T-PARC/TCS-08 Project Summary

Highlights, Accomplishments and Lessons Learned

Jim Moore and EOL staff
Many slides courtesy Pat Harr (NPS)
and NPS Staff

T-PARC Summary Debriefing
9 December 2008

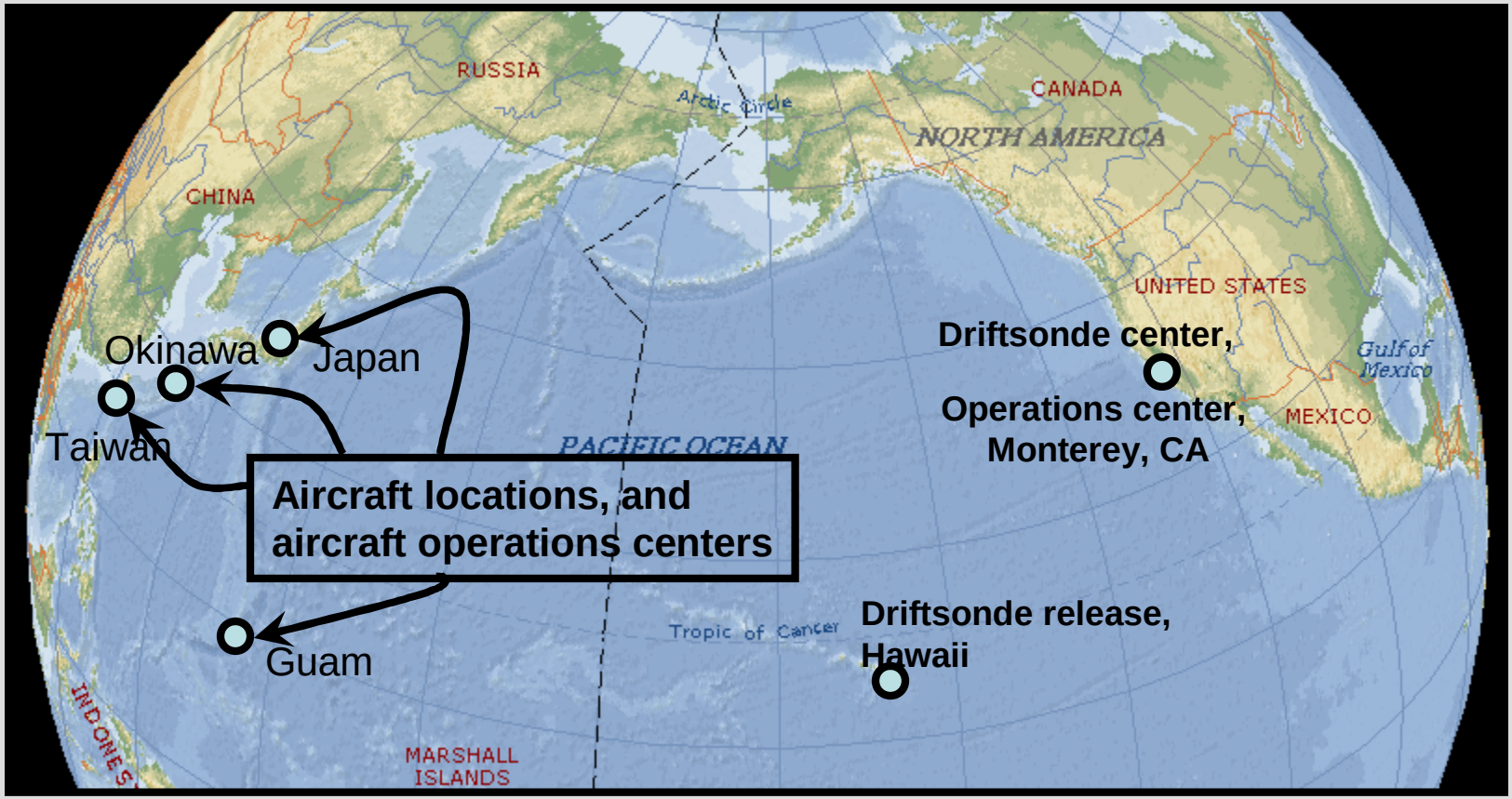
- **August-September 2008 (plus 1 week extension)**

- **Asian societal impacts from heavy rainfall, typhoon and extratropical transition (ET) with research interests in:**
    - tropical cyclone formation
    - intensification
    - Motion/track
    - decay and/or ET

- **Downstream effects of Asian and Western Pacific high-impact weather on North America, Europe with research interests in**
    - tropical and midlatitude predictability
    - tropical cyclones
        - Recurvature
        - Extra-tropical transition
    - intense extratropical cyclogenesis

