZ RANGE MOSTLY TO THE EAST AND ONE TO THE SOUTHEAST OFF THE CONVERGENCE LINE. WE LOST NOAA D. SO WHAT WE BEEN BUSILLY DOING RIGHT NOW IS WORKING UP SCAN THAT USES NOAA C AND CP-3. WE'RE STILL DOING 360 DEGREES. WE'RE DOING ONE DEGREE STEPS AND WE'RE GETTING THROUGH IN ABOUT TWO AND ONE HALF MINUTES. WE'RE GOING TO BRING THE AIRCRAFT BACK TO WORK THE LINE.

1755. WE HAVE OVER 70 DBZ, AND THE STORM IS JUST ON THE EASTERN EDGE OF THE PAM NETWORK. IT HAS A ANTICYCLONIC/ CYCLONIC PAIR IN IT AT UPPER LEVELS THERE ARE NEW STORMS FORMING. WE HAD ONE FORM TO THE SOUTHEAST THAT WAS KIND OF ON A CONVERGENCE LINE. WE MAY HAVE THE FORMATION OF THAT BETWEEN NOAA C AND CP-3. WE HAVE ALOT OF TROUBLE COORDINATING THIS NOAA C. I'M NOT SURE JUST HOW THAT DUAL DOPPLER IS GOING TO BE. WE HAVE ANOTHER STORM FORMING JUST NORTHWEST OF THE BIG 70 DBZ STORM, ON AN AREA WHERE THERE IS A PARTICULAR ENHANCEMENT IN THE CONVERGENCE. THIS CONVERGENCE LINE; THE FEATURES HAD NEARLY ALL DAY LONG A KIND OF A TRIANGULAR SHAPE. WITH THE APEX JUST WEST OF THE

BIG 70 DBZ STORM.

1826. WE NOW HAVE A 70 DBZ STORM IN THE MIDDLE OF THE SOUTHERN LOBE. IT'S PRETTY MUCH WHERE WE WORKED ALL DAY LONG, SO IT'S REALLY ABSOLUTELY EXCEPTIONAL. THE ONLY PROBLEM IS THE LOSS OF NOAA D. THAT'S MEANT THAT WE'VE LOSS THE HIGH RESOLUTION KINEMATIC DATA THAT WE WOULD LIKE TO HAVE. I JUST DON'T KNOW HOW GOOD THE DATA'S GOING TO BE BETWEEN CP-3 AND NOAA C. IT CERTAINLY RECOURSER AND WE'VE HAD A LITTLE TROUBLE KEEPING COORDINATED, BUT NOT TOO BAD.

1918. I DON'T THINK I REPORTED, BUT I'D SAY ABOUT 15-20 MINUTES AGO, WE HAD ANOTHER BIG CELL GO UP ON THE CONVERGENCE LINE A LITTLE FURTHER WEST OF THE PREVIOUS ONE. RIGHT IN THE AREA WHERE WE ARE DOING DUAL DOPPLER WITH NOAA C. AGAIN WE DON'T KNOW HOW GOOD THIS DUAL DOPPLER IS GOING TO BE, BUT IT'S SOMETHING ANYWAYS. THE CONVERGENCE LINE STILL MAINTAINS ITS TRIANGULAR SHAPE AND IT'S SLOWLY COLLAPSING IN ON ITSELF AS IT MOVES WESTWARD. EVERY ONCE IN A WHILE INITIATES A NEW STORM.

1945. WE'RE GOING TO CLOSE OPERATIONS NOW THE CONVERGENCE IS CENTERED ABOUT 10 KM SOUTHEAST OF US. NO NEW STORMS HAVE INITIATED PROBABLY IN THE LAST HALF HOUR OR SO. INTERESTINGLY ENOUGH ALL THE CHAF IS CONGREGATING RIGHT AT THE POINT OF CONVERGENCE LINE. THE POINT OF THE CONVERGENCE LINE IS, AS WE MENTIONED EARLIER, A KIND OF TRIANGULAR SHAPE THING THAT JUST BEEN SLOWLY MOVING WESTWARD. THIS CONCLUDES A VERY GOOD CASE. WE SAMPLED A DENVER CONVERGENCE LINE ESSENTIALLY ALL DAY. IT FINALLY FIRED BIG. THE ONLY THING THAT'S MISSING IS WE DIDN'T HAVE AIRCRAFT FLIGHTS JUST BEFORE IT WENT. THE PLANES HAD GONE DOWN JUST AN HOUR EARLIER. AND WE LOST NOAA D. SO THAT THE DUAL DOPPLER STUFF IS A LITTLE CORSE. AND, OF COURSE, DIDN'T GET AS HIGH AS WE WOULD LIKED TO HAVE GOTTEN. ALL IN ALL, IT SHOULD BE A VERY FINE CASE.

JUN 26

I'M IN A NOWCASTER POSITION TODAY. THE SOUNDING IS SIMILAR TO THE PAST TWO DAYS IN THAT WE HAVE ALOT OF MOISTURE IN LOWER LEVELS UP TO ABOUT TO 650 MB, THEN IT DRIES OUT. TODAY WE DON'T EXPECT TO GET THE WARMING AROUND 700 MB LIKE WE DID YESTERDAY, BECAUSE THERE IS COOLER AIR TO OUR NORTHWEST AND THE FLOW IS NORTHWESTERLY. SO IT GIVES US A PRETTY UNSTABLE SOUNDING AGAIN. AT THE BRIEFING IT WAS EXPECTED THAT THE CONVECTION WOULD GO EARLIER THAN

YESTERDAY. BUT WE DO NOT ANY SORT OF CONVERGENT LINE FEATURES ON THE PLAINS TODAY AS OF YET. THE FLOW IS VERY SHALLOW LAYER OF EASTERLY FLOW MAYBE 500 METERS TO A KM DEEP, AND THEN NORTH ERLY ABOVE.

1244. WE'VE JUST POWERED UP THE 1100 DENVER SOUNDING, AND WE'RE SEEING THE TEMPERATURE PROFILES ALOFT HAVEN'T CHANGED REALLY, EXCEPT FOR THE LOW LEVEL WARMINGS. BUT THE MOISTURE HAS DRIED OUT CONSIDERABLY, WE'VE HAD QUITE A BIT OF MOISTURE AT 700 MB BEFORE AND NOW ITS GONE. RIGHT NEAR THE SURFACE WE STILL HAVE ABOUT THE SAME AMOUNT OF MOISTURE. WE'RE DEFINITELY IN A DRYING TREND, SO WE'RE NOT GOING TO FORECAST ANY CONVECTION FOR AT LEAST THE NEXT HALF HOUR. THERE ARE NO VELOCITY FEATURES ON THE PLAINS EXCEPT 90 KM TO OUR NORTH/NORTHEAST THERE'S A SLIGHT SUGGESTION OF A FINE LINE AND ON THE SATTELITE LOOP THERE'S A SLIGHT SUGGESTION OF SOME CLOUDS THERE.

1626. WE ARE CLOSING DOWN OPERATIONS. TWO O'CLOCK SOUNDING ALSO SHOWED CONTINUAL DRYING. THERE IS REALLY NO ACTIVITY AT ALL. A FEW WEAK SHOWERS WAY BACK IN THE MOUNTAINS. AND A FEW WELL UP TO THE NORTH. BUT REALLY NOTHING GOING ON TODAY,JUST SIMPLY DRIED OUT. IT WILL NOT BE NECESSARY TO PULL ANY RADAR IMAGES FOR THE DAY. AND IT ALSO WILL NOT BE NECESSARY TO PHOTOGRAPH ANY RADAR IMAGES FOR THE DAY.

JUN 27

1200. THE DENVER MORNING SOUNDING WAS FAIRLY DRY, THERE WAS SOME MOISTURE UP AROUND 550 MB. THE 1100 SOUNDING SHOWED REMARKABLE DRYING IN THE LEVELS BELOW 600 MB, BUT WE STILL KEPT SOME SURFACE MOISTURE. THE THING IS THERE'S MOISTENING AROUND THE LAYER BETWEEN 500 AND 550 MB. SO OUR BEST CHANCE TODAY IS PROBABLY FOR HIGH BASED SHOWERS; VIRGA TYPE SITUATIONS. RIGHT NOW WE REALLY DON'T HAVE ANY ORGANIZED LOW LEVEL FLOW FEATURES AT ALL. THERE WAS EARLIER THE SLIGHTEST HINT OF A CONVERGENCE LINE 50 KM SOUTH, BUT THAT'S REALLY NOT HOLDING TOGETHER. TODAY I'M DOING THE NOWCASTER ROLE.

1245. WE'RE GETTING A FEW ECHOES TO THE SOUTHWEST IN THE MOUNTAINS AND TO THE NORTHWEST IN THE MOUNTAINS. A COUPLE OF THEM ACTUALLY TO THE NORTHWEST: ACTUALLY GOT OFF THE MOUNTAINS, BUT THERE ONLY IN THE ORDER OF 15 DBZ. BUT THERE IS ALOT OF CUMULUS BUILDUP IN THE MOUNTAINS

1316. WE'VE HAD ONE SMALL CELL, IT'S 40 TO 45 DBZ, ACTUALLY MAKE IT OFF THE MOUNTAINS. 330 DEGREES AT ABOUT 55 KM. WE'VE SEEN NO OUTFLOW, AND WE REALLY DON'T EXPECT ANY.

1335. WELL THAT'S HOW WRONG YOU CAN BE. WE SAW A DELTA V OF ABOUT 10 M/S OUT OF THAT CELL TO THE NORTHWEST. THE LONGMONT WIND DID GUST UP TO 20 KNOTS IN THE NORTHEAST.

1340. WE HAVE A NEW CELL. IT'S 330 DEGREES AT 60 KM. LOOKS LIKE IT KIND OF WILL COME DOWN OVER THE SAME PATH THE PREVIOUS ONE DID. AND WE HAVE HAD SINCE 1300 A WEAK CONVERGING LINE TO OUR SOUTHWEST AT 25 KM. WE DON'T VISUALLY SEE ANY CLOUDS ON IT THOUGH.

1358. THE SHOWER CAME OFF THE MOUNTAINS AT 330 AT ABOUT 58 KM. IT HAS PUT OUT A DIVERGING OUTFLOW. SHOWS ROTATIONAL AND CONVERGENT FEATURES IN IT. QUITE PRONOUNCED CONVERGENCE AT THREE AND A HALF DEGREES.

1407. WE HAD A DELTA V OF 15 OUT OF THIS SECOND STORM. NICE CONVERGENCE STILL AT THREE AND A HALF DEGREES.

1420. WE'VE ASKED THE AIRPLANES TO GET READY TO TAKE OFF. PROBABLY BE ABOUT 30 MINUTES. WE HAVE A NUMBER OF LITTLE CELLS IN THE 20 TO 40 DBZ RANGE THAT HAVE COME OFF THE MOUNTAINS AND ARE HOPING THAT THAT IS GOING TO PRODUCE SOME NICE VIRGA SHOWERS.

1439. THE OUTFLOW FROM THESE STORMS TO THE NORTHEAST IS ABOUT TO INTERSECT A REAL HEAVY ROLL. THAT WOULD BE AROUND 20-30 DEGREES RADIAL. I WOULD GO FOR A FORECAST OF A 30 TO 35 DBZ STORM THERE. WITHIN THE NEXT 40 MINUTES.

1444. I DON'T BELIEVE I'VE MENTIONED BUT FOR ABOUT A HALF HOUR WE'VE HAD A CONVERGENCE LINE SLOWLY DEVELOPING TO OUR SOUTHEAST. IT REALLY LOOKS LIKE AN ENHANCED ROLL AT THIS TIME.

1508. WE DO HAVE 80 KM OUT, A BOUNDARY MOVING DOWN FROM THE NORTH. IT IS JUST ABOUT IN THE PROCESS OF COLLIDING WITH THE OLD OUTFLOW BOUNDARY THAT CAME FROM THE STORMS UP AROUND LYONS AND LONGMONT. WE HAVE THE OTHER SIDE OF THE LONGMONT STORM BOUNDARY JUST ABOUT HERE. IT'S THROUGH THE MIDDLE OF THE PAM NETWORK. IT'S QUITE WEAK. THE FLOWS ARE JUST A FEW METERS PER SECOND. SO WE HAVE OPTED NOT TO DO ANYTHING WITH IT. NOAA RADARS ARE SCANNING IN THE B-1 LOW MODE, BUT THEY DO NOT HAVE CHAF AT THE PRESENT TIME. SO THEY ARE PROBABLY GOING OUT AT ABOUT 15 KM.

1533. WE HAVE A LARGE GUST FRONT THAT'S 50-60 KMS NORTH OF THE RADAR MOVING THIS WAY. WE ESTIMATE IT SHOULD REACH OUR NORTHERN DUAL LOBE WITHIN AN HOUR. THAT WOULD MAKE IT 1630 I WOULD BE A BIT SURPRISED IF IT GOT HERE EARLIER BECAUSE I EXPECT MORE COLD AIR WILL BE FEEDING INTO IT. THE AIRPLANES ARE UP, THE CHAF PLANE IS UP, SO WE'RE READY FOR IT.

1547. ESTIMATE THE GUST FRONT IS ABOUT 30 MINUTES FROM THE NORTHERN DUAL LOBE. IT REALLY IS NOT INITIATING ANY STORMS NOW. THERE ARE SOME OLD ONES THAT HAVE COME OFF THE MOUNTAINS. I EXPECT AS THEY RUN INTO THOSE IT WILL KEEP THEM ALIVE. SO ECHOES SHOULD STAY IN THE 40 DBZ RANGE. WHAT I'M LOOKING AT FOR MORE THAN 1 1/2 TO 2 HOURS AHEAD IS WHEN THIS GUST FRONT HITS THE OLD STATIONARY BOUNDARY THAT WE HAD JUST NORTH OF THE RADAR THAT THAT COULD REALLY START SOME REAL ACTION BECAUSE IT'S BEEN REAL WARM DOWN HERE. SO THAT'S PROBABLY AN HOUR AND A HALF AT LEAST AWAY.

1605.

WE HAVE THREE BOUNDARIES WE ARE DEALING WITH. ONE NORTHWEST/SOUTHEAST THROUGH THE RADAR. ANOTHER ONE MOVING UP VERY SLOWLY FROM THE SOUTH. AND OF COURSE OUR MAJOR GUST FRONT COMING DOWN FROM THE NORTH. THE ONE FROM THE NORTH IS JUST ABOUT TO ENTER THE NETWORK. WE'VE GOT FOUR SOUNDINGS LINED UP TO TAKE SOUNDINGS OF IT. VERTICAL CROSS-SECTIONS: THE PLANES WILL DO.

1636. THE GUST FRONT HAS PASSED PAM STATION 8 WHICH IS THE STATION WE WANTED IT TO PASS, AND WE ARE SENDING UP ALL FOUR SOUNDINGS RIGHT ABOUT NOW. THIS WILL GIVE US A GOOD CROSS-SECTION ACROSS IT AND THE AIRPLANES WILL START THERE CROSS-SECTIONS MOMENTARILY. THE BOUNDARY HAS A NUMBER OF 30 AND 40 DBZ ECHOES ALONG IT. IT IS HARD TO TELL WHICH ONES INITIATE IT; WHICH ONES HAVE ENHANCED, I CAN'T REALLY SAY.

1740. WE SWITCHED OVER TO WORK THE SOUTH LOBE. AS THE MAIN GUST FRONT MOVES SOUTH IT INTERSECTED WITH THE OLD STATIONARY BOUNDARY DOWN THERE. THE PLANES NEVER SEEMED TO DO IT RIGHT. FOR SOME REASON THEY WERE NEVER REALLY CROSSING THE BOUNDARY; NEVER GETTING ACROSS THE SOUTHERN END. JUST GETTING TO IT. SOME COORDINATION PROBLEMS THERE. WE JUST DID RELEASE THREE MORE SOUNDINGS ABOUT 10-15 MINUTES AGO. THAT WOULD HAVE CAUGHT BOTH SIDES OF THE BOUNDARY. THE CONVECTION HAS BEEN GENERALLY PRETTY WEAK. MOSTLY IN THE 30'S AND AN OCCASIONAL 40. NOW WE DO HAPPEN TO HAVE ONE STORM THAT IS GOING UP CLOSE TO 50, 30 KM SOUTH OF

THE RADAR. NOT BEEN REALLY ABLE TO DO THE NOWCASTING JOB. IT JUST SIMPLY DOESN'T WORK. I HAVE TO STAY IN THE OPERATIONS MORE. WE'VE HAD SOME PROBLEMS WITH SO MANY BOUNDARIES AROUND TO ANTICIPATE WHAT TO DO BECAUSE THE AIRCRAFT PUT A LARGE DEMAND ON THE SYSTEM TO ALWAYS HAVE THE SAME IMAGE UP AND THE SAME COORDINATE SYSTEM. SO IT'S SOMETHING I HAVE GOT TO WORK OUT.

1750. REALLY HAVEN'T BEEN LOOKING THAT MUCH FOR THEM, BUT I JUST NOTICED WHEN I LOOKED AT THE SCOPE, I SAW THREE DISTINCT SMALL MICROBURSTS. I THINK THEY'VE JUST BEEN ALL OVER THE PLACE.

FROM CP-3 THERE SHOULD BE ALOT OF GOOD DATA ON MICROBURST OCCURRENCES FROM THE SINGLE DOPPLER VIEW-POINT LOOKING AT DESCENDING CORES AND CONVERGENCE WITHIN CLOUDS.

1820. WE HAVE A BAND OF LIGHT PRECIP NOW ENTERING INTO THE SOUTHERN LOBE. THERE'S SOME REAL STRONG ECHOES JUST ON THE OUTSIDE OF IT, OVER 50 DBZ, BUT WE'RE GOING TO SET UP DOING MICROBURST TYPE SCANNING ON SOME STUFF IN THE SOUTHERN LOBE.

1900. OPERATIONS STOPPED.

SUMMARY

WE DID HAVE STORMS COMING OFF THE MOUNTAINS TO THE NORTHWEST. WE PRETTY MUCH HAD IT RIGHT THAT THESE STORMS WOULD EVENTUALLY PROBABLY PRODUCE A LARGE OUTFLOW. IT DID. WE GOT A MAJOR OUTFLOW THAT MOVED DOWN FROM THE NORTH. WE SET UP THE SOUNDINGS AND THE PLANES TO WORK IT WELL. OUR ANTICIPATION WAS GOOD. WE SHOULD HAVE SOME PRETTY GOOD DATA AS THE GUST FRONT MOVED THROUGH THE NORTH LOBE. WHAT'S UNKNOWN AT THIS TIME IS JUST HOW MUCH CLEARER THE NOAA RADAR'S SEE, ALTHOUGH WE DO HAVE A CHAF PLANE THERE IN PLENTY OF TIME TO PUT DOWN PLENTY OF CHAF. WE DO KNOW THAT THE AIRPLANE LEGS ALLOWED PROBABLY ONLY TWO PASSES FOR EACH PLANE THROUGH THE NORTH LOBE, BEFORE THEY WERE IN THE SOUTH LOBE. THINGS GOT A LITTLE CONFUSED WHEN THE GUST FRONT PASSED INTO THE SOUTH LOBE AND AT THAT TIME, WE HAD ANOTHER BOUNDARY. I DON'T KNOW IF I EVER MENTIONED IT EARLIER. THAT WAS TO THE SOUTH AND RATHER STATIONARY. WE HAD ONE THAT WAS PRETTY MUCH OVER THE RADAR THAT STALLED OUT WHICH WAS THE RESULTS OF EARLY OUTFLOW FROM WHAT I CALLED THE LYONS STORMS. ALL THREE

OF THESE WERE SORT OF COMING TOGETHER IN THE SOUTH LOBE, BUT IT WAS VERY DIFFICULT TO WATCH THE EVOLUTION OF THESE BECAUSE WE HAD TO CONCENTRATE ON THE AIRCRAFT. WE HAD SOME DIFFICULTY TRYING TO ANTICIPATE WHAT WOULD HAPPEN. WE KNOW THAT THE AIRCRAFT WHEN THEY FLEW THE SOUTH LOBE PROBABLY JUST BARELY GOT TO THE SOUTH SIDE OF THE GUST FRONT. SO THAT DATA MAY BE A LITTLE QUESTIONABLE. I DO THINK THAT THE DATA WE GOT IN THE NORTH LOBE WAS GOOD. LATER, WE DID SCAN SOME STORMS AFTER 1800, THAT WERE PRODUCING OUTFLOWS; REALLY IN MORE OR LESS TO TEST HOW WE COULD DO COORDINATED DUAL DOPPLER SCANS OF MICROBURST STORMS WITH NOAA RADARS. THAT SEEMED TO WORK VERY WELL. I THINK THE MAJOR THING FOR THE DAY IS THAT WE REALLY HAVE SOME PROBABLY VERY GOOD DATA ON THE GUST FRONT IN THE NORTH LOBE FROM ALL SENSORS. AND THE DATA FROM THE SOUTH LOBE IS PROBABLY OF MARGINAL USEFULNESS. ONE OF THE THINGS THAT WAS PROBABLY THE MAJOR FEATURES TODAY WAS THE VERY STRONG OUTFLOWS THAT WE GOT WITH THESE STORMS. THERE WERE A LOT OF STORMS IN THE 40 DBZ RANGE, THAT PUT OUT QUITE STRONG OUTFLOWS. I AT STAPLETON WE WERE IN NORTHERLY FLOW AND SUDDENLY THE WIND SHIFTED INTO THE SOUTH AND WENT UP TO AS HIGH AS 47 KNOTS. THERE WERE LOTS OF MICROBURSTS. WE REALLY WEREN'T CONCENTRATING ON THAT ASPECT, BUT I THINK FROM THE SINGLE DOPPLER STANDPOINT THERE OUGHT TO BE SOME PRETTY GOOD DATA THERE. ONE THING THAT WAS NEVER PUT ON TAPE WAS WE DID VERY GOOD ANTICIPATION WITH THE STRONGER STORMS THE DAY FORM. AND THAT WAS IN THE SOUTH LOBE IN AN AREA WHERE THE MAIN GUST FRONT WAS COLLIDING WITH THE OTHER BOUNDARIES. THAT'S WHERE IT HAD BEEN STAYING WARM. THESE NOWCASTS WERE NOT REALLY RECORDED, THEY WERE JUST KIND OF VERBALLY DISCUSSED. AS I MENTIONED EARLIER WE REALLY DIDN'T DO THE NOWCASTING PROPERLY. IT WAS NOT POSSIBLE FOR ME TO DO IT BECAUSE OF THE OTHER PRESSURES OF THE JOB. ALL IN ALL, I THINK IT WAS REALLY QUITE A GOOD DAY. I'M STILL IMPRESSED WITH OUR ABILITY TO NOWCAST. I'M NOT SURE THAT WE'RE THAT GOOD AT KNOWING WHICH STORMS PRODUCE MICROBURSTS. WHAT I FAILED TO DO WAS TO PUT ON THE TAPE TIMES TO TAKE PICTURES OF THE RADAR DATA. THE DAY CERTAINLY IS A DAY THAT WE DO WANT TO GO THROUGH PULLING IMAGES FROM THE RADAR TAPES. I WOULD IMAGINE THAT WOULD START SOMEWHERE AROUND 1400, BUT I DIDN'T PUT ANYTHING ON THE TAPE. I'M SURE WE ALSO WANT TO GET SOME PHOTOGRAPHS. THIS IS A DAY WHERE WE WILL HAVE TO DO A REVIEW OF THE TAPES TO MAKE THESE DECISIONS. THAT IS IT FOR JUNE 27.

ADDITIONAL NOTES THERE ARE THINGS I DIDN'T PUT ON EARLIER HAVING TO DO WITH WEATHER THAT OCCURRED. BACK ON MONDAY, WE AT ONE TIME I REMEMBER, THOUGHT THERE WAS GOING TO BE A TORNADO JUST SOUTH EAST OF HUDSON. WE LATER DID FIND OUT INDEED THERE WAS A SMALL TORNADO I DON'T KNOW HOW LONG IT LASTED. HOW BIG IT WAS. SO THAT WAS A CONFIRMATION OF WHAT WE EXPECTED. ALSO ON THAT DAY THERE WERE ALOT OF FLARE ECHOES. OF COURSE WE THEN EXPECTED LARGE HAIL. I KNOW THAT THERE WERE REPORTS OF LARGE HAIL THAT OCCURRED ON THAT DAY WITH THESE STORMS IN QUESTION. ALSO ON THURSDAY, WHICH I GUESS WOULD HAVE BEEN THE 25TH, THAT IS THE DAY WE HAD THE DENVER LARGE CYCLONE. THERE WAS SOME BIG STORMS INITIATED AT THE APEX OF THE CONVERGENCE. I DO KNOW THAT ON THAT DAY, WITH I THINK WAS THE VERY FIRST LARGE STORM, PRODUCED THAT GOLF BALL SIZE HAIL THAT DID FALL IN THE BENNET AREA DESTROYING ALOT OF CROPS

JUN 28

1125. THE MORNING SOUNDING TODAY WAS REALLY VERY DRY. WE HAD VERY LITTLE 500 MB MOISTURE, BUT GRAND JUNCTION AND LANDER HAVE LOTS OF MOISTURE BETWEEN 500 AND 400 MB, SO THAT WILL BE ADVECTING IN. WE HAD ORIGINALLY THOUGHT WE MIGHT HAVE ALOT OF HIGH BASED CONVECTION TODAY, BUT AT THIS HOUR NOTING THAT THERE IS A LOT OF MOISTURE STARTING TO ADVECT IN FROM THE EAST. THERE IS A COLD FRONT UP IN WYOMING AND IT LOOKS LIKE THERE IS MOISTURE GOING TO ADVECT IN AHEAD OF IT. WHAT WE THOUGHT MIGHT BE A HIGH BASE THUNDERSTORM DAY MAY EVOLVE INTO A INTENSE THUNDERSTORM DAY. WE HAVE SEVERAL STORMS AT THIS TIME OVER THE MOUNTAINS. ONE OF THEM AT 210 DEGREES AT 40 KM HAS ALREADY PUT OUT A NICE LITTLE OUTFLOW THAT'S AS CLOSE AS 30 KM TO US. AND THERE IS ALSO ONE UP TO THE NORTHWEST THAT HAS DONE A SIMILAR THING.

1235. BOUNDARIES A and B ARE JUST ABOUT TO COLLIDE OVER STAPLETON. WE SHOULD HAVE A CLASS GOING UP MOMENTARILY FROM STAPLETON. AND WE EXPECT THAT THE COLLISION WILL CONTINUE TO PRETTY MUCH GO ALONG I-70 FOR THE NEXT HOUR OR SO.

1244. WE DID GET CONFIRMATION THAT THE CLASS SOUNDING WENT UP ABOUT 1235. THERE IS JUST SOME CLOUDS ALONG THE SOUTHERN BOUNDARY RIGHT NOW. VERY FEW WITH THE NORTHERN BOUNDARY. THE NOAA RADARS; ONLY C IS AVAILABLE RIGHT NOW AND IT GOING TO DO RHI'S ALONG THE COLLISION POINT. NOAA C IN THEIR RHI'S DON'T HAVE ANY CHAFF AND THEY CAN ONLY SEE 10 KM,

SO THERE'S NOTHING TO GET FROM THEM YET.

1315. JUST VISUALLY LOOKED ALONG OUR LINE OF COLLISION WITH THE TWO BOUNDARIES, AND THERE'S JUST ONE LONG LINE OF CUMULUS CLOUDS. ONE OF THEM HAS A LITTLE TOWER ON IT WHERE IT'S COLLIDED. NOTHING MUCH MORE THAN THAT.

1348. WE HAVE ABOUT A 20 DBZ CELL WHERE WE HAD OUR LAUNCH BETWEEN THE BOUNDARIES THAT WERE COLLIDING. OUR THIRD SOUNDING, THE BOUNDARY WENT STATIONARY OVER THEM, SO WE'RE GOING TO HAVE TO MOVE THEM TO GET ANOTHER SOUNDING OF THAT ONE.

1445. WE'RE STARTING TO DEVELOPE A WHOLE LINE OF SHOWERS ALONG THE STATIONARY BOUNDARY AS THIS FLOW FROM THE NORTH INCREASES THE CONVERGENCE. WE HAVE SOME 40 DBZ ONES FROM US WEST NOW, AND ONE 50 DBZ ONE AT THE SOUTHEAST CORNER OF THE DUAL DOPPLER LOBES. BUT WE EXPECT THAT TO FILL IN BETWEEN THAT STORM AND US NOW. THE SURGE JUST ISN'T QUITE THERE, BUT IT'S JUST ABOUT. VISUALLY YOU CAN SEE NICE HARD BASES ALL ALONG THE STATIONARY BOUNDARY.

1504. THE CONVERGENCE AT LOW AND MID LEVELS IS GETTING VERY WELL ORGANIZED DOWN THE LINE NOW. AND I WOULD EXPECT THAT THESE STORMS WILL GO OVER 60 DBZ. ACTUALLY OFF TO THE WEST I THINK I'M STARTING TO SEE SOME THAT MIGHT BE APPROACHING IT.

1530. WE HAVE ABOUT 55 DBZ OVER US. SOME VERY SMALL HAIL IN IT. WE JUST STARTED DOING A THREE DEGREE SCAN FOR WES WILSON. I NOTICED THERE SEEMS TO BE A SMALL DIVERGENT FEATURE JUST TO THE NORTHEAST, PROBABLY A KILOMETER OR TWO. IT'S PRETTY STRONG. LOOKS LIKE IT'S DELTA V AT 20.

1532. WE HAVE PROBABLY ABOUT MARBLE HAIL NOW.

1538. WE'RE STILL DOING THE THREE DEGREE SCAN. WE DEVELOPED ANOTHER LITTLE MIMCROBURST ABOUT THREE KM DUE EAST SO WE HAVE ANOTHER GOOD ONE FOR WES DELTA V ON THIS ONE IS PROBABLY IN THE 25 METER PER SECOND RANGE.

1552. JUST NOTING AT MID LEVELS AS BEING THE TWO TO FIVE KM LEVEL. WE'RE GETTING A WHOLE LOT OF REAL TIGHT LITTLE CIRCULATIONS, BUT I THINK THEY'RE DOWNDRAFTS.

1556. THE CELL WE'RE DOING DUAL DOPPLER RADAR ON APPEARS TO HAVE A RATATING DOWNDRAFT. AND WE SAW A LITTLE BIT OF DIVERGENCE WITH IT.

1600. ACTUALLY WE SEE FOUR VERY DISTINCT ROTATING DOWNDRAFTS. THREE OF THEM ARE IN THE AREA THAT WE'RE DOING DUAL DOPPLER ON.

1615. FIVE OF THE LAST 10 MINUTES WE'VE HAD 60 DBZ IN THE SOUTH DUAL LOBE WHERE WE'VE BEEN SCANNING FOR QUITE A WHILE NOW. I DON'T KNOW IF THERE HAS BEEN ANY STRONG OUTFLOWS THOUGH

1630. ONE OF THE MOBILES WHICH IS OUT TO THE NORTHEAST ABOUT 40 KM REPORTED DUSTNADOES. WHAT WE CAN SEE IS THAT IT LOOKS LIKE THERE WAS A WEAK BAND OF PRECIP OUT FRONT OF THE MAIN LINE OF ACTIVITY THAT PUT OUT A DIVERGING OUTFLOW THAT MIGHT HAVE INTENSIFIED THE CONVERGENCE.

1645. WE'VE STOPPED OPERATIONS FOR THE DAY.

SUMMARY

WHAT HAPPENED AT THE VERY BEGINNING WAS THAT WE HAD TWO OUTFLOWS. ONE FROM THE SOUTHWEST AND ONE FROM THE NORTHWEST. THESE HAPPENED BY ABOUT 1130 IN THE MORNING, AND THEY REALLY WERE THE CONTROLLING INFLUENCES FOR THE DAY. THE ONE FROM THE SOUTH WEST WAS THE MAIN FEATURE. IT MOVED STEADILY EAST AND NORTH AND ACTUALLY STALLED OUT OVER STAPLETON AND THROUGH OUR SOUTH LOBE. HELPING IT TO STALL OUT WAS THE NORTHERN OUTFLOW WHICH REALLY WEAKENED QUITE A BIT. BUT THEY JUST BECAME A STATIONARY FEATURE. WE SET UP SOUNDINGS TO WORK THESE TWO BOUNDARIES COLLIDING WHICH I CALLED A and B EARLIER. WE GOT TWO OF THE SOUNDINGS, ONE ON THE NORTH SIDE OF THE WEAKER BOUNDARY, ONE IN THE MIDDLE, AND THE THIRD ONE WE NEVER GOT BECAUSE THE BOUNDARY STALLED OUT RIGHT OVER THEM. WE LATER USED THIS SOUNDING TO GREAT ADVANTAGE (THAT LOCATION) AS ANOTHER MAIN OUTFLOW CAME OUT OF THE NORTH. AFTER THIS STATIONARY BOUNDARY SAT THERE FOR A WHILE, CLOUDS CONTINUED TO BUBBLE ON IT. AND AS THE MAIN OUTFLOW FROM THE NORTH APPROACHED IT WAS VERY COMPLEX. IT HAD TWO OR THREE SURGES WITH IT, AND WE WERE QUITE CONFUSED ON JUST HOW TO RELEASE SOUNDINGS IN IT. BUT AS THAT APPROACHED THE STATIONARY BOUNDARY, THEN THE WHOLE STATIONARY BOUNDARY BECAME VERY ACTIVE AND PRODUCED A MAJOR LINE OF THUNDERSTORMS THAT RANGED BETWEEN 50 AND 60 DBZ. TWO STRONGEST CELLS OF ALL IN THAT LINE; ONE WAS OVER STAPLETON AND THE OTHER WAS RIGHT IN THE MIDDLE OF OUR SOUTHERN LOBE. SO THE TWO NOAA RADARS GOT GREAT DATA ON THE ONE STORM FROM ITS VERY BIRTH TO ITS DEATH INCLUDING GOOD OUTFLOW WITH IT AND

SEVERAL ROTATING DOWNDRAFTS, SO THAT WAS A GREAT SUCCESS. THE FORECASTS FOR WHERE ALL THIS ACTIVITY; WERE ESSENTIALLY PERFECT. THEY WERE MADE AN HOUR TO AN HOUR AND A HALF AHEAD OF TIME AND OF COURSE VERIFIED. THE SOUNDINGS WE HAD I THINK WERE PRETTY GOOD. I THINK WE SAMPLED THE AIR ON BOTH SIDES WELL. WE DID HAVE ONE MISSED SOUNDING IN THAT WE DIDN'T GET A SOUNDING ON THE SOUTH SIDE OF THE STATIONARY BOUNDARY. BY THE TIME THAT SOUNDING GOT UP, THEY WERE ALREADY I THINK IN OUTFLOW FROM THE STORMS IT PRODUCED. WE HAVE A FEW PROBLEMS YET ON JUST HOW WE GET THE SOUNDINGS OFF. ITS MORE OF JUST AN INTERNAL COORDINATION PROBLEM. I DON'T BELEIVE I'VE MENTIONED TODAY WAS A DAY WE HAD NO AIRCRAFT BECAUSE IT WAS A DAY THE PILOT HAD TO REST. NOBODY ELSE RESTS, BUT THE PILOT RESTS. SO DATA WISE, WE HAVE VERY GOOD SOUNDINGS ON ESSENTIALLY COLLIDING BOUNDARIES AND STATIONARY BOUNDARIES. WE HAVE GOOD RADAR DATA ON THE EVOLUTION OF A STORM I THINK PRETTY MUCH RIGHT FROM ITS UPDRAFT TO ITS DOWNDRAFT STAGE. ONE PROBLEM THAT WE HAVE IS THAT THE NOAA RADARS REALLY DO NOT SEE CLEAR AIR, EXCEPT IN THE FIRST TEN KM'S. THUS THEY NEED CHAFF AND ITS VERY DIFFICULT TO GET ENOUGH CHAFF DISPERSED, SO I'M KIND OF WORRIED ABOUT HOW WELL WE'RE GOING TO DO ON JUST BOUNDARIES THAT DON'T HAVE STORMS ON IT. IT IS SOMETHING WE'RE GOING TO HAVE TO TAKE A GOOD HARD LOOK AT. FOR STARTING RADAR IMAGES, WE SHOULD STORE REALLY THE ENTIRE DAY. THAT IS FROM ABOUT 1130 ANYWAYS TO 1600. THIS IS ONE OF OUR PRIME DAYS. I DID NOT REALLY THINK TO MAKE NOTES ON WHAT PARTICULAR SCAN TO TAKE PICTURES OF. ONE THING I PUT ON AS AN AFTERTHOUGHT IS WE DID LEAVE EARLY, WE KNEW WE WERE LEAVING EARLY. WE SAW ANOTHER MAJOR BOUNDARY COMING DOWN FROM THE NORTH MAYBE THAT'S THE COLD FRONT, WE DON'T KNOW. ON THE DRIVE HOME I COULD DEFINITELY SEE THAT NEW STORMS WERE PROBABLY INITIATING AS THAT BOUNDARY WAS HITTING THE OLD OUTFLOW FROM OUR STORMS THAT WE WORKED MOVED NORTH. I WOULD IMAGINE ALL THAT INTERSECTION TOOK PLACE SOMEWHERE RIGHT ALONG THE NORTHERN PART OF OUR DUAL DOPPLER LOBES. BUT WE WERE WELL AWARE OF THIS AND WE HAD DONE A GREAT JOB FOR THE DAY AND DECIDED THAT THAT WAS ENOUGH. BUT I REALLY DON'T KNOW WHAT HAPPENED.

JUN 29

WE REALLY DIDN'T HAVE MUCH OF AN OPERATION. STARTED OUR USUAL 1100, BUT WAS CALLED OFF BY ABOUT 1330. IT WAS AN UPSLOPE RAIN CASE. VERY HEAVY RAINS THROUGHOUT THE DAY. OVER TWO AND A HALF INCHES IN BOULDER. IT WAS NOT THE SORT

OF THING WE WANTED.

missing days June 30 - July 7

JUL 8

THE SOUNDING TODAY HAS SOME GOOD 500 MB MOISTURE. THATS TRUE AT GRAND JUNCTION ALSO, AND IT LOOKS LIKE IT WILL HOLD. WE HAD MOISTURE AT LOW LEVELS WE THOUGHT WOULD MIX OUT.

1252. WE'VE HAD FOR A GOOD HOUR OR SO A CONVERGENCE LINE. LOOKS LIKE THE DENVER CONVERGENCE LINE, BUT THE SOUTHERN HALF OF IT. IN ITS USUAL PLACE. WE HAVE THREE CELLS THAT HAVE GONE UP RIGHT ALONG THE FOOTHILLS. ONE JUST TOUCHING 40 DBZ. WE ARE DOING A SOUNDING ON EITHER SIDE OF THE BOUNDARY NOW. WE'RE GOING TO BRING UP THE CITATION TO DO A SINGLE AIRCRAFT FLIGHT ALONG IT. WE ARE JUST STARTING DUAL DOPPLER DATA ON IT. CHAFF ISN'T THERE YET BUT IT WILL BE SOON.

1325. THE CELL THAT IS DIRECTLY SOUTH OF US ON THE CONVERGENCE LINE IS PRODUCING A SMALL FLARE RIGHT NOW. REFLECTIVITIES ARE 60 DBZ. THERE ARE TWO HORIZONTAL ROLLS TO OUR NORTHEAST AND ONE TO OUR NORTHWEST. THEY ARE SLOWLY INTENSIFYING, SHOWING A CONVERGENCE AT LOW LEVELS INTO THEM THAT SEEMS TO BE SUSTAINED.

1358. THE CITATION IS DOING C-3'S ON THE WEAK CONVERGENCE LINE IN THE SOUTH LOBE. WE ARE PUTTING DOWN CHAFF ALSO AND DOING B-1 SCANNING INTO THAT LOBE. THERE ARE SOME CUMULUS BUILDING ALONG THAT LINE. THE GUST FRONT FROM THE BIG STORM NEAR CASTLE ROCK IS SLOWLY PROPAGATING NORTHWARD.

1430. THERE'S BEEN A NEW CELL GROW TO THE NORTHEAST OF THE OLD ONE. IT DOES NOT LOOK LIKE A SPLIT. IT LOOKS MORE LIKE ITS GROWING WHERE THE OUT FLOW BOUNDARY, WHICH I CALL B, AND A SURGE FROM THE SOUTHEAST, WHICH I'LL CALL C, INTERSECT. THE CITATION IS FLYING C-3 PATTERNS STILL RIGHT IN FRONT OF WHERE THESE TWO BOUNDARIES, B AND C, ARE INTERSECTING. ON THEIR NEXT LEG THEY SHOULD GO RIGHT THROUGH BOTH OF THEM.

1454. THE CITATION ON LAST PASS DID CROSS THE GUST FRONT AND WHAT WE ARE CALL ING BOUNDARY C. PROBABLY RIGHT ABOUT THAT INTERSECTION. THERE IS MORE CUMULUS CLOUDS GROWING IN THE SOUTH LOBE ALONG THOSE BOUNDARIES NOW. THERE IS SOME ANVIL MATERIAL THAT HAS BLOWN OFF THE MOUNTAINS AND REALLY IS RIGHT ALONG WHERE THE GUST FRONT IS NOW. SO THERE SHOULD BE A LITTLE ADDED MOISTURE THERE.

1510. WE HAVE ONE NEW CELL NOW THATS GONE TO 40 DBZ, WHICH IS JUST ON THE SOUTHEAST SIDE OF THE SOUTHERN DUAL DOPPLER LOBE. THE CITATION IS STILL FLYING ACROSS THE GUST

FRONT AND CINDE ONE AND TWO ARE JUST ABOUT READY TO TAKE OFF.

1520. THE GUST FRONT IS IN THE MIDDLE OF THE SOUTH LOBE. THE CITATION HAS BEEN STEADILY GOING BACK AND FORTH ACROSS IT. WE'VE GOT PLENTY OF CHAF IN IT. SO EVERYTHING IS GOING JUST FINE. WE NEED A CELL TO GROW THERE, BUT WE'LL WAIT.

1530. WE HAVE ANOTHER NEW CELL THAT IS REACHING OVER 40 DBZ, ITS JUST NOW ON THE SOUTHWEST SIDE OF DUALL DOPPLER LOBE. WE HAVE ONE THATS ABOUT 25 DBZ IN THE DUAL LOBE THAT WE'VE BEEN WORKING CONTINUALLY. THE KINGAIRS ARE GOING TO WORK THIS CELL.

1604. WE'RE GOING TO START CHANGING THE RADAR SCANNING TO THE NORTH LOBE. EXPECTING COLLISTION UP THERE BETWEEN THE STATIONARY BOUNDARY AND BOUNDARY B ABOUT 1630 STILL. THERE ARE SOME TOWERING CUMULUS UP THERE.

1630. THERE IS ANOTHER BOUNDARY, I GUESS WE CALL IT D, THAT IS COMING IN FROM THE NORTHWEST. ITS SHOWING PRETTY STRONG WINDS, ITS JUST ENTER ED THE WESTERN PART OF THE PAM NETWORK. ALL THIS IS KIND OF COMING TOGETHER AT ONCE. IN FIVE MINUTES WE'RE GOING TO LAUNCH FIVE SOUNDING ONE IS AT THE COLLISION POINT OF THE STATIONARY BOUNDARY IN THE NORTH LOBE AND GUST FRONT A COMING UP. AND WE HAVE SOUNDINGS ON EITHER SIDE OF IT.

1700. WE'RE GOING TO DO TWO MORE MOBILES. ONE IS RIGHT DEAD ON THE CONVERGENCE LINE STILL. THIS WILL BE THEIR SECOND ONE ON IT. WE'RE STILL NOT GETTING REAL GOOD ACTIVITY IN THE NORTH LOBE YET, SO RIGHT ON THE BASE LINE JUST ON THE EAST SIDE.

1702. WE'RE GOING TO STOP B-1 LOW AND GO BACK TO WORK A CLOUD ON THE BASE LINE BECAUSE THE PLANES CAN'T GET BACK YET INTO THE NORTH LOBE.

1720. NEAR STATION 15 WE'RE SHOWING A LOW LEVEL CIRCULATION ON THE CONVERGENCE LINE AND WE HAVE A CELL GROW- ING OVER IT. SO THERES A POSSIBILITY OF A DUSTNADO THERE.

1726. WE HAVE ABOUT 6 CELLS ALL ALONG THE COLLISION LINE NOW. THE STRONGEST ONE IS JUST SOUTH OF US, PROBABLY ABOUT 55 DBZ.

1745. WE HAVE A REPORT THAT THERE IS A TORNADO ONE MILE

SOUTH OF BENNET.

1748. THERE ARE TWO MICROBURSTS NOW TO OUR SOUTH AND SOUTHEAST ALONG THE LINE OF INTENSE ECHO. WE'RE GOING TO CENTER RIGHT IN THE MIDDLE OF THE LOBE ON MORE OF A GROWING ONE TO SEE IF WE CAN GET THE EVOLUTION OF A MICROBURST STORM IN A MODERATE HEAVY RAIN CASE.

1820. WE'VE BEEN SCANNING A CELL IN THE SOUTH LOBE FOR A WHILE, ANTICIPATING A MICROBURST OUT OF IT. ITS A HEAVY RAINER. IT LOOKS LIKE IT WAS A NULL CASE. WE SAW THE PRECIP SHAFT FALL OUT AND DIDN'T REALLY GET ANY DIVERGENCE, AT LEAST FROM CP-3.

1825. WE'RE GOING TO SCAN THE NORTH LOBE NOW AS THATS WHERE THE STRONGEST CONVERGENCE NOW IS AND A NEW CELL IS GROWING THERE FOR A MICROBURST STUDY.

1850. WE'VE BEEN SCANNING A BIG CELL IN THE NORTHERN LOBE. WE'VE SEEN KIND OF A ROTATING DOWNDRAFT WITH IT. IT STARTED AT HIGH LEVELS AND NOW ITS ALMOST DOWN TO THE SURFACE. THE WHOLE LINE OF CONVERGENCE NOW AT MID LEVELS AND WE THINK THAT PRETTY SOON THIS WHOLE STRONG 55 DBZ LINE WILL GO INTO AN OUTFLOW.

1858. WE HAVE A NORTH/SOUTH LINE OF 55 DBZ ECHOES. IT GOES ALL THE WAY TO THE NORTH LOBE AND THEN TO THE SOUTH. THE MOST INCREDIBLE THING IS THAT WHEN YOU LOOK AT THIS THE WHOLE LINE, IT ALL WENT FROM VERY STRONG CONVERGENCE, TO VERY STRONG DIVERGENCE AT LOW LEVELS WITHIN A MATTER OF 15 MINUTES. IT JUST TOTALLY REVERSES.

1910. AT THE NORTH END OF THIS NORTH/ SOUTH LINE, THE VERY NORTH CELL IS ROTATING. ITS LIKE THE ROTATING HEAD ON A BOW ECHO EXCEPT THE ECHO DOESN'T BOW.

1915. WE'RE JUST GOING TO CLOSE DOWN NOW.

NOTE TAKE PICTURES OF THE NORTH/SOUTH LINE OF ECHOES THAT WENT FROM STRONG CONVERGENCE TO STRONG DIVERGENCE IN A MATTER OF ABOUT 20 MINUTES.

SUMMARY

THIS HAS GOT TO BE PROBABLY OUR BEST DAY. FROM THE CONVECTION INITIATION STANDPOINT AND FOR AIRCRAFT FLIGHTS THROUGH BOUNDARIES THAT WERE MOVING BY THEMSELVES AND THOSE IN COLLISION. THIS IS FROM THE UND CITATION. WE DON'T

REALLY KNOW FOR SURE JUST HOW GOOD THEIR DATA IS GOING TO BE. THIS WAS THEIR VERY FIRST FLIGHT, BUT THIS TIME LOOKS VERY PROMISING. WE ALSO HAD SOME GOOD DOWNBURST STUDIES. PARTICULARLY NEAR THE END OF THE DAY WHERE WE GOT HEAVY RAINS THAT WENT INTO A DIVERGING LINE. I THINK WE ALSO HAVE A NULL CASE OF HEAVY RAIN THAT PRODUCED NOTHING IN THE SOUTHERN LOBE. BRIEFLY WHAT HAPPENED WAS THE DAY STARTED WITH JUST THE SOUTHERN HALF OF THE DENVER CONVERGENT LINE APPEARING DOWN NEAR CASTLE ROCK WHERE IT ALWAYS HAS THE STRONGEST CONVERGENCE. IT INITATED A STORM. THAT STORM BECAME PRETTY BIG AND INITATED OUTFLOW WHICH I CALLED B. THIS GUST FRONT STEADILY MOVED NORTHWARD AND EVENTUALLY JOINED UP WITH SOME BOUNDARY WHICH WE CALLED C. WE HAVEN'T THE FAINTEST IDEA WHAT THAT WAS FROM. CITATION WAS ABLE TO FLY BOTH OF THESE BOUNDARIES TOGETHER. WE KEPT SAMPLING THOSE. AND WE GOT A FEW CELLS THAT PRODUCED ALONG THE INTERSECTION OF THESE TWO BOUNDARIES. WITH TIME WE DEVELOPED IN THE NORTH LOBE SORT OF A NORTHWEST/SOUTEAST CONVERGENCE LINE. IT HAD A ROLL TO START WITH. BUT IT JUST KEPT GETTING STRONGER AND STRONGER. EVENTUALLY THE OLD GUST FRONT B AND C WHICH COMBINED INTO ONE COLLIDED WITH THIS STATION ARY ROLL OR UNKNOWN BOUNDARY. IT STARTED PRODUCING MORE STORMS. BUT JUST BEFORE THAT HAPPENED WE REALLY GOT AN OUTFLOW FROM THE MOUNTAINS. AND WE REALLY KIND OF HAVE A TRIPPLE POINT OF INTERSECTION. THE STATIONARY BOUNDARY, THE MOUNTAIN OUTFLOW AND THE OLD GUST FRONT THAT INITIATE KIND OF AN EAST/WEST LINE AND A NORTH/SOUTH LINE. AS THESE THREE COLLIDED. WE GOT VERY ACTIVE CELLS ALONG THOSE GOING 50-60 DBZ AND WE HAD A TORNADO PRODUCED NEAR BENNET. I'M NOT QUITE SURE WHAT HAPPENED NEXT, BUT THESE BIG STORMS THAT WERE PRODUCED BY THE COLLISION OF THESE THREE BOUNDARIES PRODUCED THEIR OWN OUTFLOWS. IN THE NORTH LOBE WHICH WE'RE REALLY ON TOP OF, WE COULD SEE TWO VERY STRONG BOUNDARIES COMING TOGETHER. WE'RE TALKING OUTFLOWS MAYBE 20 M/S IN ONE DIRECTION AND 10-15 MAYBE IN THE OTHER. AND THEY PRODUCED A VERY STRONG NORTH/SOUTH LINE OF STORMS. THIS IS THE AIR THAT HAD ALREADY BEEN COOLED. WITH ENORMOUS FORCING PRODUCED BIG STORMS THAT WERE VERY STRONG UPDRAFTS THAT BEFORE LONG YOU COULD SEE ALL THE CONVERGENCE AT MID LEVEL DEVELOPE, AND A LINE OF STRONG DOWNDRAFTS WITH VERY NICE DIVERGING OUTFLOW. WE CAPTURED IN THE NORTH LOBE AND DUAL DOPPLER SCANNING MODE MUCH OF THIS. WE HAVE LOTS OF SOUNDINGS THAT WERE WELL PLACED DURING THE DAY, THAT PROBABLY SAMPLED MOST OF THE BOUNDARIES AND INTERSECTIONS BETWEEN THEM.

THE KINGAIRS FLEW AND DID GET SOME PASSES THROUGH THESE BOUNDARIES. THEY DID WORK SOME STORMS THAT WERE WEAKER THAT WERE REALLY OUTSIDE THE DUAL LOBE. SO THAT DOES IT FOR JULY 8, A GREAT DAY AND ONE THAT I'M SURE WE'LL DO MUCH STUDY ON.

JUL 9

THE MORNING SOUNDING TODAY SHOWED A FAIR AMOUNT OF LOW LEVEL MOISTURE, VERY SHALLOW. AND THEN MOISTURE AGAIN AT 500 MB. SYNOPTICALLY, THERE'S A LOT OF COOL MOIST AIR UP IN WYOMING AND UTAH. IN THE PAM NET WORK THERE IS SOME SORT OF A WIND SHEAR LINE THAT STRETCHES EAST/WEST THROUGH THE NORTHERN LINE OF PAM STATIONS. ITS VISIBLE ON RADAR. A FINE LINE. WE HAVE NO IDEA WHAT ITS ORIGIN IS. THERE CERTAINLY WAS ALOT OF RAIN UP IN THAT AREA YESTERDAY, BUT NOT IN THE PATTERN OF THIS LINE IT APPEARS TO BE MUCH COOLER AND MOISTER ON THE NORTH SIDE OF THE LINE THAN ON THE SOUTH SIDE OF THE LINE. WE'VE LAUNCHED SOUNDINGS AT 1100 ON EITHER SIDE OF IT.

1140. THERE ARE NO ECHOES YET OR VISUAL CLOUDS ON THIS BOUNDARY YET. WE KIND OF EXPECT ALOT OF ACTIVITY ON THE CHEYENNE RIDGE WHICH WOULD PUSH OUT A BOUNDARY TO COME SOUTH.

1315. OUR EAST/WEST CONVERGENCE LINE IS STILL THERE. THE INTERESTING THING IS THE DEWPOINTS HAVE DROPPED WAY OFF IN THE NORTHERN TEIR OF PAM STATIONS. WE DON'T KNOW IF IT EXTENDS FURTHER NORTH OR NOT. WE'RE DOING A RELEASE OF MOBILES ON EITHER SIDE OF THE BOUNDARY ALONG WITH DENVER AND HUDSON CLASS.

1515. WE'RE HAVING A LAUNCH THROUGH THE MOBILES WHICH ARE IN A NORTH/SOUTH LINE, WHERE BOUNDARIES A AND B ARE SLOWLY COMING TOGETHER. A IS THE ORIGINAL NOTHERN ONE THAT IS STATIONARY AND B IS MOVING NORTHWARD. WE HAVE A BUNCH OF 10-20 DBZ ECHOES AROUND.

1529.

THE CITATION IS STARTING TO DO A C-2 THROUGH THESE TWO BOUNDARIES THAT ARE JUST COLLIDING IN THE AREA THAT HE IS GOING TO DO IT. ITS A NORTH/SOUTH LEG AND ON THE EASTERN EDGE OF THE DUAL LOBE. ALSO THE NOAA RADARS ARE DOING A B1-L IN THE NORTH LOBE. THE BOUNDARIES HAVE JUST COLLIDED IN THE SOUTHERN PART OF THE LOBE.

1630.

WE'RE HAVING TROUBLE FINDING A REAL TARGET FOR THE AIRCRAFT ANYMORE. THERE'S A LOT OF JUNKY 10-20 DBZ ECHOES AROUND, BUT NOTHING THAT'S REALLY PUTTING OUT ANYTHING BUT VIRGA, AND NONE OF IT SEEMS TO BE REACHING THE GROUND. SO WE'RE IN A SEARCH MODE RIGHT NOW. WE DO HAVE A NOTHER LARGE OUTFLOW BOUNDARY. PROBABLY FROM THE CHEYENNE RIDGE, SLOWLY MOVING THIS WAY.

1644.

IN THE MIDDLE OF THE NORTHERN DUAL LOBE WE HAVE BEEN ORGANIZING FOR THE LAST FIVE MINUTES A VIRGA LINE BY RADAR. THE AIRCRAFT ARE HEADING INTO IT AND WE'RE GOING TO START UP DUAL DOPPLER. I'M JUST AFRAID WE MAY BE GETTING MORE THE TAIL END OF THE ORGANIZATION OF IT.

1646. THE LINE IN THE NORTH LOBE IS DIVER GING QUITE RAPIDLY NOW. THE PLANES REALLY JUST CAUGHT THE TAIL END OF IT.

1705. WE MADE A FORECAST THAT THE SOUTH LOBE WOULD PRODUCE MICROBURST NEXT. HOW LONG I DON'T KNOW. BASED ON REALLY HAVING AN OLD BOUNDARY AND BOUNDARIES COLLIDING THERE.

NOTE-ONE OF THE CLOUD MOBILES LAUNCHED A SOUNDING AT 1652 AND THERE WAS A MICROBURST THERE AT 1702, SO ITS QUITE LIKELY THAT THEY LAUNCHED THAT RIGHT UP INTO THE CLOUD THAT PRODUCED THE MICROBURST.

1746. WE GOT A MICROBURST IN THE SOUTH LOBE. THE PLANES HAD JUST PASSED THROUGH IT BEFORE IT MADE ITS MICRO BURST. THEY HAD A STRONG DOWNDRAFT.

1756. WE PRODUCED A WEAK OUTFLOW MAYBE 10 TO 15 M/S WHERE THE PLANES ARE FLYING AND WE'RE DOING THE DUAL DOPPLER. IN FACT AT 1.7 DEGREES THEY STILL SEE IT, SO IT MAY BE JUST IN ITS FORMATION STAGE.

1820. PAM STATION 39 REPORTED A GUST UP TO 31 M/S FROM A DOWNBURST THAT HAD MOVED DOWN OFF THE MOUNTAINS. IT PROBABLY WAS QUITE A BIT STRONGER THAN THAT IN ITS INITIAL STAGE BECAUSE IT LOOKED LIKE IT HAD BEEN ON THE GROUND AWHILE.

1835. WE'RE CLOSING.

SUMMARY

THIS WAS A LOW REFLECTIVITY MICROBURST DAY. PROBABLY ONE OF OUR FEW AND BEST ONES. INITIALLY, WE HAD AN EAST/WEST BOUNDARY THROUGH THE NORTHERN PART OF THE NETWORK. ORIGIN TOTALLY UNKNOWN. WE'RE CONVINCED THAT IT HAD NOTHING TO DO WITH THE RAINFALLS FROM THE DAY BEFORE BECAUSE OF ITS ORIENTATION AND WHERE RAIN FELL. WITH TIME THIS BOUNDARY SLOWLY WEAKENED BUT WE GOT ANOTHER UNKNOWN BOUNDARY BETWEEN AN EAST/WEST ORIENTATION THAT MOVED UP FROM THE SOUTH. WE DID QUITE A BIT OF STUDY AS THIS ONE WHICH WE'LL CALL B AND THE ORIGINAL ONE WHICH WE'LL CALL A, COLLIDED. WE DID SOUNDINGS IN BETWEEN THEM. WE HAD THE CITATION UP THAT FLEW BACK AND FORTH ACROSS THEM AS THEY COLLIDED. THE COLLISION WAS WELL DOCUMENTED. THE COLLISION PRODUCED ONLY WEAK ECHOES. WE DOUBT IF ANY GOT TO 30 DBZ. WE HAD LAUNCHED THE KINGAIRS IN ANTICIPATION OF VIRGA SHOWERS IN THAT NORTH LOBE FOLLOWING THE COLLISION. THEY DID FLY UP THERE. THEY TENDED TO CATCH THE TAIL END OF A MICROBURST LINE. IT WAS A VERY NICE MICROBURST LINE, BUT THE AIRCRAFT GOT GOOD DOWNDRAFTS, BUT THEY DIDN'T REALLY GET THE ORIGIN. BUT IT CERTAINLY WAS WELL CAPTURED BY DUAL DOPPLER RADAR. WE THEN HAD A COLLISION OCCURRING IN THE SOUTH LOBE AS THIS ORIGINAL COMBINATION A AND B MOVED SOUTH AND COLLIDED WITH ANOTHER SURGE COMING UP FROM THE SOUTH. THIS PRODUCED AGAIN SOME WEAK SHOWERS. AGAIN LESS THAN 30 DBZ. AND PRODUCED A NUMBER OF MICRO BURSTS. ONE OF THEM I THINK WAS PARTICULARLY GOOD. I THINK THE PLANE WAS THERE WELL AHEAD OF TIME, CAPTURED THE DEVELOPING STAGE BEFORE IT GOT THE DOWNDRAFT. THERE WERE ALOT OF STRONG MICROBURSTS THIS DAY. NOTABLY PAM STATION 39 GOT 31 M/S. IN ASSOCIATION WITH THIS DOWNBURST, WE DO NOT HAVE THE DETAILS AS OF YET, BUT I BELIEVE THERE WAS A LIGHT AIRPLANE THAT CRASHED. I DON'T THINK THERE WERE ANY FATALITIES, BUT IT WAS JUST FORCED DOWN BY THE DOWNDRAFT. IT WAS DOWN NEAR CASTLE ROCK. SO ENDS OUR REALLY FIRST VIRGA MICROBURST DAY. AND IT WAS QUITE SUCCESSFUL I BELIEVE. WE LAUNCHED SOMETHING LIKE 27 SOUNDINGS AND HAD ALL THREE AIRCRAFT WORKING AT ONE TIME OR ANOTHER. THE BOUNDARY COLLISION IN THE NORTH LOBE IS A GOOD WEAK CONVECTIVE INITIATION CASE.

JUL 10

THE SOUNDING TODAY IS VERY DRY. THERE IS NONE OF THE 500 MB MOISTURE LIKE WE HAD YESTERDAY. ALTHOUGH WE EXPECT WE MIGHT START PICKING SOME UP LATER IN THE DAY. IT LOOKS LIKE OUR BEST BET IS FOR VIRGA TYPE MICROBURSTS AGAIN. MOSTLY BASED UPON CONVECTION FROM THE PLAINS. THE MOUNTAINS ARE

SO DRY THAT WE REALLY DON'T EXPECT A WHOLE LOT FROM THE MOUNTAINS.

1141. WE HAVE VERY MUCH THE SAME AS WE HAD YESTERDAY AND THAT IS AN EAST/ WEST BOUNDARY THROUGH THE NORTHERN TEIR OF THE PAM STATIONS. WE HAVE ANOTHER EAST/WEST BOUNDARY THAT IS JUST SLIGHTLY NORTH OF PAM. WE HAD THAT YESTERDAY, BUT NOT QUITE AS WELL DEFINED AS TODAY. AND THEN WE HAVE A THIRD BOUNDARY TO THE SOUTEAST WHICH LOOKS JUST LIKE THE ONE YESTERDAY. WHICH IS JUST REALLY ON THE SOUTHEASTERN EDGE OF THE PAM NETWORK. I'LL LABEL THESE BOUNDARIES A AS THE ONE THAT GOES THROUGH THE NORTHERN PART OF THE PAM NETWORK. B, THE ONE TO THE SOUTHEAST, AND C, THE WEAKER ONE TO THE NORTHWEST.

1250. WE'RE GETTING FOUR LAUNCHES, TWO ON THE NORTH SIDE OF THE BOUNDARY A, AND TWO ON THE SOUTH SIDE OF THE BOUNDARY.

1334. THE BOUNDARY IS STILL THERE. I;M NOT SURE IF I MENTIONED BOUNDARY D. WHICH IS REALLY KIND OF A SOUTHWEST ERLY PUSH OF STRONGER AIR THAT'S SOUTH OF THE RADAR. THERE ARE STILL NO REAL CLOUD FEATURES AND ITS STILL QUITE DRY. WE'RE JUST GOING TO DO EXPERIMENTS THAT SAMPLE THESE BOUNDARIES.

1426. IN CLOUD THREE'S LAUNCH, THE WINDS WERE NORTHERLY AND JUST AFTER LAUNCH THEY WENT STRONG OUT OF THE SOUTHWEST. SO THAT BALLOON WE DON'T KNOW WHICH SIDE OF THE BOUNDARY IT WILL GO UP IN.

1555. WE'VE DEVELOPED VERY STRONG CONVERGENCE IN THE NORTH LOBE AS THE BOUNDARIES HAVE KIND OF COLLIDED THERE. WE'RE GETTING MUCH CUMULUS DEVELOPEMENT THERE, ITS PRETTY SHALLOW BUT IT PROBABLY WOULD SUFFICE TO PUT UP VIRGA AND MICROBURSTS. WE'VE GOT A SITUATION WHERE WE REALLY CAN'T FLY THE AIRPLANES BECAUSE OF A SICKNESS. BUT WE ARE GOING TO PUT CHAFF IN THE NORTH LOBE.

1620. WE HAVE ALONG WHERE WE HAVE THE ENHANCED CONVERGENCE IN THE NORTH LOBE. WE;VE GOT SOME WEAK ECHO. THERE IS A REFLECTIVITY CALIBRATION PROBLEM. BUT IT SHOWS ABOUT 20-25 DBZ RIGHT NOW. ITS IN THE NORTHEAST ERN PART OF THE NORTHERN LOBE.

1700. WE HAVEN'T HAD ANY OUTFLOWS. WE'RE GOING TO SWITCH TO THE SOUTH LOBE NOW. THE CHAFF AIRPLANES UP AND WE'RE

PUTTING IT INTO THE SOUTH LOBE NOW. WE HAVE THE STRONGEST CONVERGENCE DOWN THERE REALLY NOW. WE HAD ALMOST LIKE A KIND OF MESO-LOW COVERING THE WHOLE PAM NETWORK.

1720. WE MOVED IN TO CONCENTRATE ON THE FAR SOUTHEAST OF THE SOUTH LOBE. WE HAVE SOME 20-30 DBZ CELLS JUST KIND OF SOUTH AND EAST OF THAT AREA. WE HAD A FEELING THAT WE WILL GET SOME MICROBURST BUT THEY WILL JUST BE OUT OF THE NETWORK. BUT WE'RE WORKING THAT ARE ANYWAYS. THROUGH THAT BOX WE'RE SCANNING, THE CONVERGENCE LINE GOES RIGHT THROUGH IT, SO THAT GOOD.

1735. JUST ON THE SOUTHEAST SIDE OF THE LOBE, WE GOT A 9 M/S OUTFLOW. YOU COULD JUST KIND OF TRACE THIS CORE COMING ON DOWN. IT DIDN'T ANY VELOCITY FEATURES, BUT WE GOT A DELTA V IN 9. PRETTY MARGINAL.

1804. WE GOT A MICROBURST JUST ABOUT 160 DEGREES FROM US. IT HAD A DELTA V OF ABOUT 16 SCAN.

1825. THE BOX WE'VE BEEN SCANNING WITH NOAA RADARS IN THE VERY SOUTHEASTERN PART OF THE LOBE DID PUT OUT A MICROBURST. IT WAS VERY MINIMAL IN THE LAST SCAN. IN THE VERY NEXT SCAN IT WAS STRONGER. IT WAS RIGHT DEAD CENTER IN THE BOX WE WERE SCANNING. SO WE DO HAVE A CASE HERE OF DUAL DOPPLER SCANNING OF A MICRO BURST CASE. PROBABLY AT LEAST 10 MINUTES BEFORE IT OCCURRED, WE WERE SCANNING TO ABOUT A FIVE KM DEPTH. IT SHOULD BE OF USE. ONE QUESTION IS HOW MUCH REFLECTIVITY THE NOAA RADARS REALLY SAW. THE CHAFF PLANE HAD TO BREAK OFF FROM THERE ABOUT MAYBE 15-20 MINUTES EARLIER BECAUSE OF A MECHANICAL PROBLEM. BUT THERE IS A GOOD CHANCE WE HAVE A CASE HERE.

1835. OPERATIONS CLOSE DOWN.

SUMMARY

IT WAS REMARKABLE HOW SIMILAR THIS DAY STARTED TO THE DAY BEFORE WITH THE SAME CONVERGENCE LINES. THE EVOLUTION WAS SOMEWHAT DIFFERENT THROUGH THE DAY. WE KIND OF EVENTUALLY EVOLVED INTO A LARGE CIRCULATION THAT WAS MORE OR LESS CENTERED IN THE PAM NETWORK. THE CONVERGENCE SEEMED TO BECOME THE STRONGEST IN THE SOUTHERN LOBE LATER IN THE DAY AND WE DID PRODUCE A NUMBER OF ECHOES DOWN THERE OF THE 20-30 DBZ AREA, ALTHOUGH A COUPLE HIT 40, THESE WERE SOUTH OF THE NETWORK. MOST OF THEM PRODUCED WEAK MICROBURSTS. WE HAVE DATA WITH THE NOAA RADARS ON

CERTAINLY ONE GOOD MICROBURST AT THE END OF THE DAY AND MAYBE ONE EARLY ONE THAT WAS VERY MARGINAL. WE DIDN'T HAVE ANY PLANE COVERAGE, BUT WE HAVE LOTS OF SOUNDINGS. WE TOOK SOUNDINGS DURING THE DAY WATCHING THE EVOLUTION OF THESE BOUNDARIES AND LATER ON FOR ANY MICROBURSTS. SO WE GOT VERY GOOD SOUNDING COVERAGE. NO AIRCRAFT AND PROBABLY SOME GOOD DUAL DOPPLER ON MICROBURST. ONE OF THE INTERESTING FEATURES IS HOW WE DEVELOPED SUCH STRONG WINDS WITH NO REAL FEAT URES. PRECIPITATION CERTAINLY DID NOT GENERATE THESE STRONG BOUNDARIES WE HAD. I'M BEGINNING TO THINK ALOT OF IT HAS TO DO WITH TERRAIN INDUCED. THERE'S ALSO THE THOUGHT IT HAS SOMETHING SIMILAR TO THERMAL LOWS. IN THIS CASE THERE WAS ALOT OF HIGH CLOUDINESS IN THE NORTH OF THE NETWORK. IT CERTAINLY WAS MUCH COOLER UP THERE, SO THE THERMAL LOW IDEA DOES COME IN. I DIDN'T CHECK IT OUT, BUT THERE MAY HAVE BEEN SOME LARGER SYNOPTIC SCALE FEATURE INVOLVED.

JUL 11

THE DAY IS CHANGED QUITE A BIT FROM YESTERDAY IN THAT WE HAVE A BIG COLD POOL OF AIR THAT CAME DOWN FROM WYOMING. ITS A COUPLE HUNDRED MILLIBARS DEEP. MUCH MOISTER AND COOLER. ITS GOING TO TAKE ALOT OF HEATING TO BREAK THIS, WE REALLY DON'T EXPECT IT TO BREAK, BUT WE EXPECT MOUNTAIN SHOWERS AND GRADUAL MOVEMENT OFF THE MOUNTAINS AS THE DAY GOES ON.

1400. WE HAD KIND OF JUST A BIG PUSH OF AIR THAT WE THINK CAME OFF THE MOUNTAINS. ITS MORE OF A NORTH/SOUTH FEATURE, BUT IT ENHANCED NORTHERLY FLOW. WE HAVE 30-40 DBZ ECHOES IN THE MOUNTAINS. SOME OF THEM HAVE BEEN SUCCESSFUL IN COMING OFF MOSTLY TO OUR NORTH. BUT NOW WE HAVE ONE THAT'S JUST TO OUR SOUTHWEST. ITS MOVING TOWARDS US.

1407. WE JUST HAVE HAD A DENVER CLASS LAUNCH. AND WE'RE GOING TO TRY TO HAVE CLOUD ONE RELEASE WITHIN ABOUT FIVE MINUTES FROM NOAA C, WHICH GIVE US A SOUNDING ON EITHER SIDE OF THIS ENHANCED NORTHERLY PUSH OF AIR THAT IS SLOWLY PUSHING EASTWARD

1523. WE SENT THE CHAFF PLANE HOME. NOAA RADARS HAVE QUIT SCANNING. WE'VE JUST HAD LITTLE WEAK 20 DBZ SHOWERS KIND OF MOVING THROUGH THE NETWORK NOT PRODUCING ANY OUTFLOWS. STILL PROBABLY A LITTLE BIT TOO STABLE. ALTHOUGH WE'RE STARTING TO REACH CONVECTIVE TEMPERATURE. RIGHT NOW WE JUST HAVE A FEW 40 DBZ STORMS IN THE MOUNTAINS.

1552. WE STILL DON'T HAVE ANY BOUNDARIES IN THE PLAINS. WE JUST HAVE ONE FEATURE AND THAT IS A STRING OF 45 DBZ STORMS BACK IN THE MOUNTAINS THAT ARE REALLY STREAMING OFF RIGHT TOWARDS US. THEY TEND AS THEY COME OFF THE MOUNTAINS TO DIE.

1600. WE'RE GOING TO LAUNCH A CLASS AT STAPLETON AND CLOUD THREE WHICH IS OUT NEAR NOAA C. THE IDEA HERE IS THAT THE WAY THIS ECHO IS STREAMING OFF MOUNT EVANS TOWARDS US, ALMOST EXACTLY DUPLICATES THE SITUATION ON JULY 4, WHEN WE PRODUCED SOME VERY MAJOR OUTFLOWS AND MICROBURSTS. SO WE WANT TO COMPARE THE TWO DIFFERENCES TO BE SURE ITS THE SOUNDING. THAT DAY WAS DEEP AND WELL MIXED AND THIS DAY ISN'T.

1618. THE DENVER CLASS SOUNDING JUST WENT UP AND IT WILL GO RIGHT UP INTO THE ANVIL OF THIS STORM THATS BEEN STREAMING OFF MOUNT EVANS. SO IT SHOULD BE AN ALMOST PERFECT DUPLICATE OF THE FOURTH OF JULY CASE.

1655. CP-3 WAS DOWN FOR ABOUT 10 MINUTES. DURING THAT TIME OF COURSE THE STORM THAT WE HAD BEEN WATCHING CAME OFF THE MOUNTAINS TO OUR WEST SOUTHWEST DID PUT OUT A DIVERGENCE. AND THEN THERE MYSTERIOUSLY THERE'S SOME OTHER STRONGER NORTHERLY FLOW JUST ON THE NORTH SIDE OF THE DIVER GENCE. WE GOT SOME VERY STRONG CONVERGENCE ON THE VERY NORTH SIDE OF THE STORM. WE'VE JUST LOST THE CHAFF PLANE.

1702. NOAA RADARS ARE GOING TO START SCAN NING THE NORTH LOBE WITH A B-1 MEDIUM. THE CELL IS CERTAINLY DIVER GING OUT IN A NORTH/SOUTH DIRECTION AND ITS LOOKS LIKE WE ARE GETTING ENHANCED CONVECTION ON THIS NORTH SIDE. ITS REALLY JUST ON THE WESTERN EDGE OF THE DUAL LOBE.

1727. OUR LINE OF ECHOES IN THE NORTH LOBE PUTS OUT LITTLE PULSES OF DIVERGENCE, NOT VERY STRONG. WE DO NOT HAVE REALLY A GOOD SUSTAINED GUST FRONT ASSOCIATED WITH IT. WE'RE NOT REALLY GETTING ANY NEW CONVECTION INITIATION EITHER.

1800. CP-3 HAS GONE DOWN WITH PROBABLY A BAD TUBE. WE'LL KNOW IN ABOUT 10 OR 15 MINUTES HOW LONG IT WILL BE. IN THE MEANTIME OF COURSE WE'RE BLIND. WE DO NOTE THAT AT KINGSBURG THEY HAD A 42 KNOT WIND OUT OF THE NORTH ITS STILL WITH THIS DIVERGING LINE WE HAD EARLIER UP IN THAT AREA. THE NOAA RADARS HAVE SWITCHED TO THE SOUTH LOBE. ALL WE KNOW

IS THAT THERE IS A CELL THAT IS 50 DBZ THAT IS SLOWLY MOVING TOWARDS THAT SOUTH LOBE.

1845. THIS 50 DBZ CELL IS NOW TRACKING THROUGH THE FAR SOUTHEAST SIDE OF THE NORTH LOBE. WE'RE SCANNING IT WITH THE NOAA RADARS. ITS ALREADY PUT OUT AN OUTFLOW SO WE'RE ONLY SCANNING IT TO FOUR KM HIGH BECAUSE ITS SO CLOSE TO THE BASE LINE.

1847. NOTE TWO CELLS IN THE SOUTH LOBE, RATHER WEAK ONES, BUT THEY HAVE PUT OUT DIVERGING OUTFLOWS.

1855. WE CHANGED THE NOAA RADARS TO SCAN IN THE NORTHWESTERN PART OF THE NORTH LOBE. THERE'S SOME 30-40 DBZ CELLS STREAKING ACROSS THERE.

1938. WE HAVE TWO NORTHEAST/SOUTHWEST LINES. THE NORTHERN ONE BEING THE STRONGER ONE. THEY'RE SLOWLY KIND OF MOVING TOGETHER. THE NORTHERN LINE IS RIGHT OVER STAPLETON NOW. WE'RE JUST GOING TO SCAN THE NORTH LOBE WITH A B-1. NOT ANY PARTICULAR GOOD OUTFLOWS WITH THEM, BUT THEY ARE SLOWLY COMING TOGETHER.

1956. WE'RE GOING TO SHUT DOWN NOW. THE TWO LINES KIND OF CONVERGED TOGETHER FORMING A PRETTY LARGE RAIN MASS OF ABOUT 30-40 DBZ RAIN. WE DON'T EXPECT WE WILL GET ANY REAL OUTFLOWS WITH IT.

SUMMARY

THE MOST INTERESTING THING ABOUT THE DAY WAS THAT WE DID GET QUITE A FEW STORMS IN THE 25-45 DBZ RANGE. ALOT OF THESE LOOKED LIKE THEY JUST SIMPLY CAME OFF THE MOUNTAINS. USUALLY THEY'D DIE A LITTLE BIT AS THEY CAME OFF THE MOUNTAINS BUT MANY MANY JUST KEPT COMING AND SOME INTENSIFIED EVEN AFTER THEY CAME OFF THE MOUNTAINS. CONVECTIVE INITIATION DIDN'T SEEM TO BE PLAYING A BIG PART TODAY. ONE THOUGHT FROM JOHN BROWN IS THAT SYMMETRIC INSTABILITY IS GOING ON. WE DO KNOW THAT PROBABLY ONE OF THE MOST MAJOR LINES WHICH WAS A NORTHEAST/SOUTHWEST ONE THAT I HAD MENTIONED EARLIER THAT CAME OVER STAPLETON, DID SEEM TO BE TO BE SOMEWHAT ATTACHED TO A STRONGER PUSH OF NORTHWESTERLY FLOW THAT WAS COMING DOWN FROM THE NORTHWEST. BUT I'M SURE THAT IF YOU CHECKED TODAY THROUGH THE TAPE YOU WILL SEE STORMS THAT DID INITIATE OVER THE PLAINS WERE NOT ATTACHED TO ANY SURFACE CONVERGENCE FEATURE. TODAY IT OFTEN SEEMED THAT THE BOUNDARY LAYER

WAS SOMEWHAT DETACHED FROM WHAT WAS GOING ON ALOFT. ONE OF THE THINGS WE THOUGHT WAS GOING TO BE PRETTY GOOD WAS THE FACT THAT WE HAD THIS 45 DBZ STORM THAT CAME OFF MOUNT EVANS LOOKED JUST LIKE THE FOURTH OF JULY CASE. IT SEEMED LIKE THIS WAS A NULL CASE EVENTUALLY IT DID PUT OUT A DIVERGING OUTFLOW, BUT I DON'T THINK IT WAS ANYWHERE NEAR AS STRONG AS THE FOURTH OF JULY. I DO KNOW THAT UND AND FL-2 DID COLLECT DUAL DOPPLER DATA ON THAT. I THINK IT WILL BE A VERY INTERESTING DAY TO SIT AND LOOK AT JUST TO SEE HOW THAT ONE DEVELOPED IN A FAIRLY STABLE ENVIRONMENT. A MOIST STABLE ENVIRONMENT. THE DATA WE COLLECTED WITH THE NOAA RADARS IN THEIR DUAL LOBES GENERALLY I DON'T THINK IS VERY USEFUL. WE DIDN'T REALLY GET ANY GOOD OUTFLOWS WE DID CHOOSE TO PICK THE NORTH LOBE OVER THE SOUTH. WE USUALLY DID NOT PICK THE LOBE THAT PRODUCED AN OUTFLOW. THERE WERE SOME MINOR OUTFLOWS BUT THEY WERE NOT VERY STRONG THERE WERE I THINK ABOUT 16 SOUNDINGS LAUNCHED TODAY, SO WE HAVE A NICE RECORD CONCERNING WHAT STABILITIES WERE AND HOW THINGS EVOLVED WE DID NOT HAVE ANY AIRCRAFT FOR THE DAY.

JUL 12

WE HAVE RECEIVED MASSIVE COOLING OVERNIGHT. WE HAVE UPSLOPE, SO ITS COLD AND RAINY THIS MORNING.

1227. THERE'S ONE BAND OF PRECIP THAT STRETCHED THROUGH OUR SOUTHERN DUAL LOBE THAT WAS EXTREMELY INTERESTING IN THAT IT LOOKED VERY MUCH LIKE A DIVERGING LINE. IT HAD ALL THESE LITTLE CELLS ALL ALONG IT, AND EACH ONE DIVERGED AT THE SURFACE OF MICROBURST INTENSITY. BUT WHAT'S INTERESTING IS THE SOUNDING IS TOTALLY SATURATED AND DOESN'T LOOK AT ALL LIKE A MICROBURST CASE. WE DID GET 12 MINUTES OF DATA ON IT BEFORE IT LEFT THE SOUTHERN LOBE OF THE TWO NOAA RADARS. CP-3 HAS A WHOLE HISTORY OF IT. WE DON'T HAVE ANY SPECIAL SOUNDINGS TO GO WITH IT

1620. WE CLOSED OPERATIONS. NOTHING HAPPENED. WE DID HAVE SMALL SHOWERS START COMING UP THE MOUNTAINS, BUT WE COULDN'T GET MUCH OVER 35 DBZ. ITS JUST STILL TOO STABLE ALTHOUGH THE SUN DID GET OUT.

JUL 13

CLEAR AND SUNNY AFTER OUR BIG UPSLOPE FROM YESTERDAY. BUT ITS ALSO GETTING VERY DRY AND THE SOUNDING IS FAIRLY STABLE TODAY. SO WE'RE NOT ALL THAT HOPEFULL THAT WE'LL GET

ANYTHING TODAY.

1405. WE HAVE THE FIRST INDICATION OF A CONVERGENCE LINE FAR TO THE SOUTH ON THE PALMER DIVIDE. IT ALSO SHOWS UP IN OUR MOST SOUTHERN PAM STATION SKIES ARE STILL BASICALLY CLEAR.

1614. OUR BOUNDARY IS ESSENTIALLY STATIONARY. ITS PAST STATIONS 42 AND 43. CLOUD TWO IS GOING TO GO TO THE SOUTH SIDE OF THE BOUNDARY, AND WE ARE GOING TO DO A SIMULTANEOUS RELEASE FROM CLOUD TWO AND ELIZABETH. PROBABLY IN ABOUT A HALF HOUR. THERE IS NO OTHER REAL ACTIVITY.

1700. ELIZABETH AND MOBILE LAUNCHED. THERE IS STILL NO ACTIVITY ANYWHERE WE'LL BE CLOSING DOWN SOON.

JUL 14

WEATHER DOESN'T LOOK A WHOLE LOT BETTER THAN YESTERDAY. THE SOUNDING IS FAIRLY DRY, THERE IS SOME MOISTURE JUST BELOW 500 MB. BUT THERE IS SOME INDICATION IT MAY DRY OUT. SO WE'RE ACTUALLY NOT TOO HOPEFUL FOR TODAY.

1530. OPERATIONS CALLED OFF. THINGS CONTINUALLY DRIED OUT. THERE WERE ESSENTIALLY NO CLOUDS AND ENDS THE THIRD DAY IN A ROW WITH NOTHING.

JUL 15

THE MORNING SOUNDING IS VERY DRY. THERE IS NO MOISTURE AT ANY LEVEL. THE SATELLITE INDICATES THAT IT SHOULD REMAIN DRY AND ALL UPSTREAM SOUNDINGS SUGGEST THE SAME THING. THE 1100 SOUNDING WAS EVEN DRIER.

1210. WE'RE GETTING A WEAK INDICATION OF A CONVERGENT LINE 60 KM TO THE SOUTHEAST SHOWING ON THE RADAR AND IN THE FAR SOUTHEAST PAM STATION. WE ALSO HAVE A LINE OF CUMULUS ASSOCIATED WITH IT AND IT LOOKS LIKE IT EXTENDS UP TOWARD THE NORTH EAST. THE MOUNTAINS ARE ALSO DEVELOPING SOME PRETTY HEALTHY CUMULUS FOR THIS TIME OF THE DAY.

1305. CLOUD TWO WENT SOUTHEAST OF BYERS AND REPORTED AS THEY CROSSED THE CLOUD LINE THAT THE MIXING RATIO WENT UP TO 9, AND THE WINDS WENT IN TO THE SOUTHEAST AT ABOUT 15. THEY'RE GOING TO GO INTO THE SOUTH A LITTLE MORE AND SET UP. WE WILL DO A SOUNDING BETWEEN BYERS AND CLOUD TWO AT PROBABLY ABOUT 1330.

1545. WE'RE GOING TO DO ANOTHER PAIR OF SOUNDINGS ON

EITHER SIDE OF THIS BOUNDARY TO THE SOUTHEAST. IT WILL BE BETWEEN ELIZABETH AND I BELIEVE CLOUD THREE. WE'VE HAD WHERE WE TOOK THE EARLIER PAIR OF SOUNDINGS A CELL THATS GONE UP TO 50 TO 60 DBZ. WE STILL HAVE A NUMBER OF CELLS ALONG THAT LINE, BUT NO OUTFLOWS OR ANYTHING THAT IS COMING THIS WAY.

1554. A CELL AT ABOUT 190 TO 200 DEGREES FINALLY PUT OUT AN OUTFLOW. IT WAS ABOUT 90 KM SOUTH OF US AND SLOWLY MOVING NORTHWARD.

1705. THE GUST FRONT HAS ONLY MOVED ABOUT 20 KM IN OVER AN HOUR NOW. WE FIGURE ITS JUST NOT GOING TO GET HERE FOR A COUPLE HOURS, SO WE'RE GOING TO CLOSE OPERATIONS.

JUL 16

THE SOUNDING TODAY HAS MOISTURE AT 500 MB AND IT LOOKS LIKE IT WILL STEADILY INCREASE THROUGHOUT THE DAY. THIS MORNING AT ABOUT 1100 THE NCAR KINGAIR WENT UP TO GREELY TO FLY FOR MOTA SEGAL. THEY SAID THAT THAT THEY DIDN'T NECESSARILLY SEE ANY BIG TEMPERATURE CONTRASTS, BUT THEY DON'T REALLY KNOW. ON THE RADAR WE WERE JUST BARELY ABLE TO SEE CLEAR AIR THAT FAR AND WE DID NOT SEE ANYTHING. IT WAS REALLY TOO FAR FOR US TO SEE.

1247. ON THE WAY HOME FOR THE KINGAIR, WE ARE GOING TO HAVE IT PASS THROUGH A SHEAR WEAK CONVERGENCE LINE THAT WE HAVE TO OUR NORTH THAT RUNS NORTHWEST/SOUTHEAST AT ABOUT 20 KM NORTH OF THE RADAR. WE HAVE SOME CUMULUS GROWING ALONG THAT LINE. IT DOES NOT LOOK VERY CONVERGENT ON THE RADAR. THERE ARE WEAK SHOWERS BACK IN THE MOUNTAINS. ONE UP TO THE NORTHWEST SHOWS ABOUT 40 DBZ. I SHOULD NOTE AT THIS TIME THAT WE THINK WE KNOW WHAT THE REFLECTIVITY PROBLEM IS AT CP-3. PROBABLY MEANING THAT OUR REFLECTIVITY'S, PARTICULAR AT THE HIGH END, HAVE BEEN LOW BY ABOUT 8 DBZ.

1252. THE AIRCRAFT IS JUST ABOUT TO START ITS PASS THROUGH THIS, I'LL CALL IT A SHEAR LINE AND LINE A. THEY'RE GOING TO COME THROUGH AT ABOUT 6500 FEET AND THEY'LL JUST MAKE ONE PASS

1312. WE HAVE A LITTLE OUTFLOW FROM THE MOUNTAINS, WE'LL CALL IT B, THATS TO THE NORTWEST.

1334. WE HAVE A COMPLEX OF STORMS THAT IS JUST COMING OFF THE MOUNTAINS TO THE NORTHWEST THAT IS NOW PUTTING OUT AN

OUTFLOW THAT I'LL CALL C.

1358. WE'VE NOTICED ANOTHER WEAKER OUTFLOW WHICH I'LL CALL D, STRAIGHT TO OUR WEST/NORTHWEST. IT SEEMS TO BE HEADING NORTWARD.

1445. I DON'T THINK I MENTIONED BUT PROBABLY DURING THE PAST 15-20 MINUTES, C AND D DID COLLIDE TO OUR NORTWEST IT DIDN'T REALLY PRODUCE ANY PRECIP ITATION ECHO, BUT YOU CAN SEE SOME CLOUDS OUT THERE BUT THEY ARE NOT PARTICULARLY SPECIAL. THERE IS A HORIZONTAL FLOW FEATURE THAT GOES THROUGH THE NORTH LOBE THAT HAS A NUMBER OF CUMULUS ON IT: NOT WHAT I WOULD CALL TOWERING. THIS BOUNDARY C WILL BE MOVING THROUGH THOSE.

1508. CINDE 2 AND CINDE 3 ARE DOING A C-1 PATTERN ALONG BOUNDARY C AS ITS JUST BEGINNING TO ENTER THE NORTHWEST PART OF THE NORTH DUAL LOBE.

1540. THE AIRPLANES ARE DOING A C-1 JUST AS THIS BOUNDARY IS IN THE NORTH LOBE. THEY ACTUALLY DID CROSS THE BOUNDARY.

1645. WE HAVE ONE AIRPLANE WORKING VIRGA NEAR THE AIRPORT AND THE OTHER TWO ARE GOING TO WORK SOME YOUNGER LOOKING STUFF IN THE SOUTH LOBE. WE'RE GOING TO CONCENTRATE OUR SCANNING AND THE AIRPLANES IN THE SOUTH LOBE.

1715. AT 1700 THE CLASS AND CLOUD ONE RELEASED. THEY'RE REALLY ON EITHER SIDE OF TWO COLLIDING BOUNDARIES THAT ARE IN BOTH DUAL LOBES. BOTH NORTH AND SOUTH. THEY COLLIDED JUST ABOUT OVER D. THE PLANES ARE FLYING SOME GROWING CUMULUS IN THE SOUTH LOBE. THEY'RE STILL IN EARLY STAGES

1726. PAM SHOWS NICE DIVERGENCE FROM A MICROBURST THAT IS JUST EAST OF OUR BASE LINE. WE'RE NOT WORKING THAT CELL BECAUSE ITS ON THE BASE LINE AND AGAIN IT DOESN'T SEEM TO SEE IT THESE REAL SMALL ONES RADAR DOESN'T SEE.

1730. I JUST HEARD FROM THE LINCOLN LABS ABOUT 10-15 MINUTES AGO. THEY WERE DOING DOPPLER AND THEY DID PICK UP THE MICROBURST THAT WE DIDN'T SEEM TO SEE THAT SHOWED UP IN PAM. THE PLANES UNFORTUNATELY WEREN'T FLYING THAT ONE. THEY WERE FLYING ONE SOUTH. THAT ONE WAS ON OUR BASE LINE.

1823. THE PLANES HAVE BEEN FLYING M-1'S BASICALLY AROUND THE SOUTH LOBE AND REALLY NOT CATCHING ANYTHING GOOD. ITS JUST A SHALLOW DECK OF CLOUDS THAT DOES NOT PUT OUT

ANY OUTFLOW. RADARS HAVE BEEN SUPPORTING IT, BUT WE JUST REALLY HAVEN'T GOT A GOOD CASE. THE PLANES ARE GOING TO FLY THROUGH ONE OF OUR CONVERGENCE LINES IN THE SOUTH LOBE ON THEIR WAY HOME. AND THEY'LL DO A MISSED APPROACH TO STAPLETON AND GET SOME DATA THROUGH IT. WE'LL SUPPORT IT WITH THE RADARS.

1915. WE CLOSE DOWN FOR THE DAY.

SUMMARY

THE MAJOR FEATURE OF THE DAY WAS A GUST FRONT THAT MOVED DOWN FROM A STORM COMPLEX TO THE NORTHWEST. IT STALLED OUT RIGHT IN OUR NORTH LOBE WE GOT SOUNDINGS IN THE MIDDLE OF IT ON EITHER SIDE. WE GOT AIRCRAFT PASSES THROUGH THE BOUNDARY WHEN IT HIT ITS STATIONARY STAGE. THIS BOUNDARY C REALLY DID NOT PRODUCE ANY ECHO. IT DID SEEM TO PRODUCE ONE ECHO WHEN IT COLLIDED WITH BOUNDARY D MAYBE 30 DBZ. WE HAD ALL THE AIRCRAFT UP WAITING FOR ACTIVITY TO DEVELOPE IN OUR NOTH AND SOUTH LOBES. THEY FLEW ALOT OF M-1 PATTERNS. REALLY DIDN'T GET ANYTHING THAT I THINK IS GOING TO BE THAT USEFUL. THERE WERE NUMEROUS BOUNDARIES TODAY. PROBABLY WOULD HAVE GONE UP TO F,G, OR H. WE DID NOT KEEP TRACK AFTER AWHILE. THESE ALL SEEM TO COME MAINLY FROM STUFF NEAR THE MOUNTAINS. MOST OF THEM ARE ALL WEAK OUTFLOWS, ALTHOUGH WE CERTAINLY HAD THIS ONE THAT WAS A STATIONARY NORTH/SOUTH ONE THROUGH THE LOBES. WE DON'T KNOW WHERE IT CAME FROM, IT JUST DEVELOPED. WE HAD A TREMENDOUS AMOUNT OF CONVERGENCE IN BOTH THE NORTH AND SOUTH LOBES IN THE LATER PART OF THE DAY. AND IT JUST COULD NOT PRODUCE ANY SUBSTANTIAL MICROBURSTS. WE THINK PROBABLY THE BEST THING TODAY WAS UND AND FL-3 PROBABLY COLLECTED DUAL ON THE ONLY REAL MICROBURST THAT OCCURED IN THE DUAL LOBES. SO I GUESS WHAT WE HAVE IS ANOTHER DATA SET OF MOVING BOUNDARY THAT BECAME STATIONARY. THATS WHERE WE COLLECTED ALL THE DATA AT. THE SOUNDINGS ARE PROBABLY VERY INTERESTING FROM THE STANDPOINT OF WHY CONVECTION DIDN'T REALLY OCCUR- DEEP CONVECTION. I SAW SOME OF THE SOUNDINGS AND THEY LOOKED VERY INTERESTING. I THINK WE SHOULD HAVE EXPECTED MORE OF THAT TO HAPPEN. ONE OF THE FEATURES THAT NEEDS TO BE CHECKED IS THE ESTABLISHMENT OF OF THE NORTH/SOUTH STATIONARY CONVERGENCE LINE THROUGH THE PAM NETWORK. I THINK IT AT LEAST WAS STRENGTHENED FROM SOME MICROBURST ACTIVITY THAT OCCURRED JUST WEST OF STAPLETON THAT PUT OUT A WEAK OUTFLOW. I THINK THIS MAY HAVE MORE OR LESS

COLLIDED WITH A ROLL OR SOMETHING THAT NEEDS TO BE CHECKED.

JUL 17

WE'VE HAD QUITE A CHANGE. THE SOUNDING IS GOING TO BE VERY MOIST TODAY WE BELIEVE. WE'VE LOTS OF MOISTURE THAT CAME UP FROM THE SOUTH. WE HAVE SOME SORT OF SYNOPTIC SCALE TROUGH FEATURE THAT IS RUNNING RIGHT NOW NORTH/SOUTH THROUGH THE EXTREME EAST EDGE OF THE PAM NETWORK. WE EXPECT TO GET HEAVY RAINERS TODAY, CELLS TO MOVE FROM THE SOUTHEAST.

1410. STARTING ABOUT 20 MINUTES AGO, THE NOAA RADARS STARTED SCANNING THE NORTH LOBE WITH B-1 LOW. THE NORTH SOUTH BOUNDARY IS JUST ON THE VERY EDGE OF THE DUAL LOBES. WE'RE PUTTING CHAFF IN THE EASTERN SIDE NOW. THERE ARE JUST SOME SMALL CUMULUS NOW ALONG THAT LINE.

1424. CONVERGENCE LINE IS STILL MOSTLY STATIONARY ON THE EASTERN SIDE OF THE NETWORK. THE INTERESTING FEATURE RADARS SHOWS IN THE MOVING LOOP SOME RECEEDING FLOW THAT LOOKS LIKE ITS GOING TO TIGHTEN UP THE CONVERGENCE THERE IN THE NEXT 10 MINUTES OR SO. THE AIRCRAFT ARE GOING TO START FLYING THE BOUNDARY ANY MOMENT NOW. THEY'RE SETTING UP A C-3 PATTERN THAT'S IN THE NORTH LOBE.

1555. WE HAVE ONE 55 DBZ ECHO THAT'S ON THE VERY SOUTHERN END OF THIS CONVERGENCE LINE. ABOUT 80 KM SOUTH. CUMULUS BUILDUPS ARE MUCH BETTER ALONG THIS LINE. THE PLANES ARE STILL FLYING IN THE NORTH LOBE CROSSING THIS BOUNDARY. WE DID A SERIES OF SOUNDINGS ABOUT A HALF HOUR AGO. AND THE NOAA RADARS ARE STILL SCANNING THE NORTH BOUNDARY. WE THINK THEY HAVE PRETTY GOOD RETURN. YOU SEE IN THE RADAR CONVER GENCE IN THE LOWEST KM TO AND THEN ABOVE THAT ITS ALL DIVERGENT. THE AIRPLANES REPORT UPDRAFT ALONG THE EAST SIDE OF THE BOUNDARY AND DOWN DRAFT ON THE WEST SIDE.

1613. WE'RE GETTING OUR FIRST ECHO IN OUR DUAL LOBES. THE FIRST ONE IS RIGHT ON THE BASE LINE JUST SOUTH OF WHERE WE'VE BEEN WORKING ALL THIS TIME. WE'RE JUST GETTING THE FIRST HINT OF ONE SMACK DAB IN WHERE WE HAVE BEEN WORKING.

1623. NOTED JUST A FEW MINUTES AGO ONE OF THE AIRCRAFT FLEW RIGHT THROUGH WHERE THIS NEW CELL IS GROWING. THAT WAS RIGHT IN THE GROWING STAGES, SO ITS GONE RIGHT THROUGH THE UPDRAFT. AND THIS IS THE SAME AREA RIGHT IN THE NORTH

LOBE WHERE WE'VE BEEN SCANNING.

1650. WE'VE GOT SOME ROTATION WITH A CELL THAT WE GOT THE INITIATION ON IT IN THE MIDDLE OF THE NORTH LOBE. ITS AT LOW LEVELS, IT DIDN'T REALLY EVER PUT OUT ANY DUSTNADO, BUT IT WAS BEING SCANNED NICELY. THIS STORM IS STILL IN ITS GROWTH STAGE. AND THE WHOLE LINE IS FILLING IN. WE MAY HAVE THE GROWTH OF ANOTHER STORM THAT WAS JUST ON THE NORTH OF THIS ONE. WE MAY HAVE THE INITIATION OF THAT ONE, I DON'T KNOW.

1701. JUST NEAR NOAA C WE HAVE TORNADOES. TWO OF THEM. WE SAW THE ROTATION AND HAVE BEEN ASKED TO GO OUT AND TAKE A LOOK.

1716. AT 1709 CLOUD THREE LAUNCHED A SONDE RIGHT UP INTO A STRONG ROTATION WE HAVE RIGHT OVERHEAD. THATS WHERE THOSE DUSTNADOES WERE JUST A LITTLE BIT AGO. WE STILL HAVE A GOOD ROTATION JUST ABOVE THE GROUND

1744. WE WERE GOING TO SCAN THE GUSTFRONT AS ITS COMING OUT OF THIS STORM AS ITS MOVING WEST. BUT THERES NOT ENOUGH CLEAR AIR FOR THE NOAA RADAR WE'RE GOING TO GO BACK AND SCAN A CELL IN THE NORTH LOBE ON THE SOUTH EAST SIDE THATS GOT SOME CIRCULATION IN IT. THATS ABOUT ALL WE CAN DO IN THAT AREA. WE HAVE A SURGE THATS BEEN COMING UP FROM THE SOUTH WEST THATS JUST ABOUT RUNNING INTO OUR OLD CONVERGENCE LINE.

1840. I DON'T KNOW IF I'VE COMMENTED, BUT WE HAVE A LITTLE LINE OF ECHOES RIGHT THROUGH THE MIDDLE OF THE NORTH LOBE, UP OVER 50 DBZ. THEY WERE CREATED WHEN THE SURGE FROM THE SOUTHWEST MET THE OUTFLOW FROM THE ORIGINAL STORMS AND AMAZINGLY AS COOL AS THE AIR WAS IT SEEMED TO BE ABLE TO PRODUCE THESE ECHOES. AND THEY'VE SUSTAINED THEMSEVES FOR QUITE A WHILE NOW. SO ITS OF INTEREST IN SEEING JUST MASS LIFTING OF COLD AIR UNTIL ITS FINALLY REACHED ITS FINAL LEVEL OF CONVECTION. THATS ALL WE GOT GOING NOW. THE GENERAL AREA OF STORMS IS DYING OUT AND BECOMING MORE STRATIFORM.

1845. WE'RE GOING TO CLOSE DOWN NOW.

SUMMARY

THIS WAS THE BEST CONVECTIVE INITIA TION CASE TO DATE. WE HAVE SYNOPTIC SCALE NORTH/SOUTH CONVERGENCE LINE THAT WAS JUST ON THE FAR EASTERN PART OF THE PAM NETWORK THAT WORKED WESTWARD UNTIL IT WAS ALMOST IN THE CENTER

OF THE NETWORK. WE FLEW THE AIRPLANES THROUGH IT, TOOK SOUNDING ON EITHER SIDE. WE PUT CHAFF ALL IN THE NORTH LOBE RIGHT NEAR THE BOUNDARY. AND EVENTUALLY LATER IN THE AFTERNOON, STORMS INITIATED RIGHT WHERE WE WERE WORKING. WE SHOULD HAVE THE INITIAL UPDRAFTS ON THESE STORMS. WE COULD SEE THE CONVERGENCE GRADUALLY INCREASING AT LOW LEVELS DIVERGING OUT ABOUT A KM ABOVE THE GROUND AND WITH TIME THE CONVERGENCE GOT DEEPER AND DEEPER, UNTIL IT WAS LIKE FOUR KM DEEP. SO WE SHOULD HAVE VERY NICE EVOLUTION OF THE CONVECTION ON THIS LINE. THERE WAS ONE OTHER FEATURE GENERATED BY THIS LINE. IT PUT OUT A GUST FRONT THAT STARTED MOVING WESTWARD, BUT AT THE SAME TIME WE HAD VERY STRONG FLOW SOUTHWEST FROM THE MOUNTAINS. THIS MAY AGAIN HAVE BEEN SYNOPTICALLY CREATED BY THE PASSAGE OF A TROUGH AND ENHANCED BY LOTS OF COOLING BY PRECIPITATION OVER THE MOUNTAINS. THESE WINDS EVENTUALLY COLLIDED WITH THIS GUST FRONT PRODUCING MORE CELLS IN AIR THAT WE REALLY WOULD HAVE THOUGHT TOO COOL. BUT THERE WAS TREMENDOUS CONVERGENCE AND IT WAS ABLE TO LIFT AIR ENOUGH FOR CONVECTION. THAT HAPPENED AGAIN IN OUR NORTH LOBE. WE WERE NOT ABLE TO GET THE INITIATION OF THIS ALTHOUGH WE WERE INITIALLY SET UP TO DO IT. WE DIDN'T HAVE ANY CHAFF ANYMORE SO WE COULDN'T GET THE ROOTS OF THE CONVECTION. ONE OTHER THING TO NOTE WAS THAT AS WE WERE GETTING STORMS DEVELOPED ALONG THIS NORTH/SOUTH LINE THERE WERE NUMEROUS REPORTS FROM OUR FIELD OBSERVERS OF DUST WHIRLS. ORIGINALLY THEY WERE CALLED TORNADOES BY PEOPLE AT NOAA C. THEY WERE PROBABLY GUSTADOES AND A LOT WERE PROBABLY DUSTDEVILS. BUT THEY WERE ALL ALONG THE CONVERGENCE LINE IN AREAS WHERE WE WERE GETTING GOOD STRONG UPDRAFTS AND RADAR WAS SHOWING NICE LITTLE CIRCULATIONS. VERY TYPICAL OF THE DUSTADOES WE'VE BEEN SEEING SO MUCH OF THIS SUMMER.

JUL 18

THE SOUNDING TODAY IS VERY DRY. AND UPSTREAM IS DRY. WE'RE NOT EXPECTING ANY ACTIVITY AT ALL.

1354. WE HAVE RELEASED BY 1300, ALL THE AIRCRAFT AND ALL WE'RE DOING IS TO TAKE THREE SOUNDINGS AT ABOUT THIS TIME. ONE AT DENVER, ONE AT HUDSON, AND THEN A MOBILE AT PLATTEVILLE. THERE IS A LOT OF INTERESTING CLEAR AIR FEATURES. ONE BEING UP NORTH OF US WHERE WE GOT SORT OF EASTERLY FLOW AND STRONG SOUTHWESTERLY HERE. MAYBE A MOISTURE DISCONTINUITY. THERE'S SOME SORT OF JET FEATURE THAT GOES

ACROSS JUST THE SOUTHERN PART OF THE PAM NETWORK. BUT WE'RE ESSENTIALLY BRINGING EVERYTHING DOWN.

NOTE-ON JULY 17, THE CALIBRATION FOR THE RADAR WAS CHANGED. SO IT WILL BE A DIFFERENT SLOPE OR AT LEAST A DIFFERENT THRESHOLD.

TODAY THE 18TH, THEY DID SOME WORK ON THE IMAGE REJECTION FILTER AND IT SEEMS TO HAVE IMPROVED OUR SENSITIVITY EVEN FURTHER. THE CLEAR AIR TODAY IS SOLID. ESSENTIALLY 115 KM MAXIMUM RANGE.

1330. CLOSE OF MOST OF OPERATIONS. SHELBY FRITSCH DID HIS CLEAR AIR TURBULENCE EXPERIMENT WHICH REQUIRED NOAA C AND D AND THEIR CHAFF AIRPLANE. THERE REALLY WAS VERY FEW CLOUDS ALL DAY. THERE WAS SOME VERY INTERESTING FLOW FEATURES. KIND OF A JET ACROSS THE SOUTHERN PART OF THE PAM NETWORK. NICE CLEAR AIR FEATURES. CLEAR AIR TODAY WENT OUT TO MAX. RANGE OF 115 KM. THEY HAD DONE SOME WORK ON CP-3 WHICH IMPROVED THE SENSITIVITY EVEN FURTHER.

JUL 19

ITS STILL PRETTY DRY TODAY. THE SOUNDING IS ALMOST AS DRY AS YESTER DAY, BUT WE HAVE SOME WEAK CONVECTION OVER THE MOUNTAINS. AND SO IT DOESN'T LOOK LIKE WE'LL GET ANY NEW MOISTURE ADVECTED IN. WE HAVE IN THE PAM KIND OF A BIG ROTATING FEATURE AT 1100. CP-3 IS GOING TO STAY DOWN FOR AN HOUR OR TWO TO WORK ON THE CALIBRATION PROBLEM.

1330. THE PROJECT IS GOING TO CLOSE DOWN PARTIALLY. THE NOAA RADARS AND THE AIRCRAFT ARE BEING LET GO. I'LL STAY HERE WITH CP-3 AND ALL THE SOUNDINGS WILL REMAIN ON STANDBY.

1440. I'VE SENT ONE OF THE SOUNDINGS SOUTH OF BENNET, WHERE THEY'RE MAKING A SOUNDING IN A FEILD OF CUMULUS CLOUDS DOWN THERE. OVER THE MOUNTAINS WE HAVE THREE OR FOUR WEAK SHOWERS, PROBABLY ONLY 20 DBZ. THE REFLECTIVITIES, WE REALLY DON'T KNOW WHAT THEY ARE ON THE RADAR NOW WE'VE BEEN GOING THROUGH THESE CALIBRATIONS, SO WE'RE NOT SURE OF THE VALUES. THERE'S BEEN ONLY ONE REAL FEATURE AND THATS BEEN A NORTHWEST/ SOUTHEAST ORIENTATED CONVERGENCE LINE OF UNKNOWN NATURE SLOWLY MOVING NORTHEAST. ITS REALLY BEYOND THE NERWORK, SO WE'RE NOT DOING ANYTHING WITH THAT.

1555. OVER THE PAST 15 MINUTES, WE'VE BEEN DEVELOPING

NORTHWESTERLY FLOW UP AROUND BOULDER. I'VE NO IDEA WHETHER ITS FROM SOME ACTIVITY THAT IS COMING OFF THE NORTH OF BOULDER. SOME 30 DBZ STUFF. IT COULD BE, BUT IT DIDN'T REALLY LOOK LIKE IT. I'M GOING TO SEND ONE OF THE CLOUD VEHICLES UP IN THAT DIRECTION IN ANTICIPATION OF A STRENGTHENING OF CONVERGENCE TO THE NORTHWEST OF US.

1630. WE HAVE A WHOLE LINE OF VIRGA STUFF THATS NORTHWEST OF THE RADAR AND JUST NORTHWEST OF BOULDER. ITS SHOWING THE CLASSIC CONVERGENCE AT MID LEVELS AND LINING OUT IN A REFLECTIVITY LINE. LOOKING LIKE IT WILL DEVELOPE INTO A MICROBURST LINE. MUCH OF IT WILL BE BACK IN THE MOUNTAINS THOUGH. AND AT THIS TIME WE ALSO HAVE A CONVERGENCE LINE BETWEEN STAPLETON AND BOULDER THATS FAIRLY STATIONARY BUT STRENGTHENING CONSIDERABLY.

1755. THE CONVERGENT LINE STILL LIES MORE OR LESS NORTHEAST/SOUTHWEST GOING THROUGH ARVADA AND ERIE. AND THEN IT GOES EAST/WEST ABOUT 10 MILES NORTH OF THE NETWORK. VISUALLY THERE ARE A WHOLE FEILD OF CUMULUS CLOUDS. THEY ARE NOT VERY DEEP. SOME ACTUALLY ARE ICING OUT A LITTLE, PRODUCING SOME VIRGA, BUT THEY ARE QUITE SHALLOW. CLOUD TWO AND CLOUD THREE WILL BE MOMENTARILY DOING A SOUNDING ON EITHER SIDE OF THE BOUNDARY. I DIDN'T ADD EARLIER, THE TIME THAT CLOUD TWO TOOK THEIR SOUNDING ON THE NORTHWEST SIDE OF THE BOUNDARY WAS 1639.

1813. WELL ON THIS CONVERGENCE LINE IF WE ARE TO BELEIVE THE REFLECTIVITIES, WE HAVE JUST INITIATED A 30 DBZ ECHO.

1816. CLOUD THREE RELEASED AT X = 1 EAST, Y = 15 NORTH.

1851. ONE OF THE CELLS ON THE CONVERGENCE LINE DID PUT OUT A VERY WEAK DIVERGENCE. I DON'T THINK IT WAS 10 M/S. WE HAVE A WHOLE STRING OF CELLS THAT ARE ON IT THAT GO UP TO 30 DBZ OR SO.

1900. WE'LL SHUT DOWN HERE, LET CLOUD TWO AND THREE GO.

SUMMARY

WE HAVE A RARE CASE TODAY WHERE WE SUDDENLY DEVELOPED A OUTFLOW FROM THE NORTHWEST. IT CAME OUT FROM THE BOULDER AREA. I GUESS I WOULD CLASS IFY IT AS A MOUNTAIN OUTFLOW. THERE WAS ALOT OF VIRGA AND A NUMBER OF SHOWERS UP IN THAT AREA. ITS PROBAB LY MOUNTAIN OUTFLOW THAT HAS SLOWLY WORKED DOWN. NOW ITS ALMOST ON TOP OF STAPLETON, AND ITS THROUGH THE NORTHWESTERN PART OF THE

PAM NETWORK. IT INITIATED A WHOLE LINE OF 30 DBZ SHOWERS, SOME MAYBE 35 DEPENDING TOO ON HOW WELL THIS RADARS CALIBRATED. I DON'T THINK WE GOT ANYTHING OF MICROBURST STRENGTH. BUT ITS A VERY NICE CASE OF THE INITIATION OF CONVECTION BY A CONVERGENCE LINE IN A VERY MARGINAL MOISTURE SITUATION. IT ALSO WOULD PROBABLY HAVE BEEN A PRETTY GOOD CASE FOR THE AIRPLANES. THEY WOULD HAVE BEEN ABLE TO FLY IT AND IT WOULD HAVE BEEN A NICE KIND OF NULL CASE FOR THEM FOR MICROBURST STUDIES.

JUL 20

THE SOUNDING TODAY IS EVEN DRIER THAN IT HAS BEEN. PARTICULARLY THE ONE THAT WAS TAKEN AT 1100. CLOUD WISE IT DOESN'T LOOK AS GOOD AS IT DID YESTERDAY AT THIS TIME. THERE IS SOME MOISTURE AT MID LEVELS SOUTH OF US AND ALSO JUST WEST OF US.

1630. OPERATION WOUNDING DOWN UNTIL 1730. WE DID NOT GET ANY BOUNDARIES OF SIGNIFICANCE. THE MOUNTAINS JUST GOT ECHOES BETWEEN 10-20 DBZ. THE MOISTURE DID RETURN AT THE 500 MB LEVEL DURING THE DAY. WE HAD KIND OF A CAP ABOVE IT AND WE JUST COULD NOT DEVELOPE ANY THICKNESS TO THE CLOUDS. IT WAS A DAY WITH NO ACTION

JUL 21

LOW LEVEL MOISTURE HAS INCREASED QUITE A BIT. WE HAD MIXING RATIOS OF 7-8, PARTICULARLY IN THE SOUTHERN LOBE. AND WE HAVE MORE OR LESS INCREASE IN THE SOUTHWEST WINDS IN THE SOUTH LOBE WHICH SET UP A PSEUDO BOUNDARY. THE SOUNDING IS A LITTLE BIT MORE MOIST THAN YESTERDAY. LOOKS LIKE WE COULD GET MOUNTAIN VIRGA SHOWERS AS WELL AS DEVELOPING THUNDERSTORMS IN THE PLAINS.

1140. WE STILL HAVE THIS PSEUDO CONVERGENCE LINE IN THE SOUTH LOBE WITH KIND OF ENHANCED CONVERGENCE DOWN TO THE SOUTHWEST. IT LOOKS LIKE WE MIGHT BE ABLE TO GET A CASTLE ROCK STORM IN TWO HOURS.

1312. IN THE LAST 15 MINUTES WE'VE DEVELOPED SOME SORT OF AN EASTERLY PUSH THAT SHOWS UP A BIT AS A FINE LINE ALSO IN THE NORTH LOBE. WE'VE START ED CHAFFING THE NORTH LOBE. AND THE NOAA RADARS ARE DOING SOME SCANNING OF THE CLEAR AIR UP THERE. WE HAVE STILL A CONVERGENCE LINE OFF TO THE SOUTHWEST. I DON'T BELIEVE ITS QUITE AS STRONG AS IT USED TO BE. THERE IS SOME BETTER CLOUD DEVELOPMENT DOWN

TOWARDS THE MOUNTAINS IN THAT DIRECTION. BUT NOTHING VERY SPECTACULAR.

1335. NOAA RADARS ARE STILL SCANNING THE NORTH LOBE. BASICALLY HAVE SOME SORT OF EASTERLY PUSH THERE THAT THEY'RE SCANNING. ENHANCED CONVERGENCE IN THE AREA. JUST A FEW CLOUDS NOTHING MUCH GOING ON. ALSO AT THIS TIME, OUR CONVERGENCE TO THE SOUTHWEST IS SLOWLY MOVING NORTH AND GETTING WEAKER.

1730. WE REALLY HAVE DEVELOPED JUST STRONG SOUTHEAST FLOW THROUGH THE WHOLE NETWORK THROUGH THE AFTERNOON TRIED TO GET A DENVER CYCLONE GOING BUT IT JUST FELL APART. NOW WE ARE GETTING QUITE A BIT OF ACTIVITY, MOSTLY ON THE WEST SIDE OF THE CONTINENTAL DIVIDE. LOOKING AT THE SATELLITE LOOP AND ALL, LOOKS LIKE ITS MOVING THIS WAY. THE SOUNDINGS ARE SHOWING THATS ITS WARMED UP QUITE A BIT AT UPPER LEVELS DURING THE DAY AND NOW IT LOOKS LIKE ITS STARTING TO COOL. PARTICULARLY AT GOLDEN. THE IMPRESSION IS THAT BY THE TIME WE GET ENOUGH COOLING ALOFT IT WILL BE TOO LATE IN THE DAY.

1745. PROJECT CALLED DOWN.

JUL 22

WE HAD A SOUTHEASTERLY FLOW THROUGH MOST OF THE NETWORK TODAY. THE SOUNDING HAD SOME 500 MB MOISTURE. CLOUDWISE THERE IS A FEW MORE CUMULUS OVER THE MOUNTAINS THAN NORMALLY FIRST THING IN THE MORNING

1330. THE 1100 SOUNDING FROM STAPLETON SHOWED A GREAT LOSS IN MOISTURE AT 500 MB. ALTHOUGH WE ARE STILL GETTING HALF DECENT CUMULUS DEVELOP MENT OVER THE MOUNTAINS. BETTER THAN IT HAS BEEN. MIXING RATIOS ARE HOLDING AROUND 8 IN THE MESONET. SO EVEN THOUGH ITS DRIED OUT, THERE ARE OTHER SIGNS THAT LOOK HOPEFULL.

1354. WE REALLY DON'T HAVE ANY CONVERGENT LINES OR ANYTHING. THERE IS ONE SLIGHT HIND OF 50 KM TO THE SOUTH. THERE MIGHT HAVE BEEN A SLIGHT OUTFLOW WITH A DINKY LITTLE SHOWER. CELLS IN THE MOUNTAINS ARE RUNNING ABOUT 20 DBZ AT THE MAXIMUM AND THERE AREN'T TOO MANY.

1440. WE HAVE A CLUSTER OF CELLS THAT ARE 30-40 DBZ, 60-70 KM TO THE SOUTH. THERE'S A VERY SMALL CONVERGENCE LINE THAT LOOKS LIKE IT HAS BEEN DOWN THERE FOR A WHILE. WE HAVE A GOOD 45 DBZ AT 300 DEGREES IN THE MOUNTAINS. AND WE HAVE ONE

WEAK 20 ONE THATS OUT IN THE PLAINS AT 330 DEGREES. WE DON'T KNOW WHERE THAT CAME FROM, ITS JUST THERE.

1533. WE HAVE 30-45 DBZ ECHOES JUST SOUTH OF THE NETWORK AND ABOUT THE SAME ON THE NORTHWEST SIDE OF THE NETWORK. NEITHER ONE HAVE REALLY PUT OUT A SIGNIFICANT OUTFLOW YET. OUR AIRPLANES SHOULD BE ABOUT 15 MINUTES FROM TAKEOFF. WE DON'T HAVE ANY REAL CONVERGENCE LINES AT THIS TIME.

1626. WHEN THE AIRCRAFT CAME UP WE START- ED HAVING A BUNCH OF CRASHES. SOME- THING TO DO WITH CHANGING THE SOFT- WARE WITHOUT TESTING IT AGAIN. THERE ARE TWO LINES OF ACTIVITY. ONE NORTH OF THE NETWORK AND ONE SOUTH. THE TWO PLANES ARE FLYING VIRGA STUFF TO THE NORTH OF THE NET WORK WELL OUT OF DUAL COVERAGE. THE RADARS ARE SCANNING THE SOUTH LOBE, SOME WEAK VIRGA THERE. NOTHING SPECTACULAR.

1635. WE'RE GOING TO DO DUAL IN THE NORTH LOBE ON A CELL GROWING THERE UNDER A VERY WEAK CONVERGENCE LINE. ITS REALLY ASSOCIATED WITH JUNK THATS COME OFF THE MOUNTAIN, BUT THERE IS A PRETTY HOT AREA THERE. WE'RE GOING TO SEND UP A SOUNDING JUST TO THE SOUTH OF IT.

1722. WE HAVE CONVERGENCE LINES ALL THROUGH THE NORHT LOBE AND A GUST FRONT APPROACHING FROM THE BOULDER AREA. WE'RE GETTING QUITE A BIT OF ENHANCEMENT OF CONVERGENCE STRAIGHT NORTH OF US. TWO CONVERGENCE LINES ARE KIND OF COMING TOGETHER. WE STILL HAVE A LINE OF 50-55 DBZ ECHOES THAT STRETCH JUST NORTH OF THE DUAL LOBES. THEY FORM A LITTLE KIND OF TOWARD THE NORTHEAST. WE HAVE SOME WEAK ECHOES ON THE SOUTH SIDE OF THE DUAL LOBES.

1751. WE'RE GOING TO DO A LAUNCH ON EITH- ER SIDE OF THE GUST FRONT THAT IS COMING DOWN FROM BOULDER. ITS ONLY ABOUT 5 KM TO OUR NORTHWEST. ITS WELL DEFINED AND WE'LL GET A SOUND- ING ON EITHER SIDE. IT LOOKED LIKE WE'RE GOING TO DEVELOPE SOME MICRO- BURSTS IN THE SOUTH LOBE. WE'RE STARTING TO GET MID LEVEL CONVERG- ENCE AND WE'RE SENDING THE PLANES DOWN THERE.

1752. I NOTICED PRETTY STRONG DIVERGENCE, I THINK DELTA V AT 10 JUST SOUTH OF THE SOUTH LOBE.

1756. WE HAVE A VERY NICE DIVERGING LINE THE SOUTH SIDE OF THE SOUTH LOBE. WE'VE GOT KIND OF AN OCCLUSION POINT JUST WEST OF OUR NORTH LOBE. THE TWO BOUNDARIES ARE KIND OF OCC- LUDING. THERE WAS SOME SORT OF REP- ORT OF A GUSTNADO, BUT

WE HAVEN'T BEEN ABLE TO CONFIRM IT. RADAR DID NOT REALLY SHOW IT. AND WE REALLY HAVE TWO MAJOR FLOWS KIND OF HEAD-ING TOWARDS EACH OTHER AND THEY SHOULD COLLIDE JUST SOUTH OF STAPLETON.

1800. OBSERVERS HERE DID REPORT A GUSTNADO JUST NORTH OF US, PROBABLY WHERE THE OCCLUSION POINT WAS.

1811. THE RADARS AND THE AIRPLANES ARE BOTH WORKING THE SOUTHERN PART OF THE SOUTH LOBE. THAT AREA HAS ALREADY PUT OUT QUITE A BIT OF SPECTACULAR DIVERGING OUTFLOW. SO ITS ALREADY IN THE OUTFLOW STAGE.

1834. THE GUST FRONT IS JUST PAST STAPLETON AND WE'RE GOING TO DO A LAUNCH WITH DENVER ON THE COOL SIDE AND CLOUD TWO ON THE WARM SIDE. SO THIS WILL GIVE US OUR SECOND SET ACROSS THIS GUST FRONT.

1843. WE'VE HAD A POWER OUTAGE HERE FOR FEW MINUTES, SOMETHING TO DO WITH A GENERATOR. A COMMENT ON THIS SECOND SET OF SOUNDINGS, RIGHT NOW VISUALLY THE CLOUDS ARE REALLY DISSIPATING ON THE GUST FRONT, EVEN THOUGH THERE IS STILL REAL GOOD CONVERGENCE. SO IT WILL BE VERY NICE TO SEE HOW THINGS HAVE CHANGED BETWEEN THESE TWO SETS OF SOUNDINGS.

1917. WE'RE GOING TO SCAN THE NOAA RADARS IN THE SOUTH LOBE, THE VERY NORTHWEST PART. THE GUST FRONT IS JUST ENTERING THERE. THERE'S A FEW 20 DBZ CELLS THERE. AND WE'LL PROBABLY BRING THE AIRCRAFT IN ACROSS THE GUST FRONT.

1950. WE HAVE CINDE 2 JUST ABOUT NOW TO MAKE A PASS AT 7000 FT. THROUGH THE GUST FRONT. WE'VE BEEN SCANNING, IT IS NOT PRODUCING ANY REAL CELLS NOW JUST 20 DBZ AT BEST. THIS IS HIS LAST PASS THROUGH IT ON HIS WAY HOME. DUAL DOPPLER IS STILL COLLECT ING ON IT. 2005 WE'RE CLOSING OPERATIONS NOW. THE GUST FRONT IS STILL THERE. ACTUALLY ITS KIND OF GOING THROUGH A LITTLE OCCLUSION PROCESS IN THE SOUTH LOBE VERY FEW CLOUDS ALONG IT NOW. JUST COOLING OFF.

SUMMARY

THE MAJOR THING WAS THAT THE MOISTURE TODAY WAS REALLY JUST IN THE LOWEST LEVELS. WE DIDN'T HAVE MUCH 500 MB MOISTURE YET WERE ABLE TO PRODUCE THUNDERSTORMS IN THE MOUNTAINS AND THEN ON THE PLAINS. FIRST ONES INITIATED TO THE SOUTH IN THE PLAINS, ABOUT 60-70 KM, AND THEY DID SEEM TO BE ASSOCIATED WITH SOME WEAK CONVERGENCE LINE DOWN

THERE. WE DIDN'T SAMPLE IT SO WE DON'T KNOW MUCH ABOUT IT. WHAT WAS MORE INTERESTING WAS THAT WE DID INITIATE SOME PRETTY STRONG STORMS, 55 DBZ, THAT WERE JUST ACROSS THE NORTHERN PART OF THE NETWORK. THERE WAS NOT REAL OBVIOUS CONVERGENCE LINE WITH THESE, ALTHOUGH YOU COULD SEE IN PAM KIND OF A CONVERGENCE ZONE. AND WITH TIME ON RADAR, WE DEVELOPED SOME SORT OF A CONVERGENCE LINE. IT NEEDS TO BE REVIEWED TO SEE WHAT MORE WE CAN FIGURE OUT ABOUT IT. BUT ITS RATHER SURPRISING THOSE STORMS DEVELOPED AS WELL AS THEY DID. I DO REMEMBER ONE OF THEM PUTTING OUT A REAL NICE MICROBURST, WE HAPPENED TO HAVE A NUMBER OF VIS ITORS FROM THE FAA. ABOUT 25 VISITORS. DUAL DOPPLER WISE WE PROBABLY DON'T HAVE ANY GOOD CASES FOR CONVECTION INITIATION, ALTHOUGH MAYBE IN REVIEW WE'LL SEE THATS NOT THE CASE. BUT ITS JUST THE OLD PROBLEM OF SEEING ENOUGH CLEAR AIR WITH THE NOAA RADARS SO I'M NOT SURE. WE WERE CHAFFING, BUT I'M NOT SURE IF IT DID A GOOD ENOUGH JOB. ONE OF THE MAIN THINGS THE AIRPLANES DID, WAS TO FLY OUTSIDE THE DUAL DOPPLER AREA THE WHOLE TIME. AND THEY WERE FLYING THE WEAKER SHOWERS AND THERE WERE REALLY MORT BIG CONGLOMERATES OF SHOWERS THAT PRODUCED SOME VERY STRONG OUTFLOWS. PARTICULARLY IN THE SOUTHEASTERN PART OF THE NETWORK. REALLY JUST OUTSIDE OF THE NETWORK. THERE WERE VERY STRONG OUTFLOWS. ON DOPPLER RADAR WE COULD SEE THE MID LEVEL CONVERGENCE START IN THE STRONG OUTFLOWS. THE RATE THE AIRPLANES GOT THERE, AFTER THE OUTFLOWS STARTED, AND THEY STAYED WITH THEM FOR A LONG TIME SO THEY MAY HAVE GOTTEN PORTIONS WHERE THEY DEVELOPED THE INITIAL DOWNDRAFTS. BUT MOST OF THEM WERE KIND OF IN THE DOWNDRAFT STAGES. TWO NEXT GUST FRONTS THAT CAME DOWN FROM THE ACTIVITY TO THE NORTH. THE SLOWLY MOVED INTO THE NETWORK AND IN THE SOUTH LOBE. WE GOT SOME VERY NICE DUAL DOPPLER DATA ON THEM. AT THAT TIME THEY WERE NOT PRODUCING ANY STORMS. BUT WE SHOULD HAVE SOME VERY HIGH RESOLUTION DATA. WE GOT TWO SETS OF SOUNDINGS ON EITHER SIDE OF THIS GUST FRONT AT TWO DIFF ERENT TIMES WHICH SHOULD BE VERY GOOD. AT THE FIRST SET, WE WERE PRODUCING ALOT OF CLOUD AND CERTAIN LY SOME ECHOES. WE'RE NOT SURE OF THE REFLECTIVITIES. ON THE SECOND SET WAS WHEN WE WEREN'T PRODUCING ANY MORE. CLOUDS WERE DISSIPATING. SO FOR CONVECTIVE INITIATION, THAT WAS PROBABLY THE MAJOR THING OF THE DAY. ONE THING WAS WE DID A SPECIAL STUDY FOR A NOAA PERSON. IT WAS KIND OF A TURBULENCE STUDY. JUST CLEAR AIR WORK THAT HAD THE CHAFF PLANE AND THE TWO NOAA RADARS EARLIER. AND THEN WE ALSO DID ANOTHER STUDY FOR NOAA

PEOPLE WHICH INVOLVED PROFILERS AND CLOUD THREE GOING TO PROFILER SITES. ALSO THEY HAD ANOTHER GMD AT ONE OF THE PROFILERS SITES. I THINK THESE WERE FLAGGLER AND FLEMMING. I'M NOT SURE. SO THERE WERE SOME OTHER SOUNDINGS DURING THE DAY WE DON'T KNOW ABOUT. FOR THIS REASON WE GOT ALOT OF SOUNDINGS EARLIER THAT WE HADN'T PLANNED ON. ALSO WE DID INTERCOMPARISON SOUNDINGS. HUDSON WITH C-1 AND C-2 ON THE SAME BALLOON. WE'LL DO OTHER COMPARISONS ON ANOTHER DAY

JUL 23

THE SOUNDING TODAY WAS RATHER MARGINAL. NOT MUCH MOISTURE AT 500 MB, SOME LOW LEVEL MOISTURE. THE BIG HOPE IS TO ADVECT IN MOISTURE FROM THE EAST.

1705. WE'RE GOING TO CLOSE DOWN NOW. WE DIDN'T REALLY GET ANYTHING ALL DAY. WE HAD EASTERLY FLOW. JUST SIMPLY DIDN'T HAVE ENOUGH LOW LEVEL MOISTURE. QUITE A BIT OF CLOUDS IN THE SOUTHEAST, AND MAJOR STORMS 150 KM TO THE EAST, SO THERE IS A LOT OF MOISTURE. WE ONLY GOT MINOR CONVECTION OVER THE MOUNTAINS, 20-30 DBZ STUFF. IT DID MANAGE TO COME OUT OVER THE PLAINS NORTH OF BOULDER, BUT DIDN'T PRODUCE ANYTHING. SO IT WAS A DAY WITH NO REAL BOUNDARIES EXCEPT FAR TO THE NORTH, AND THEY WERE JUST SLIGHT WIND SHIFT BOUNDARIES AND NO ACTIVITY IN THE AREA.

JUL 24

WE'VE HAD A COLD FRONT MOVE DOWN THROUGH THE NIGHT, IN FACT THERE WERE ACTUALLY THUNDERSTORMS IN THE DENVER AREA LASTNIGHT BETWEEN 2200 AND 0000. THE BOUNDARY, THE COLD FRONT IS REALLY HUNG UP IN THE SOUTHERN PART OF THE MESONET, AND THE MIXING RATIOS ARE WELL UP BETWEEN 10 AND 13.

1149. THE COLD FRONT IS BEGINNING TO LOOK MORE LIKE THE DENVER CONVERGENCE LINE. SET UP IN THE NORMAL LOCATION RIGHT IN THE MIDDLE OF THE NETWORK. AT THIS TIME IN THE SOUTHERN PART WE HAVE TEMPERATURES ALMOST NEAR CONVECTIVE TEMP. THERE ARE 40-50 DBZ CELLS BACK IN THE MOUNTAINS. AT 1100 WE TOOK SOUNDINGS FROM ALL THE CLASS AND WE'RE GETTING THE MOBILES POSITIONED ON EITHER SIDE OF THE BOUNDARY. WE WON'T HAVE THE CHAFF PLANE FOR A LITTLE WHILE YET. THE NOAA RADARS AREN'T SCANNING YET

1224. CONVERGENCE LINE PRETTY MUCH STATIONARY. NCAR KINGAIR IS DOING C-3 PATTERNS IN THE SOUTHERN LOBE ACROSS IT.

WE SENT UP SOUNDINGS ON EITHER SIDE OF THE BOUNDARY AT 1215 FROM TWO MOBILES.

1305. TWO KINGAIRS HAVE HOOKED UP NOW AND THEY'RE GOING TO BE FLYING THE CONVERGENCE LINE. THE NOAA RADARS ARE STILL DOWN, THEY HAVEN'T GOT ANY SCANNING ON THE BOUNDARY YET. WE'RE GOING TO SEE ABOUT GETTING THE FL-2 AND UND TO DO IT.

1310. THE AIRCRAFT REPORTED THAT THERE ARE A COUPLE OF CUMULUS. WE CAN SEE THEM. THEY SEEM TO BE JUST NORTH OF WHERE THEY'RE FLYING ALONG THIS LINE.

1339. CONVERGENCE LINE THERE IS SLOWLY MOVING NORTHWESTWARD. THE PLANES ARE FLYING DOWN ON THE SOUTH END OF IT. NOAA RADARS ARE STILL NOT SCANNING IN DUAL MODE. AND I JUST NOTICED AS THE AIRPLANES MADE THEIR LAST PASS THROUGH, RADAR SHOWS CONVERGENCE AT LOW LEVELS AND DIVERGENCE ABOVE. ON EARLIER PASSES A LITTLE WHILE AGO THEY REPORTED 11 GRAMS/KG OF MOISTURE AT 7500 FT.

1353. THE AIRCRAFT ARE GOING TO SWITCH TO A C-2 PATTERN. WE HAVE A BUNCH OF LITTLE CUMULUS ALL ALONG THE CONVERGENCE LINE NOW.

1436. FIRST CELLS ARE FORMED IN THE NORTH LOBE. THEY'RE IN THE 20 DBZ AREA ALONG THE CONVERGENCE LINE THERE ARE TWO OF THEM. A LOT OF TOWERING CUMULUS THE WHOLE LENGTH OF THE LINE. PLANES ARE STILL FLYING THE SOUTHERN END. WE STILL DO NOT HAVE NOAA C. WE'RE GOING TO TRY TO DO DUAL WITH NOAA D AND CP-3 THAT WILL BE RATHER LIMITED, BUT WE'RE LOOKING IN THE SOUTH LOBE.

1450. PLANES ARE DOING AN M-1 IN A DEVELOPING CLOUD IN THE DUAL ARE BETWEEN NOAA D AND CP-3. ITS ABOUT 20 DBZ NOW. WE HAVE 40-50 DBZ ECHOES IN THE NORTH LOBE NOW. A LINE JUST SLOWLY DEVELOPING NOW.

1510. ROBERTS TOOK SLIDES FROM HERE ALL ALONG THE LINE. WE NOW HAVE ABOUT 50-55 DBZ STORMS IN THE NORTH LOBE AND IN THE 40'S IN THE SOUTH LOBE. STILL DO NOT HAVE NOAA C. WE'RE STILL COORDINATING WITH D IN THE SOUTH LOBE. PLANES ARE FLYING M-1 IN THE SOUTH LOBE ON THE CELL THAT IS JUST ON THE EDGE OF OUR DUAL LOBE WITH NOAA D.

1511. I NOTICED DIVERGING OUTFLOW WITH THE STORM IN THE NORTH LOBE.

1520. HAIL FLARE WITH A CELL JUST STRAIGHT SOUTH OF CP-3. WE HAVE SOME OUTFLOW WITH A CELL IN THE NORTH LOBE THAT IS MOVING DOWN TO COLLIDE WITH THE CONVERGENCE LINE, THE INITIAL ONE. WE EXPECT STORM GROWTH THERE. WE'RE GOING TO TRY AND GET A SOUNDING IN THAT AREA BUT WE MAY BE LATE.

1605. I NOTICED A NEW CELL ON THE GUST FRONT AS IT MOVES NORTH. STILL HAVE REAL GOOD DIVERGENCE OUT OF THE MAIN CELL IN THE NORTH LOBE. SOME INDICATION THAT WE ARE STARTING TO DEVELOPE A GUST FRONT THAT MAY MOVE SOUTHEAST, BUT ITS NOT CLEAR YET.

1615. WE'VE HAD ONE OF THE KINGAIRS FLYING BACK AND FORTH IN THE SOUTH LOBE ANTICIPATING A GUST FRONT TO COME OUT. WHAT WE HAVE COMING OUT IS FURTHER NORTH OF THEM, SO I DON'T THINK THEY'VE GOT ANYTHING YET.

1617. ON THE .9 DEGREE SCAN I CAN SEE ANOTHER GUST FRONT MOVING OUT. THERE IS TWO RINGS NOW. AND THEN IN THE MIDDLE THERE IS EVEN A THIRD STRONG MICROBURST. IT DOES LOOK LIKE WE'RE GOING TO GET THE GUST FRONT TO MOVE SOUTHEASTWARD WHERE THE KINGAIR HAS BEEN FLYING. SO WE ARE GOING TO KEEP THEM ON THAT TRACK.

1622. THE AIRCRAFT AT 1000 FT. CERTAINLY GOT THROUGH THE GUST FRONT. I CAN SEE IT ON THE RADAR NOW. MOVING OVER TO GET THE RADARS TO SCAN HIGH RESOLUTION ON A GUST FRONT WHERE THE AIRPLANES FLYING. THAT IS THE NORTHEAST PART OF THE SOUTH LOBE.

1630. WE HAVE A NICE GUST FRONT NOW MOVING TOWARD THE SOUTHEAST, NOT PRODUCING ANYTHING YET. THE FARTHER GUST FRONT MOVING TOWARDS THE NORTH WEST IS PRODUCING CELLS. ITS JUST PRODUCED ANOTHER ONE UP TO THE NORTH. AND I THINK MAYBE ANOTHER ONE WILL PRODUCE TO OUT NORTHWEST.

1640. THE LAST 30 MINUTES IN PAM HAS BEEN AN ENORMOUS DIVERGING OUTFLOW IN THE NORTH LOBE. ITS WORTH GETTING SOME AM OUTPUT ON.

1655. .9 DEGREE SCAN ITS A BEAUTIFUL CIRCULAR GUST FRONT THAT COVERS ALMOST THE WHOLE NORTHERN SCANNING AREA. WORTH A PICTURE. AS THE GUST FRONTS MOVING SOUTHEAST, IT HAS PRODUCED ONE CELL THATS OVER 50 AND ANOTHER ONE THATS IN THE 40'S. ACTUALLY IT SEEMS TO BE DOING BETTER AT PRODUCING NOW MOVING SOUTHEAST THAN THE ONE THATS GOING NORTHWEST. THERES ANOTHER BOUNDARY THAT APPARENTLY

CAME OFF THE MOUNTAINS SOUTH THAT LOOKS LIKE IT WILL EVENTUALLY COLLIDE WITH THE ONE THATS THE MAJOR CIRCULAR GUST FRONT. THE CELL JUST NORTH OF THE RADAR IS SHOWING A FLARE ECHO.

1710. THE AIRPLANES HAVE ALL LEFT NOW, EXCEPT FOR THE CHAFF PLANE IS PUTING CHAFF IN THE SOUTH LOBE WHERE THE GUST FRONT IS.

1719. THE GUST FRONT IS NOW MOVING UP AGAINST THE MOUNTAINS TO THE WEST AND NORTHWEST OF US. THE FORECAST QUESTION IS WILL IT INITIATE STORMS THERE. I THINK IT KIND OF WILL. WE WILL FIND OUT. WE HAVE ONE MAJOR CELL LEFT THAT IS JUST TO OUR NORTH WEST AND ITS PRODUCING A FLARE ECHO YOU CAN SEE LOTS OF HEAVY RAIN FALL ING OUT OF IT VISUALLY.

1724. WE NOTICED A STORM INITIATED IN ADVANCE OF THE GUST FRONT. THATS IN THE FAR SOUTHEAST OF THE SOUTH LOBE NEED A REVIEW TO SEE IF THERE IS ANY OBVIOUS REASON. THE NOAA RADARS REPORT BACK NOW THEY DO HAVE COVERAGE SO THEY MAY HAVE SOME DUAL DOPPLER ON THIS GUST FRONT THATS WHERE THE STORM INITIATED IN FRONT OF IT.

1728. WE JUST LOOKED AT THE GOLDEN SOUNDING THAT WAS JUST TAKEN A LITTLE BIT AGO. JUST IN ADVANCE OF THE GUST FRONT HITTING THE MOUNTAINS, AND IT IS INCREDIBLY UNSTABLE. SO IF STORMS DON'T GO OVER THE MOUNTAINS IT WILL BE INTERESTING WHY NOT.

1739. WE'VE HAD A COLLISION OF THE BOUND ARIES JUST TO OUR SOUTH/SOUTHWEST AND SHOULD CONTINUE TO COLLIDE AS YOU MOVE EASTWARD.

NOTE -AT 1625, PAM 9 HAD A WIND OF 33 M/S.

1821. WE GOT TWO CELLS NOW THAT ARE OVER 40 DBZ WHERE THE BOUNDARIES COLLIDED TO OUR SOUTH. ONE OF THEM IS JUST TO THE SOUTHWEST PART OF THE SOUTHEAST LOBE AND WE'RE SETTING THE NOAA RADARS UP TO SCAN THAT FOR A MICROBURST STUDY.

1920. FOR ABOUT THE LAST 10 OR 15 MINUTES THE NOAA RADARS HAVE BEEN SCANNING THE MIDDLE OF THE SOUTH LOBE. THERE IS A CELL THAT WENT UP THERE OVER 45 DBZ. WE ALSO HAD CLOUD ONE IN THE VICINITY LAUNCH A SOUNDING AT 1905 AND BYERS HAS JUST PUT UP ANOTHER ONE.

1948. THE CELL WE'VE BEEN SCANNING IN THE SOUTH LOBE HAS

PUT OUT SOME SORT OF A WEIRD OUTFLOW. IT STILL HAS AREAS OF 45 IN IT AND ALL BUT WE'VE REALLY GOT THE HISTORY OF IT. WE'RE GOING TO QUIT ON IT. ABOUT HAD ENOUGH FOR ONE DAY. IT CERTAINLY WAS A GOOD DAY.

SUMMARY

WE HAD A COLD FRONT STALL OUT IN THE SOUTH PART OF THE NETWORK THAT EVOLVED INTO A DENVER CONVERGENCE LINE. IT SAT THERE OF COURSE FOR HOURS AND IT EVENTUALLY PRODUCED 55 PLUS DBZ STORMS, WE HAD A NUMBER OF AIRCRAFT FLIGHTS IN THE BOUNDARY WELL BEFORE IT PRODUCED THESE STORMS UP TO THE TIME IT DID PRODUCE. EXCELLENT DATA SET. WE DID NOT HAVE THE NOAA RADARS, BOTH WERE DOWN, THERE IS NO DATA THERE. WE HAVE GOOD SOUNDINGS ON EITHER SIDE OF THE BOUNDARIES WATCHING THE EVOLUTION OF THE MOISTURE. EVENTUALLY THESE STORMS PUT OUT A GUST FRONT. THE FIRST ONE COLLIDED WITH PART OF THE STATIONARY BOUNDARY THAT PRODUCED A VERY STRONG STORM THAT WAS PROBABLY 60 DBZ OR MORE. IT HAD A FLARE ECHO IN IT. LATER AS THESE STORMS DEVELOPED MORE, A MAJOR GUST FRONT CAME OUT. IN FACT THERE WERE TWO OF THEM. THEY WERE RINGS. THERE WERE A NUMBER OF STRONG DOWNBURSTS. WE HAD THE AIRCRAFT FLYING THE GUST FRONT AS IT MOVED SOUTH OF ONE OF THESE CELLS AS IT INITIATED AND CAME OUT. THE NOAA RADARS WERE SCANNING THAT EXACT AREA. AS THE PLANE WAS FLYING THERES GREAT QUEST ION WHETHER THEY WERE GETTING ENOUGH RETURN TO SEE ANYTHING. IF THEY DID IT COULD BE AN EXTREMELY HIGH RESOLUTION DATA SET WITH AN AIRPLANE THERE. AS THE GUST FRONTS MOVED OUT IN A RINGED FASHION, THEY PRODUCED STORMS BOTH ON THE SOUTHWEST AND NORTHEAST SIDE. EVENTUALLY THE NORTHERN PART COLLIDED WITH THE FOOTHILLS AND PRODUCED A NUMBER OF VERY STRONG STORMS. IT WAS INTERESTING THAT IT WAS ONLY IN ONE AREA THOUGH. AS THE SOUTHERN PART OF THE GUST FRONT MOVED SOUTH IT EVENTUALLY COLLIDED WITH A MOUNTAIN OUTFLOW THAT PRODUCED A WHOLE LINE OF THUND ERSTORMS THAT RAN THROUGH THE SOUTH ERN PART OF OUR DUAL LOBE. WE GOT SOME 45-50 DBZ STORMS THERE. ONE OF THOSE STORMS WAS SCANNED BY THE NOAA RADARS AS IT DEVELOPED AND THEN EVENTUALLY PUT OUT A WEAKER OUTFLOW. THIS WAS AN EXCELLENT DAY FOR CONVECTION INITIATION. WE HAVE LOTS OF SOUNDINGS IN VERY GOOD LOCATIONS. WE HAVE MOVING BOUNDARIES PRODUCING STORMS, COLLIDING BOUNDARIES PRODUCING STORMS. WE HAVE BOUNDARIES HITTING THE MOUNTAINS AND PRODUCING STORMS. THE ONLY DOWN SIDE WAS THE NOAA RADARS.

JUL 25

THE SOUNDING TODAY HAS QUITE A BIT OF LOW LEVEL MOISTURE. AND THERE IS MOISTURE EVEN AT MID LEVELS. PAM SHOWED MORE OR LESS A DENVER CONVERGENCE LINE. VERY MOIST TO THE NORTH A LITTLE DRIER TO THE SOUTH. MIXING RATIOS ARE AS HIGH AS 10 TO 13 IN THE NORTH.

1330. OVER THE PAST HOUR OR TWO THE DENVER CONVERGENT LINE IS MORE OR LESS DISSIPATED. ALTHOUGH THERE STILL IS A ZONE OF CONVERGENCE AND SORT OF CYCLONIC TURNING OF THE WIND. ITS QUITE WEAK. THE NCAR KINGAIR WENT DOWN TO THE PALMER DIVIDE AND IS JUST NOW COMPLETING THREE EAST/WEST PASSES. THERE ARE LOTS OF TOWERING CUMULUS OVER THE MOUNTAINS. THE UPPER LEVEL WINDS ARE SUCH THAT ONLY THE ANVILS ARE LIKELY TO COME OFF. AND THAT WOULD BE SOME TIME.

1445. FOR THE LAST 30 MINUTES TO AN HOUR WE HAD AN AREA OF APPROACHING FLOW DEVELOPING BETWEEN DENVER AND BOULDER. WE'RE GOING TO SEND UP TWO SOUNDERS TO DO SOUNDINGS ON EITHER SIDE. OTHERWISE THERE IS REALLY NOTHING OUT OVER THE PLAINS AND THERE ARE SOME 30-40 DBZ ECHOES WELL BACK IN THE MOUNTAINS.

1530. WE GOT BACK THE SOUNDINGS THAT WERE TAKEN ONE AT TABLE MESA PARK AND RIDE AND ONE AT BROOMFIELD PARK AND RIDE. WE HAD JUST A SMALL CONVERGENCE BOUNDARY THERE. AND REMARKABLY THE ONE AT BOULDER WAS ABOUT TWO DEGREES COLDER UP TO AT LEAST ABOUT 600 MB. AND THE MIXING RATIO WAS ABOUT TWO GRAMS/KG MORE. VERY DEEP LAYER. ALL SEEMS LIKE ITS A VERY SMALL FEATURE. THE SOUNDINGS ALL HAVE VERY BIG CAPS ON THEM SO THAT CONVECTION IS NOT REALLY POSSIBLE AT ALL. THE ONLY STORMS EXISTING ARE WAY BACK IN THE MOUNTAINS. ACTUALLY ON THE WEST SIDE OF THE DIVIDE. AND WE'RE GOING TO CLOSE DOWN. I'M NOT SURE IF I MENTIONED, BUT AFTER WE FINISHED THE KINGAIR FLIGHT ALONG THE PALMER DIVIDE, THEY WENT UP TO FLY ANOTHER FLIGHT FOR SEGAL AND SCHREIBER, AND THEY ARE ON THEIR WAY BACK FROM THAT NOW

JUL 26

EARLY TODAY BY 1000, WE HAVE QUITE A FEW BUBBLING CUMULUS OVER THE MOUNTAINS. THE SOUNDING IS CERTAINLY MORE MOIST AT 500 MB. AND THERE IS FAIRLY DEEP MOISTURE ON THE SURFACE. LIKE 7 OR 8 KG TO A DEEP LAYER AND THE PAM IS SHOWING 9 AND 10'S. WINDS ARE QUITE SOUTHERLY AND IT LOOKS LIKE IT WILL BE HARD FOR STORMS TO MOVE OFF THE MOUNTAINS.

1200. WE HAVE AS MUCH AS ABOUT 35 PLUS DBZ ECHO OVER MOUNT EVANS. LOTS OF TOWERING CUMULUS OVER THE MOUNTAINS IT EVEN LOOKS LIKE WE'RE GETTING SOME ON THE WESTERN EDGW OF THE PALMER DIVIDE. WE STILL HAVE BASICALLY NORTH TO NORTHEAST FLOW. PAM KIND OF SHOWS ANTICYCLONIC ROTATION

1800. OPERATIONS ENDED.

SUMMARY TODAY WE HAD MANY THUNDERSTORMS IN THE MOUNTAINS. THEY ALL MOVED STRAIGHT NORTH. NO OUTFLOWS OCCURRED. THEY GOT OUT INTO THE PLAINS. SOME OF THE CELLS GOT AS HIGH AS 55 DBZ, ANYWAYS. BUT WE JUST COULD NOT GET ANYTHING TO FORM. LATER DURING THE DAY, AT ABOUT 1700 WE DEVELOPED A CUMULUS FEILD JUST EAST OF THE RADAR. AND WE SENT A SOUNDER OUT THERE TO GET A SOUNDING IN IT JUST THIS SIDE OF IT. AND IT LOOKED LIKE WE HAD A CAP THERE THAT SUDDEN LY RELEASED. ITS MAKING US WONDER ABOUT DOING A SPECIAL EXPERIMENT TOMORROW TO UNDERSTAND THESE LITTLE CAPS WE ARE GETTING. WE DID DO A BIG INTERCOMPARISON DAY FROM DENVER WE SENT UP FOUR SOUNDINGS ON THE BALLOON FROM THE NWS. TWO MOBILES AND ONE CLASS. ALSO WE SENT OP A SINGLE ONE ON A DIFFERENT BALLOON.

JUL 27

THIS MORNING BY 0530, WE HAD NUMEROUS CUMULUS BUBBLING OVER THE MOUNT AINS, EVEN SOME OF THEM WERE GETTING OVER THE PLAINS. BY THE TIME WE GOT HERE FOR THE BRIEFING, SOME OF THOSE STORMS WERE 40 DBZ. WE HAVE EXTENSIVE STORMS OVER THE MOUNTAINS AGAIN THE UPPER LEVEL FLOW IS STRAIGHT SOUTH, SO THERE IS NO WAY FOR THEM TO COME OFF. WE DON'T HAVE ANY REAL CONVERGENCE ZONES, THE WINDS ARE VERY CONFUSED, MOSTLY LIGHT AND VARIABLE. THERE IS SOME HINTS OF CONVERGENCE TO THE SOUTH, BUT ONLY WEAK AND THE SAME IS TRUE TO THE NORTH.

1230. WE HAD A LAUNCH FROM ONE OF THE MOBILES UP NEAR IDAHO SPRINGS. ANOTHER ONE FROM GOLDEN, AND ANOTHER FROM THE WEATHER SERVICE WITH A MOBILE, TO LOOK AT THE MOISTURE DISTRIBUTION AND STABILITY DISTRIBUTION.

1423. WE'VE STARTED OUR BOUNDARY LAYER ROLL EXPERIMENT. THE AIRCRAFT HAVE MADE A COUPLE OF PASSES ALONG I-70 NOW. IT GOING TO DO IT AT ABOUT 4 DIFFERENT LEVELS GOING UP TO ABOUT 1 1/2 KM. WE DON'T HAVE ALL OUR SOUNDERS IN PLACE YET. WEATHER WISE WE STILL HAVE LOTS OF STORMS IN THE MOUNTAINS. ALL STAYING IN THE MOUNT AINS. AND WE DO NOT HAVE ANY

CONVERGENT LINE FEATURES ON THE PLAINS.

1450. THE SOUNDERS RELEASED. WE'RE DOING RHI'S INTERMITTENT WITH SURVEILLANCE SCANS AND THE PLANES FLYING RIGHT ALONG WHERE THE SOUNDINGS WENT UP.

1511. WE HAD THE FIRST OUTFLOW TO OUR WEST JUST COMING OFF THE MOUNTAINS.

1525. THE GUST FRONT IS MOVING RIGHT ALONG. WE HAD ONE WEAK 20 DBZ CELL RIGHT IN FRONT OF IT THAT SEEMS TO BE SUDDENLY INTENSIFYING AS THE GUST FRONT HITS IT.

1610. GUST FRONT IS PROGRESSING. ITS GETTING FAIRLY CLOSE TO STAPLETON. WE GOING TO DO AN EXPERIMENT, HIGH RESOLUTION CROSS SECTION WITH THE SOUNDERS. WE GOING TO RELEASE ONE ALMOST TO NOAA D. WE HAVE SOUNDERS THAT ARE ONLY GOING TO BE ABOUT 10 KM APART. TWO ON ONE SIDE AND TWO ON THE OTHER. WE'LL GET HORIZONTAL SPATIAL VARIATIONS USING ELIZABETH AND HUDSON. INTERESTING NOW ALL THE STORMS THAT ARE BEING INITIATED ARE ONLY SOUTH OF US. THE NORTH HAS NO INITIATION GOING ON. VISUALLY, YOU SEE THAT WE HAVE A FIELD OF CUMULUS IN THIS AREA MOST OF THE AFTERNOON, BUT NOT UP TO THE NORTH. SO IT SEEMS LIKE ITS JUST INITIATION OF A CUMULUS FIELD BY A GUST FRONT.

1650. WE GOING TO RELEASE IN ABOUT 3 MINUTES ALL THE SOUNDINGS. THE GUST FRONT FROM I-70 SOUTH IS PRETTY GOOD, BUT NORTH IS PRETTY MUCH FALLING APART. SO ITS VERY WEAK IN THE AREA WHERE WE'RE DOING IT. WE GOT THE AIRPLANES TO WORK THE GUST FRONT AS IT PASSES THE SOUTH LOBE IN A SMALL AREA WHERE WE'VE CHAFFED AND WE'LL BE DOING A NORMAL DOPPLER SCAN ON IT. RIGHT NOW CONVECTIVE INITIATION HAS ALMOST CEASED WITH THIS CASE. WE'RE GETTING ALMOST NO NEW ECHOES.

1700. LOOKING BACK AT WHAT HAPPENED HERE WE DID GET A GOOD CLEAR GUST FRONT GO OVER OUR SOUNDING SITE. WHAT HAPPENED WAS WE GOT SOME OTHER NORTHWESTERLY PUSH THAT GREATLY COMPLICATED IT. SO I'M AFRAID WE DON'T HAVE REAL GOOD CASE OF JUST A PURE GUST FRONT. NOW WHERE THE PLANES ARE FLYING, IT STILL LOOKS PRETTY GOOD DOWN IN THAT AREA. AND THATS ALSO WHERE THE NOAA RADARS ARE SCANNING. THE SOUNDINGS WERE TAKEN ABOUT 10-15 KM NORTH OF THERE.

1752. WE'RE SHUTTING DOWN. WE'RE NOT INITIATING ANY NEW GROWTH. WE'VE GOT SOME PRETTY NICE DATA I THINK AS

FAR AS HIGH RESOLUTION DUAL DOPPLER ON THE GUST FRONT AND GOOD AIRCRAFT FLIGHTS THROUGH IT. ANY INITIATION IS VERY WEAK SHOWERS. PROBABLY NOTHING EVEN TO 30 DBZ. OUR SOUNDINGS UNFORTUNATELY REALLY DIDN'T GO ACROSS THE GUST FRONT. IT DIED IN THAT AREA. AT LEAST TODAY WE FINALLY GOT A MOUNTAIN OUTFLOW AFTER WE HAD SUCH MASSIVE ACTIVITY IN THE MOUNTAINS. WHEN THE OUTFLOW CAME IT WAS JUST AFTER ALL THE MOUNTAIN STORMS DISSIPATED.

JUL 28

THINGS HAVE NOT CHANGED DRAMATICALLY. WE STILL HAVE BASICALLY SOUTHERLY FLOW ALOFT. QUITE A BIT OF MOISTURE. STORMS FORMING EARLY ON THE MOUNTAINS THEN DRIFTING NORTH. AT THE BEGINNING OF THE DAY THERE'S NO CONVERGENCE LINES. JUST A WEAK NORTH OR NORTHEAST FLOW.

1222. WITHIN ABOUT THE LAST 20 MINUTES, WE HAVE DEVELOPED A CELL ON THE PALMER DIVIDE THAT IS EAST OF THE MOUNTAINS. ITS UP TO OVER 45 DBZ NOW. AND THERE IS SOME SUGGESTION OF A WEAK CONVERGENCE LINE DEVELOPING TO OUR SOUTHEAST. WE STILL HAVE LOTS OF STORMS IN THE MOUNTAINS. WE SENT THE NCAR KINGAIR UP TO GREELY TO DO THE VEGETATION STUDY FOR THE THIRD TIME. WE'RE GOING TO SUPPORT IT THIS TIME WITH THREE SOUNDING SYSTEMS. ONE IN THE CENTER OF THE VEGETATION, AND ONE JUST UPSTREAM AND ONE JUST DOWNSTREAM. THE AIRPLANE IS ACTUALLY ON ITS WAY AND WILL PROBABLY ALMOST FINISH ITS LEGS BEFORE WE GET THE SOUNDINGS OFF. A LITTLE SLIGHT PROBLEM IN GETTING COORDINATED BECAUSE WE HAD TOO MANY VISITORS HERE.

1348. WE GETTING AN ANVIL STREAMING OFF FROM THE PALMER DIVIDE, THAT IS JUST COMING INTO OUR RADAR SCANNING AREA. WE'RE JUST STARTING THE NOAA RADARS SCANNING. THERE'S NO CHAFF, BUT THEY DO SEE THE ICE FALLING OUT OF THE ANVILS, SO THERE IS SOME ECHO THERE.

1356. SEEMS LIKE WE'RE DEVELOPING SOME SORT OF A NORTH/SOUTH CONVERGENCE LINE RIGHT ON THE WESTERN EDGE OF THE PAM NETWORK. PRIMARILY IN THE SOUTH LOBE.

1500. IN THE BOX WE'RE SCANNING WITH THE NOAA RADARS WE HAVE BEEN GETTING INCREASING REFLECTIVITIES THERE. WE ARE UP IN THE 20'S MAYBE 30'S NOW.

1505. WE HAD THIS CONVERGENCE LINE AND THEN AN OUTFLOW FROM WHAT LOOKED LIKE THE WEST THAT CAME AND COLLIDED

WITH A STATIONARY BOUNDARY. NOW ITS PRODUCED A LINE OF CELLS JUST SOUTH OF THE SOUTH LOBE.

1520. WE DID GET A LITTLE MICROBURST RIGHT ON THE SOUTHWEST EDGE OF THE BOX WE'RE SCANNING. WE GOT THIS CELL ALL THE WAY FROM INITIATION TO OUTFLOW.

1515. NOTICED THE CITATION FLEW RIGHT THROUGH OUR BOX WE WERE SCANNING JUST WHEN THE CELL WAS PUTTING OUT THE MICROBURST.

1543. WE'RE SWITCHING THE NOAA RADARS TO SCAN CONTINUOUSLY. THE SOUTHERN PART WITH THE B-4. BUT IN THE NORTH LOBE WE HAVE A CONVERGENCE LINE THERE AND SOME CELLS STARTING AND WE GOT CHAFF RIGHT THERE.

1557. THE CITATION HAS PULLED AWAY FROM US FLYING THE SOUTH LOBE FOR TURBULENCE STUDIES, BUT THATS NOT TOO BAD BECAUSE HE'S GOING TO BE DOING ALOT OF FLYING ACROSS GUST FRONTS AND STUFF. SO THERE'S GOING TO BE DATA THERE WE CAN MAKE USE OF.

1605. CLOUD THREE IS IN THE NORTH LOBE AT UND. THERE ARE TWO BOUNDARIES THAT ARE SQUEEZING TOGETHER THERE. WE'RE GOING TO RELEASE A SOUNDING MOMENTARILY.

1625. WE'RE GETTING CONVECTION INITIATION IN THE NORTHERN LOBE. WE HAVE RIGHT NOW TWO BOUNDARIES COLLIDING THERE. THE STATIONARY ONE AND THE OUTFLOW FROM THE WEST. WE'VE GOT SOUNDINGS IN ALL THREE AIR MASSES. WE HAVE THE AIRPLANES FLYING IN THERE. AND WE GOT HIGH RESOLUTION DATA. WE SHOULD HAVE AN EXCELLENT INITIATION CASE HERE.

1700. WE GOT ANOTHER GUSTNADO REPORT IN THE NORTH LOBE. WE HAD TWO OTHERS EARLIER, I THINK IT MIGHT HAVE BEEN AN HOUR OR 30 MINUTES AGO.

1725. NOTICED IN THE NORTH LOBE A VERY STRONG ROTATING DOWNDRAFT. A NEW GUST FRONT HAS BEEN THERE FOR ABOUT 15-20 MINUTES, MOVING TOWARDS THE NOTHWEST OUT OF THE NORTH LOBE.

1730. ANOTHER STRONG MICROBURST JUST ABOUT 8 KM EAST OF THE AIRPORT.

1800. NOT SURE I MENTIONED, BUT WE HAVE HAD SOME INITIATION ON THE GUST FRONT THAT IS MOVING NORTHWESTWARD. I SAW ABOUT A 45 DBZ CELL THERE.

1820. SHUT DOWN.

SUMMARY

THE BIG THING TODAY WAS THAT WE DEVELOPED A STORM ON THE PALMER DIVIDE. THIS MADE EVERYTHING DIFFERENT FROM OUR TWO PREVIOUS DAYS, ALTHOUGH EVERYTHING SEEMED TO BE THE SAME. FOR SOME REASON WE DEVELOPED STORMS OVER THE PALMER DIVIDE WHICH SENT OUT ANVILS OVER THE NETWORK WHICH THEN PRODUCED CONVERGENCE LINE, WHICH THEN PRODUCED STORMS, AND PRODUCED OUTFLOWS. AND WE HAD MAJOR ACTIVITY THROUGH THE PLAINS. THE DAY STARTED WITH DOING A STUDY FOR SEGAL AND SCHREIBER. THIRD TIME WE DID A VEGETATION FLIGHT FOR THEM AND THIS TIME WE SUPPORTED WITH SOUNDERS IN THE VEGETATION AREA AND ON EITHER SIDE OF IT. ONCE THE PALMER STORM DEVELOPED, IT PUT OUT AN ANVIL. WE TRIED WITH THE AIRPLANES TO FLY THE ANVIL, BUT WE COULD NOT EVER GET CLEARANCE FROM AIR TRAFFIC CONTROL. WE DID GET INTO THE SOUTHERN DUAL LOBE. WE DID LOTS OF SCANNING WITH THE NOAA RADARS. WE DEVELOPED A CONVERGENCE LINE THAT SEEMED TO BE ON THE EAST SIDE OF THE ANVIL WE DON'T UNDERSTAND WHY, BUT WE DID STORMS STARTED THEN TO DEVELOPE ON THIS CONVERGENCE LINE. WE HAVE ONE CELL THAT DEVELOPED WITHIN THAT DUAL SCANNING AREA THAT EVENTUALLY PUT OUT AN OUTFLOW. WE HAVE FULL HISTORY FROM ANVIL THROUGH STORM DEVELOPEMENT TO OUTFLOW. WE THEN MOVED OUR SCANNING TO THE NORTH LOBE. WE HAD, I GUESS WE WOULD CALL IT THE ANVIL CONVERGENCE LINE, AND A WESTERLY OUTFLOW FROM THE MOUNTAINS. THIS OUTFLOW THAT CAME FROM THE WEST DIDN'T SEEM TO PRODUCE ANY THING. BUT WHEN IT STARTED COLLIDING WITH THE ANVIL STATIONARY BOUNDARY, STORMS STARTED TO BE GENERATED ALL UP THROUGH THE SOUTH LOBE AND UP THROUGH THE NORTH LOBE. AND I THINK WE HAVE SOME PRETTY GOOD CONVECTIVE INITIATION ON STORMS IN THE NORTH LOBE WITH THE DUAL RADARS. THEY TRIED SOME UPDRAFT MARKER EXPERIMENTS AND WE SHOULD HAVE SOME DATA THERE. EVENTUALLY WE DEVELOPED SOME MAJOR STORMS IN THE NORTH LOBE BUT VERY STRONG OUTFLOWS AND MANY MICROBURSTS. WE HAD ROTATING DOWNDRAFTS WITH MICROBURSTS. ALL WELL DOCUMENTED IN THE NORTH LOBE BY DUAL RADARS. EVENTUALLY WE PRODUCED A MAJOR GUST FRONT THAT MOVED TOWARDS THE NORTHWEST AND THE KING-AIRS DID FLIGHTS THROUGH THAT. THIS GUST FRONT PRODUCED ONLY WEAK SHOWERS, BUT THAT AFTER A WHILE WAS OUT OF THE DUAL AREA. SO IT WAS A VERY GOOD CONVECTION INITIATION DAY. THE BIG DISSAPPOINTMENT WAS WE DID NOT GET THE PLANES INTO THE ANVIL. I THINK THAT WOULD

BE THE MOST INTERESTING THING IS THAT THE ANVIL AND A CONVERGENCE LINE THAT SEEMED TO BE ASSOCIATED WITH IT.

JUL 29

WE HAVE LOTS OF LOW LEVEL MOISTURE TODAY. MIXING RATIOS ARE IN THE 10 PLUS AREA. WE DON'T HAVE AS MUCH MOUNTAIN CONVECTION FIRST THING AS WE HAVE HAD THE PAST TWO DAYS. WE HAD QUITE A BIT OF ALTOSTRATUS OVER CAST OVER THE MOUNTAINS. BUT EVERYTHING LOOKS LIKE WE SHOULD HAVE A GOOD DAY.

1412. WE FINALLY HAVE GOTTEN SOME PRETTY GOOD ACTIVITY IN THE MOUNTAINS. 40 TO 50 DBZ STORMS. WE HAVE LOTS OF CUMULUS ALONG THE PALMER DIVIDE. AND HAVE ACTUALLY PRODUCED ONE OR TWO CELLS RIGHT UP NEXT TO THE MOUNTAINS. WE HAVE ONE THAT HAS ACTUALLY COME OFF THE MOUNTAINS, AND IS SLOWLY MOVING NORTH/NORTHEAST. ITS STILL QUITE SMALL. THERE SEEMS TO BE SOME INDICATION OF CONVERGENCE INCREASING IN ASSOCIATION WITH THAT CELL TO THE SOUTH.

1550. WE'RE DOING LAUNCHED FROM ALL MOBILES. WHAT WE HAVE IS KIND OF A CONVERGENCE LINE THAT IS NORTHEAST/SOUTHWEST, THAT EXTENDS OFF TO OUR SOUTHEAST. WE GOT SOUNDINGS ON EITHER SIDE. AND WE ALSO GOT A PUSH OF EASTERLY FLOW. CLOUD THREE WHO IS LAUNCHING NEAR PAM 30 IS IN THAT FLOW. I THINK CLOUD ONE WHO IS UP NEAR UND IS ALSO IN THAT FLOW. THERE IS ONE OTHER BOUNDARY TO MENTION, AND THAT IS ONE OFF TO THE NORTHWEST THAT SEEMS FAIRLY STATIONARY. BUT I THINK WHAT IT IS, IS SHADING FROM THE ANVIL OF BIG STORM UP TO THE NORTH IN THE MOUNTAINS. ITS BEEN THERE FOR MAYBE A HALF HOUR. IT LOOKS LIKE WE'RE STARTING TO BUILD SOME ECHOED RIGHT ON THE FOOTHILLS ALONG THE CONVERGENCE LINE. ONE BIG ONE BACK IN THE MOUNTAINS JUST WEST OF IT.

1630. WE DEVELOPED A 45 DBZ STORM RIGHT OVER NOAA D. ITS ALONG THE EXTENSION OF THIS NORTHEAST/SOUTHWEST CONVERGENCE LINE. HASN'T REALLY BEEN PRODUCING MUCH EXCEPT 20 DBZ CELLS LATELY. WE HAVE A STRONGER FLOW DEVELOPING TO THE NORTHWEST ALONG OUR OLD CONVERGENCE LINE UP THERE. THE FLOW HAS INCREASED QUITE A BIT AND ITS MOVING TOWARD THE SOUTHEAST.

1700. WE'RE BUILDING A STORM RIGHT OVER STAPLETON. WE HAVE THIS FLOW FROM THE NORTHWEST THAT IS KIND OF COLLIDING WITH A STATIONARY BOUNDARY HERE. AND ITS ALSO COLLIDING WITH A CELL THAT FORMED ON THE STATIONARY BOUNDARY JUST

NORTH OF D. WE'RE SCANNING THE TWO NOAA RADARS IN THAT AREA.

1708. PROFS TEAM REPORTED A GUSTNADO IN OUR AREA BUT WE NEVER COULD SEE IT.

1715. THERE WAS A GUSTNADO. RADARWISE IT LOOKED LIKE IT WAS JUST SOUTH/SOUTH EAST OF US.

1716. THE CITATION IS GOING TO MAKE A PASS RIGHT THROUGH OUR NORTHERN LOBE. WE'RE GETTING NEW STORMS DEVELOPED THERE AND WE'RE GOING TO START SCANNING THERE IMMEDIATELY.

1720. WE HAVE ABOUT 20 M/S AT THE AIRPORT NOW. KIND OF AN OCCLUDING GUST FRONT RIGHT ON US.

1726. WE HAVE A PERFECT RING GUST FRONT THAT JUST WENT OUT RIGHT FROM THE CENTER OF STAPLETON. CLOUD TWO REPORTS A GUSTNADO WHICH WOULD PUT IT SOMEWHERE ABOUT I-70 AND GUN CLUB ROAD. I GUESS IT WOULD BE ON THIS GUST FRONT THAT'S MOVING OUT FROM THE STAPLETON STORM.

1755. NOTICED TWO ECHOES. ONE IN THE FAR SOUTHEAST LOBE AND ANOTHER JUST EAST OF BOTH LOBES, THAT DEVELOPED OUT OF I DON'T KNOW WHERE.

1832. WE GOT A VERY NICE MICROBURST JUST NORTH OF NOAA D. WE'RE NOT WORKING THAT CELL.

1836. I DON'T KNOW IF I MENTIONED, BUT WE'RE DOING A STUDY ON THE GUST FRONT WITH C AND D. AND WE ALSO GOT TWO SOUNDINGS ON EITHER SIDE, AND WE HAVE THE CITATION FLYING IT. RIGHT NOW ONE OF THE NOAA RADARS IS DOWN SO WE ARE MISSING DATA RIGHT NOW.

1847. NOAA C IS BACK. THEY WERE DOWN 12 MINUTES.

1855. THE CHAFF PLANE HAS RUN OUT OF CHAFF SO WE WON'T MOVE THE BOX ANYMORE. WE'LL JUST SIT AND WAIT FOR GROWTH WHERE WE HAVE CHAFF. WE HAVE A BUNCH OF LITTLE 10 AND 25 DBZ CELLS IN THE LOBE WE'RE SCANNING. NOTHING STRONGER THOUGH.

1905. WE'RE GOING TO STOP SCANNING THE SOUTH LOBE. WE HAD A NICE EXPERIMENT ON IT. TWO SOUNDINGS, THE CITATION, AND LOTS OF DUAL DOPPLER DATA. WE ONLY INITIATED PROBABLY NOTHING MORE THAN 30 DBZ, IF THAT. WE'RE NOW GOING TO SWITCH AND DO THE NORTH LOBE WHERE THERE IS A LONG LINE OF ECHOES WHICH IS DOING ALOT OF DIVERGING. WE'LL SCAN THAT FOR A LITTLE WHILE.

1915. OPERATIONS TERMINATED.

SUMMARY

FIRST THING IS WE DEVELOPED A NORTH EAST/SOUTHWEST CONVERGENCE LINE. IN THE USUAL AREA OF THE DENVER CONVERGENCE LINE. IT SEEMED LIKE IT WAS BOTH HAVING EASTERLY FLOW THAT GOT TURNED BY THE MOUNTAINS TOWARDS THE NORTH. AND ALSO EARLY ANVILS. THEY WERE DOWN IN THAT AREA THAT SOMEHOW CREATED THIS CONVERGENCE LINE. WE JUMPED ON IT AND GOT SOUNDINGS ON EITHER SIDE OF IT. EVENTUALLY IT STARTED TO PRODUCE ECHOES ALL ALONG IT. PARTICULARLY PRODUCED ONE NEAR NOAA D. THE SECOND THING WAS THAT I BELIEVE IT WAS THE ANVILS THAT WERE COMING OFF THE MOUNTAINS TO OUR NORTH THAT PRODUCED ANOTHER CONVERGENCE LINE. AND THEN EVENTUALLY AN OUTFLOW THAT MOVED DOWN TOWARDS US AND IT INTERACTED WITH OUR STATIONARY BOUNDARY THAT I JUST MENTIONED. AND WE PRODUCED MORE ACTIVITY. PARTICULARLY IN THE NORTHERN LOBE. WE HAD AIRCRAFT FLIGHTS THROUGH THAT BOUNDARY AS IT MOVED DOWN. AND WE ALSO HAD THE NOAA RADARS SCANNING IT. PRODUCED SOME STORMS THERE. EVENTUALLY THE STRONGEST CONVERGENCE ALL OCCURRED JUST ABOUT OVER STAPLETON, AND WE PRODUCED A MAJOR CELL IN THE STAPLETON AREA THAT PUT OUT A VERY NICE CIRCULAR GUST FRONT THAT JUST EMMANATED FROM THE CENTER OF STAPLETON. CLOSED OPERATIONS AT THE AIRPORT FOR ABOUT 30 MINUTES, ONLY TAKEOFFS. THEY STILL LANDED PLANES. I HAVE TO REPORT, I DO NOT KNOW IF ITS TRUE, OF 87 MPH IN ONE OF THE ELWAS STATIONS. THIS GUST FRONT MOVED OUTWARDS AND WE JUMPED ON IN THE SOUTH LOBE DOING LOTS OF FLIGHTS WITH THE CITATION AND THE NOAA RADARS WITH LOTS OF CHAFF AS IT MOVED THROUGH THE LOBE. INTERESTINGLY IT INITIATED STORMS EVERYWHERE ESSENTIALLY BUT WHERE WE SCANNED. WE GOT A BEAUTIFUL SET OF SOUNDINGS ON EITHER SIDE OF THE GUST FRONT. THE AIRCRAFT GOING BACK AND FORTH AND WITH THE HIGH DUAL DOPPLER RESOLUTION DATA. INITIATION WAS NO MORE THAN 25 DBZ. BUT THERE WERE OTHER STORMS INITIATING ON OTHER SIDES THAT WERE STRONGER. WE HAVE ALOT OF SOUNDINGS FROM THE CLASS AND MOBILES. SO WE HAVE REALLY A DAY WITH A KIND OF NULL CONVECTIVE INITIATION AND ALSO GOOD INITIATION EARLY WITH SOUNDINGS ON BOTH SIDES. WE HAD SOME VERY STRONG MICROBURSTS. BUT I DON'T BELIEVE ANY OF THEM DID WE EVER REALLY SCAN THEY WERE ALWAYS MIGHT HAVE OCCURRED IN THE LOBES, BUT WE DIDN'T SCAN THEM. BUT THERE IS SOME VERY STRONG CASES WE'LL BE INTERESTED IN SEEING SINGLE DOPPLER. THERE WERE THREE REPORTS OF GUSTNADOES. MAYBE FOUR. WE NEVER VISUALLY SAW ANY. AND I

NEVER SAW REALLY GOOD RADAR SIGNATURES OF ANY. BUT THESE WERE FROM PROFS CHASE TEAM AND ALSO FROM OUR CLOUD VEHICLES.

JUL 30

1530. WE'VE GOT OUR SOUNDERS TO THE SOUTH THERE'S AN ANVIL THERE FROM A STORM ON THE PALMER DIVIDE. ITS PRETTY DIFUSE AND WIDE. WE'RE GOING TO PUT ONE SOUNDING INTO IT AND THEN GO EAST AND PUT ONE INTO THE CLEAR AIR WE HAVE A VERY WEAK CONVERGENCE LINE THATS NORTHEAST/SOUTHWEST AND ITS IN ITS USUAL PLACE. WE HAVE ALSO A SUGGESTION OF ANOTHER WEAK ONE THATS NOTHEAST/SOUTHWEST TO OUR NORTHWEST. THE MOUNTAINS HAVE HAD SOME FAIRLY ACTIVE THUNDERSTORMS. PARTICULARLY UP TO THE NORTH AREA AND NOW TO THE SOUTH.

1700. WE'RE JUST GETTING THE FIRST BIT OF OUTFLOW TO THE SOUTHWEST COMING OFF THE MOUNTAINS AND WE HAVE THE CLOUD VEHICLES LINED UP READY TO DO A RELEASE ON EITHER SIDE OF THE BOUND ARY.

1730. THE GUST FRONT IS VERY SHALLOW. IT ONLY SHOWED UP ON THE .4 AND .9 DEGREE SCAN. THE SOUNDINGS ARE GOING TO RELEASE MOMENTARILY ON EITHER SIDE OF THE BOUNDARY. THE CELL THAT HAS COME OFF IS WEAKENING BUT NOT DRAMATICALLY. THE GUST FRONT WE'RE SAMPLING IS ABOUT 10 MILES SOUTH OF WHERE THE CELL IS NOW.

1748. WE'VE INITIATED JUST BETWEEN OUR SOUNDERS ON THIS BOUNDARY A CELL THAT IS ABOUT 25 DBZ AT THIS TIME.

1810. WE HAVE ANOTHER CELL GROWING RIGHT OVER STAPLETON, ITS JUST IN ADVANCE OF THE GUST FRONT AND WE'VE HAD SORT OF A LITTLE NORTHEAST/SOUTHWEST CONVERGENCE LINE IN THIS AREA THAT SEEMS TO BE GROWING WHERE THESE TWO ARE KIND OF COMING TOGETHER.

1900. WE'RE ESSENTIALLY CLOSING DOWN. WE HAVE THE NOAA RADARS SCANNING THE OLD GUST FRONT. WE GOT SOME CHAFF THERE NOW. THERE IS NO CLOUD WITH IT NOW. THINGS ARE PRETTY MUCH WINDING DOWN NOW.

July 31

We still have same monsoonal circulation. A lot of moisture from the mountains east, always on the dividing line. No preferred motion to the winds on the plains; mixing ratios are around 10.

1345 Had some 40 - 50 dbz storms in the mountains starting at about 11:00. One barely came off the mountains around Boulder and has put out a weak outflow; first noticed at 1310. It is still there, barely moving and quite faint. The winds are a little bit more south, westerly so the echoes are not just moving along the mountains but have moved off. We have another weak convergence line possibly located on the palmer divide. A few very weak echoes in the area around the 10 dBz range.

1500 We've read 62 dBz off the mountains between Golden and Denver. There is a good gust front at least 16 meters per second. We have been observing some very strong convergence in the updraft of low levels. The cloud vehicles, cloud 3 and cloud 1, lined up in front of the gust front.

1505 Observing a trace of a hail flare with the storm to the northwest. FL2 reported getting a slight one; we are likely to have 1/2 inch hail.

1530 Launching cloud 3 and 1; boundary's between them.

1540 Gust front just passing Stapleton moving into a field of cumulus clouds where we've had an old stationary boundary so we expect it will initiate fairly strongly to our south and east.

1610 Concentrating on the middle of the south flow where we have cells growing rapidly as the gust front approaches.

1614 Lost Cloud 2 a short time ago near Buckley and we noticed there is now a cell growing there that is right behind the gust front.

1620 Observing weak outflow from the south and a major gust front squeezing together in our south lobe; should have best growth there.

1723 Moving the radars to the north lobe where there is a cell 50 dBz. Going to utilize it for a microburst study. Hopefully it is not in the dissipation stage yet. In the south lobe we are looking for initiation but only have small echoes in the 20 dBz range. Just outside the north lobe, where the real collision was, we only got 55 dBz.

1728 A microburst developed out of the 55 dBz cell. Probably about 15 one way and 10 the other.

1858 Tracking a 62 dBz cell that is moving along the western edge of our dual lobe. Cold air beneath it being fed from about 30 kilometers to the southeast with no outflow. We thought maybe we'd see outflow on top of the cold air but have not. It did produce a flare echo for awhile.

1930 Storm over Lafayette, which was the same storm that was in the mountains that was so strong, moved up to that area and suddenly put out a very strong outflow, more similar to a microburst line with a high reflectivity line through it at 55 dBz. The cell in the south lobe is essentially dying out. We did see at the surface

some weak divergence, only about 6 m per second in which resolved receding flow. Nothing in our network really produced microbursts today. Every cell that did was on the side of it. There was some pretty good microbursts but none in our network.

Summary Today was characterized by monsoon flow producing numerous mountain thunderstorms and we got many gust fronts from the mountains and from storms that were initiated over the plains. The main boundary of the day was really one that initially started up near Boulder with a very weak outflow then later got reintensified by 63 dBz storm and that boundary started to move southeast. We secured soundings on either side of it initially, and at several other stages as it pushed southeast. We sampled that boundary very well throughout its lifetime as it moved southeast. It has interacted with several boundaries in producing storms at different times. One feature was a stationary convergence line with a field of cumulus that was in the usual position of the Denver convergence line (just the southwest portion of it). So the first storms initiate on the plains for that area. That was enhanced also by some Palmer Divide storms that moved north and put out a weak outflow. We have dual Doppler data for this main boundary north flow while not producing any storms. We have dual Doppler data on the initiation of very weak storms in the south flow. There is a large 63 dBz storm we were able to initiate just on the edge of our dual Doppler area. That storm put out a very nice microburst maybe 5 miles east of the airport. There was some confusion later in the day when we had strong mountain outflows behind this primary boundary and also very large outflow coming straight down from the north from the activity well up to the north. All three of these boundaries started interacting and thus, numerous more storms generated. We are not totally clear on just how these interactions went. We did some dual Doppler scanning on storms forming on primary boundary as it was south of our network then these storms would move north up over the cold air. None of them produced any microbursts but I think we tracked three of the cases. There was one case where we did produce a major outflow back in the cold air up near Lafayette, west of the network. So we had a good day from the standpoint of convective initiation and sampling the major boundary with soundings at different times and different places. We did not do well on getting a microburst on dual Doppler lobes. We had no cases.

August 1, 1987

We have much more westerly flow aloft. Still quite a bit of moisture, but not quite as moist at the surface as it has been the last few days. We have a slight northerly flow in the network. We have some sort of a speed convergence zone to our north, about Hudson. It's not a real clear feature so it seems to be changed with height.

1555 We're going to close down. The soundings warmed up as usual dramatically aloft and stayed relatively stable in the low layers and we really couldn't get anything to happen. We had a little the palmer divide; weak showers that started to dissipate also. As we're closing down, there are a few 40 dBz storms

west of the divide but everything looks very suppressed. So much for the frogs which made it look like we'd have a lot of activity today.

August 2, 1987

First thing noted this morning is that we have cumulus building fairly actively over the mountains particularly north of Denver. The sounding this morning shows instability and a fair amount of moisture so we may get convection but it appears to be more for the mountains; on the plains its more questionable. The flow aloft is around 250, or 260, so anvils will move out.

1300 We had one weak anvil push out up in the Boulder, Longmont area which produced a slight convergence line just south of Boulder. Boulder's wind actually turned in the north. So again we see an anvil that produces weak convergence line even though the anvil is quite weak. Right now we have quite a bit of 40 dBz storms to our southwest so that looks very good for anvil production soon.

1350 We have boundary B now which is an outflow from a storm up near Fort Collins so that is 80 K away. It gave Fort Collins 42 m/s winds at the PROFS station there. We still have plenty of anvil material in the mountains to the southwest, and 40-45 dBz storms there. We are going to deploy the cloud vehicles now in anticipation of anvils.

1450 We've had some radar problem with velocities. It appears they are noisy. The sign seems right, the values roughly right, but a lot of high velocities and a lot of low velocities mixed in. We're going to continue to operate in this mode while Vincent comes out to see what the problem is. The velocity data certainly is not correct now.

1514 We have another little outflow off to our west, southwest probably from the anvil's in that area. We are also staring to get some bigger cumulus and were getting some return from the southwest to our east. Boundary B, the one from Fort Collins, is still slowly moving southward, and boundary A is very weak.

1519 We've obtained just about 40 dBz and a cell 8 K south, southeast of us and that is not on any convergence line.

1530 We are going to take soundings from cloud 1 and cloud 3. Cloud 1 is in the vicinity of this new cell growth without an obvious boundary, and cloud 3 is back in some weak outflow from the mountains.

1540 We had a very weak microburst about 20 miles south of us that put out outflow still there 10 minutes later.

1616 The cell 180 at 30 from us just put out an outflow.

1627 A weak shower near Stapleton has put out an outflow headed west and south and we have an older outflow down in the southwest. We're going to have cloud 3 do a sounding right in between these as they squeeze together in the same

time while cloud 1 is just a few miles southwest get a sounding in the cooler outflow air.

1717 We've been flying the airplane and scanning the west side of the south side lobe. It's right on the convergence line but not really producing much. We're going to move over and scan the boundary hoping that we get more of an organized divergence line.

1727 There is a cell we've been scanning in the south lobe for about 10 minutes. I just noticed a delta-V of about 10 m/s on the lower scan, that's just an estimate.

1725 We've got a microburst line about 50 - 60 K southeast of the radar. It had no real features with it aloft before it happened. We were flying further north. Since 1700 we haven't had the chat plane; the cutter jammed. We've only been able to scan echoes's that have real precipitation.

1839 Hudson just launched and we have our old main gust front coming from the southeast colliding with one coming down from the north. As far as we can tell, they've launched right into the convergence center. We're doing one more echo on the far northern lobe, its running about 35 dBz now. The boundary runs right in the middle of it.

1910 The cell we're scanning in the north lobe just hit barely 40 dBz about 10 minutes ago. You can see it descend. It looks like we've got divergence on top of the gust front. Nothing touched the ground.

1924 We're shutting down. The cell on the north lobes are rained out. Gust front is still moving on to the north.

Summary It's quite interesting looking at the sky to the north where this convergence line has been moving for many hours now. Its a whole line with small cumulus on it. In the area where we're working are the biggest cumulus, some look a little more lively than they did. The main thing for the day was this main convergence line that passes through the whole PAM network coming up from the southwest. It started as outflow from mountain activity that was reintensified several times by other smaller showers when they put out microbursts behind it. A diverging line mentioned south of the network intensified this line, but really it started from fairly minor activity and became the major feature of the day. Sometimes producing cells and most of the time not. I guess some of the bigger cells were produced more up in the northern lobe or just outside it when it collided with another boundary coming down from the north and one coming in from the east. The airplane, the citation we had for quite a bit of the day flew this convergence line a number of times. Also tried to fly some high altostratus anvil material hoping that we'd get some good anvil microbursts but that didn't happen. In fact the main thing we tried to do all day was try to get anvil microbursts and even though we got a lot of altosratus material, it just never got itself together. We never saw the velocity features; the convergence mid-levels. We had a fair number of microbursts

that occurred today; most of them weak. I don't know of any that had a delta-V of even 20. None of them seemed to show any real velocity features. As convergence at mid-levels, they had descending cores. It was a strange day marginal convection wise. Microburst wise we just couldn't seem to get anything very strong. We had some good soundings on either sides of the main convergence line and also when it collided with another line from Hudson. The soundings as usual were pretty good. Doppler wise we have about 10 minutes history on a storm in the south lobe that produced a weak microburst and about an hour history on a storm in the north lobe that put out a weak divergence on top of the cold air.

August 3, 1987

Cold frontal passage about 8:00 this morning and by 11:00 through the whole network. Pretty stable conditions with hope there might be some activity over the mountains that are over the Palmer Divide today.

1350 We have developed storms with over 50 dBz back in the mountains to the southwest. There is a big anvil but a lot of other higher clouds too. We still are fairly stable on the plains although its warming up fairly well. We have an experiment running to do with the cold front where we are releasing soundings from many different locations; kind of looking at the depth of it in the heating up of the boundary layer after cold fronts passed.

1409 You can see very nicely how the anvil coming off the mountain is effecting the environmental flow showing strong southwesterlies which is basically northerly flow.

1630 Started the NOAA radar doing B2 scans in the north lobe. This anvil seems to be effecting velocities down almost to the surface.

August 4, 1987

7:30 Started great balloon release experiment. We experienced fog and stratus rolling in early this morning into Boulder by about 5:30. Stapleton is in the clear right now, it's more or less foggy and stratus to the north and west. Nethernet actually has strong easterlies on the north half, little bit of northerly in the north southwest half so there's sort of a convergence line running though it. Northerlies basically along the foothills and more or less easterlies off to the east. Everybody got their balloon releases off at 7:00.

8:19 CP-2 and 3 do a start.

8:22 13 scanning the south lobe with CP-2.

8:41 Doing another dual with CP-2.

9:05 Another coordinated start with CP-2. The return is still quite poor most of the clear air return is aloft. Convergence line still sits in the PAM pretty much where it has all morning.

9:26 Another coordinated start. We seem to observe in PAM that the easterlies are backing off towards the east a little bit. Radar clear return is not good near the surface yet; still better aloft.

9:50 Another coordinated scan with CP-2.

10:25 About an hour ago we stopped collections, we did just the 7:00 and 9:00 soundings and it's just too complicated by the cold air outflow and other stable airs that were in the soundings. So we're going to go back and do a regular day.

1520 We have the southwestern part of the Denver convergence line. There are a couple small cumuli there. We're going to put a sounding on either side of it. It's a very weak convergence line but that's all we have. There's a few 30 dBz storms back on the foothills southwest.

1610 Doing launch of 3 soundings: one on the north side; one kind of in the zone; one on the south side of this weak Denver convergence line.

1739 Our convergence line is a little tighter, we've got a few cumuli building on it and really concentrating on our first echo study for Charlie Knight. We have one cumulus in the middle of the south lobe and we're starting dual scanning. We don't have a chaff there. At 1543, CP-2 had first echoes at about 5 K high, probably -10 -15 dBz. Still in growth stage and we are scanning the area with both NOAA radars.

1815 Another set of 3 soundings: one on the north side of boundary and the other 2 south of it. We're on our first echo study. We've got about 10 dBz and we've had new growth on the north side but not very vigorous.

1848 Probably 10 minutes ago they let the NOAA radars go and immediately after we have a cell just north of the baseline that is going up like a rocket. CP-3 is sectored in right on it just looking at that cell.

1906 The cell is at 60 dBz. First hint of divergence.

1916 The cell is still there, has gone down hill some. Excellent case to do time light profiles on since it is totally isolated. It's showed some convergence at 4 1/2 and 5 1/2 degrees; pretty strong but not sure whether that is up or down. Suggest it be down but we haven't had strong outflow at all.

1955 Doing dual with CP-2 on this convergence line which has a cyclone rotation on it. We're doing north lobe and then we're going to do the south lobe momentarily. We're going to get two more soundings with it. We're stopping at 2015. Experiencing some trouble with tape decks at CP-3 so I don't know how good dual Doppler data is going to be with CP-2 on the convergence line.

Summary Started at 7:30 to do the great balloon experiment but we had a major outflow from a storm in Kansas that came up against the mountains that produced a lot of stratus and fog and even some light rain in the Boulder area.

With this we had 4 millibar rise in boulder. The soundings at Denver showed major cooling up to about 600 millibars. Cooled on the order of about 8 - 10 degrees. Totally rebounded by about 11:00 so just a major feature. It moved in and out but kind of killed our balloon experiment. We then set up the southwest end of the Denver convergence line but then slowly built northeasterly and you could almost say it was a regular Denver convergence line by the end of the day. It simply did not produce hardly even a cloud until after 6:00 when we started to get a small cumulus building on. We we're nicely able to do Charlie Knights first echo experiment. The first echoes in the south lobe; it only went to 10 dBz. We got full history with the NOAA radars before any echo to first echo in rainout (10 dBz). The cell continued to build northerly, all being very weak until we got one that was just about on the baseline that became a major cell. The only cell around. 60 dBz +. It even produced a very small flare echo that we verified pea size hail fell out of with one of the cloud vehicles after the flare stage. So we're pretty sure there was 1/4" to 1/2" hail, a small flare; a no microburst case. It was totally isolated but no outflow ever got 10 m per second. Unfortunately we do not have any NOAA dual Doppler data. It was hard to keep everybody waiting this long. We lost some of the troops. The convergence line increased in strength but didn't produce anymore. We do have two other soundings on either side of it and its attempted dual Doppler data with CP-2 which may be marginal depending on parity error problems at CP-3. The second cell, the 60 dBz one, should be another good case for Charlie Knight even though the NOAA radars weren't scanning. CP-3 did scan it well the whole time and even went into just sector scans. The mesocyclone that developed on this Denver convergence line was really quite spectacular in PAM. It's certainly worth some pictures of PAM data.

August 5, 1987

7:30 Try great balloon experiment again today. All the soundings got off at 7:00. CP-2 and CP-3 will being dual soon. Dual Doppler with CP-2 started at 1837 doing the north lobe then we'll do the south following it at approximately 15 - 20 minute intervals. Doing the north lobe at 7:57.

1744 Giving times of coordinated dual scans with CP-2 during the morning exercise while studying the evolution of the warm cap. Times: 8:13, 8:31, 8:53, 9:15, 9:36, 9:55, 10:15, 10:36, 11:05, 11:26, 11:45, 12:16, 12:46, 13:06, 13:31, 13:49. Ended the balloon experiment at 1:00. Was not a good case today.

17:50 Waiting for virga material to build. Some indication of boundaries. One now on the west side of the airport, a north south line, and another that goes out through the south lobe, primarily. Curving boundary, basically north south, on the north part it goes east, west. We are bringing up the citation, then we start chaffing the north lobe. These clouds are very thin. We are getting as much as 20 dBz, but visually they look quite poor. We are basically hoping that this convergence line in lobes will enhance a little bit and give us enough for a virga microburst. These convergence lines are really of unknown origin. They seem to have developed on

their own or came off the mountains but with no real outflow associated with them.

18:10 Things are no better! The cloud deck is about 5 K ft. deep. It rides all along to the northwest, southeast convergence line we have. The convergence looks good on radar but just shallow. We are going to do sounding releases on the other side and then give up.

16:18 Doing some scanning on the south lobe where some chaff has been dumped right along the convergence line, to document what kinematics we can on the convergence line. The soundings are going up now.

1830 Closing down.

August 6, 1987

In cloud 2 today. Brief look of the weather: shallow easterly flow in the network. Cold frontal passage at 8:00 a.m. Activity over mountains fairly weak, some anvil material but not much towering cumulus to go with it. Just made a visit to NOAA C. On our way out near PAM 46 to do a launch. Hoping moisture will come in from the east. Weather service has put out a severe storms watch for the area. Will try to do a 2:00 sounding for most of the network.

1456 Did a launch at 1416 east of Prospect Valley. Has moved a mile east and have a gust front approaching 20 miles away. Can see weak rain shafts coming down to the ground with dust scattering out underneath them. We assume there is microbursts along that. Taken some pictures looking west. We will document exactly directions here with some pictures.

1503 Started the movie camera. Pointing west, southwest. Still have quite a line of virga just behind the gust front.

Summary Two mountain outflows and one other that came up from the south headed east, west. The first outflow apparently died out in the middle of the network. Visually we could see it producing microburst activity right on the western edge of the network. The second outflow that rapidly moved through the whole network intersected with the one coming in from the south. One was east, west and one north, south and intersected north of I70 as it moved through the network. No storms over 40 - 45 dBz were produced. Could see convective initiation and strong outflows. NOAA radars did get the life history of microburst storms in the south lobe; in the north lobe they didn't get that much. Our second sonde we released just behind the east, west boundary that was moving north in front of the gust front coming from the west. The balloon was moving north rapidly while to the west was a big wall of dust just as the gust front approached. Three convergence lines and microburst cases and convection initiation.

1730 Operations shut down.