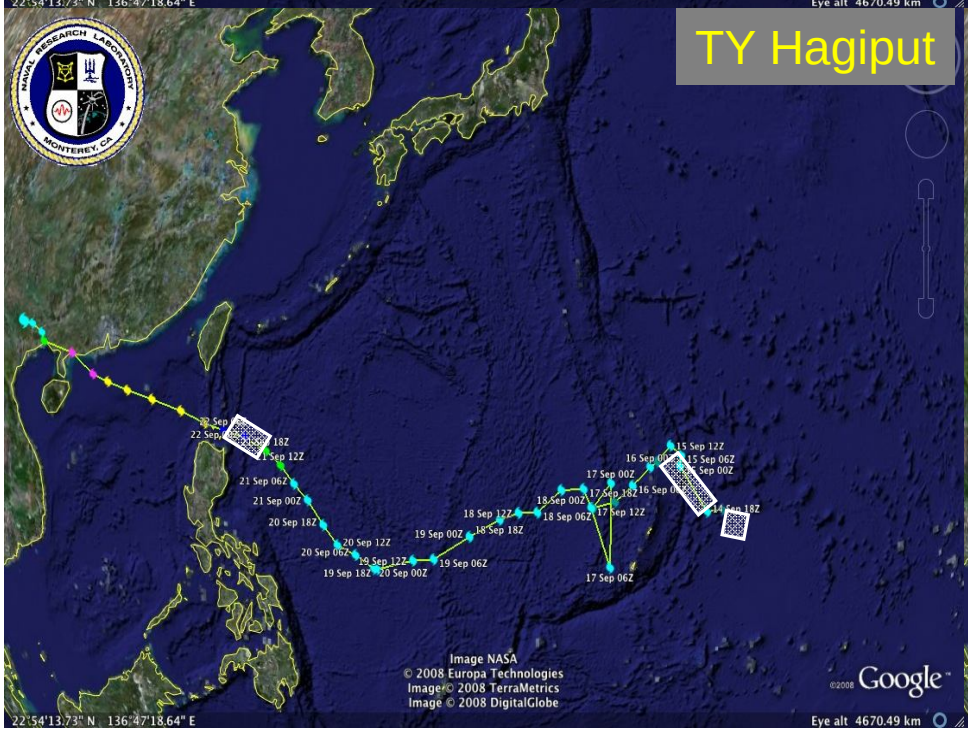
- **International Collaborators: U.S. (NSF, ONR), Germany, Japan, China, South Korea, Canada, France, U.K., Taiwan, ECMWF**

Summary
T-PARC and collaborating projects constitute a GLOBAL OPERATION



9 time zones across international dateline,
3 countries (EOL operations only)

T-PARC/TCS-08 Typhoons



Operations by the numbers…

- 9 participating nations
  - Canada, China, England, France, Germany, Japan, South Korea, Taiwan, United States
- Over 500 aircraft mission flight hours
  - 216 C-130, 179 P-3, 83 Falcon, 37 DOTSTAR
- 76 missions
  - 25 Falcon, 23 C-130, 21 P-3, 7 DOTSTAR
- 7 airfields
  - Andersen AB, Guam; NAF Atsugi, Japan; Kadena AB, Japan; Taichung Taiwan, Yokota AB, Japan; MCAS Iwakuni, Japan; Misawa AB, Japan
- 11 tropical circulation systems
  - 4 typhoons, 1 TD, 1 ex-TS, 5 others
- Over 1500 dropsondes and driftsondes released

Tropical Circulation Systems by the numbers…

- During August – September, there were 12 total systems ≥ TD intensity over the western North Pacific
  - 4 typhoons, 4 tropical storms, 4 TDs
- 51 TCS systems
  - With a few recycled a time or two
- 11 systems in which aircraft missions were flown
  - 4 typhoons, 1 TD, 1 ex-TS, 5 others
- 72% of all missions were flown on the 4 typhoon cases
  - 6 Nuri, 28 Sinlaku, 5 Hagiput, 15 Jangmi (54/75 = 72%)

TPARC/TCS-08 Field Catalog

2008 Field Season

Catalog Home | Daily Reports | Operational Products | Model/Forecast Products | Research Products | Missions | Tools & Links

Links for display of real-time display of aircraft operations and satellite imagery in Google Earth and meetings in Elluminate

9, 2:54 Z | Guam: Thur, Oct 9, 12:54 PM | Tokyo: Thur, Oct 9, 11:54 AM
8, 8:54 PM | Monterey: Wed, Oct 8, 7:54 PM | Taipei: Thur, Oct 9, 10:54 AM
Hawaii: Wed, Oct 8, 4:54 PM

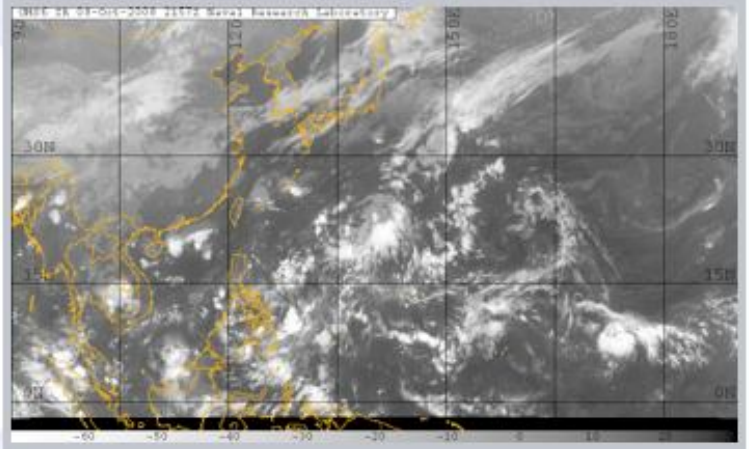
Quick Links:

- Facilities Status
- Operations Plan of the Day
- TPARC Weather Discussion
- Real-Time P3 Flight Track (kml)
- Real-Time C-130 Flight Track (kml)
- Real-Time MTSAT Vis/IR Imagery (kml)
- Real-Time Driftsonde Track (kml)

(Download kmls first then open in GoogleEarth)

- NPS Weather Briefing Website
- Elluminate Meetings

Northwest Pacific Latest Infrared Image



Additional Satellite Imagery:

Latest 4 hours Visible
Latest 4 hours Water Vapor

Information Links:

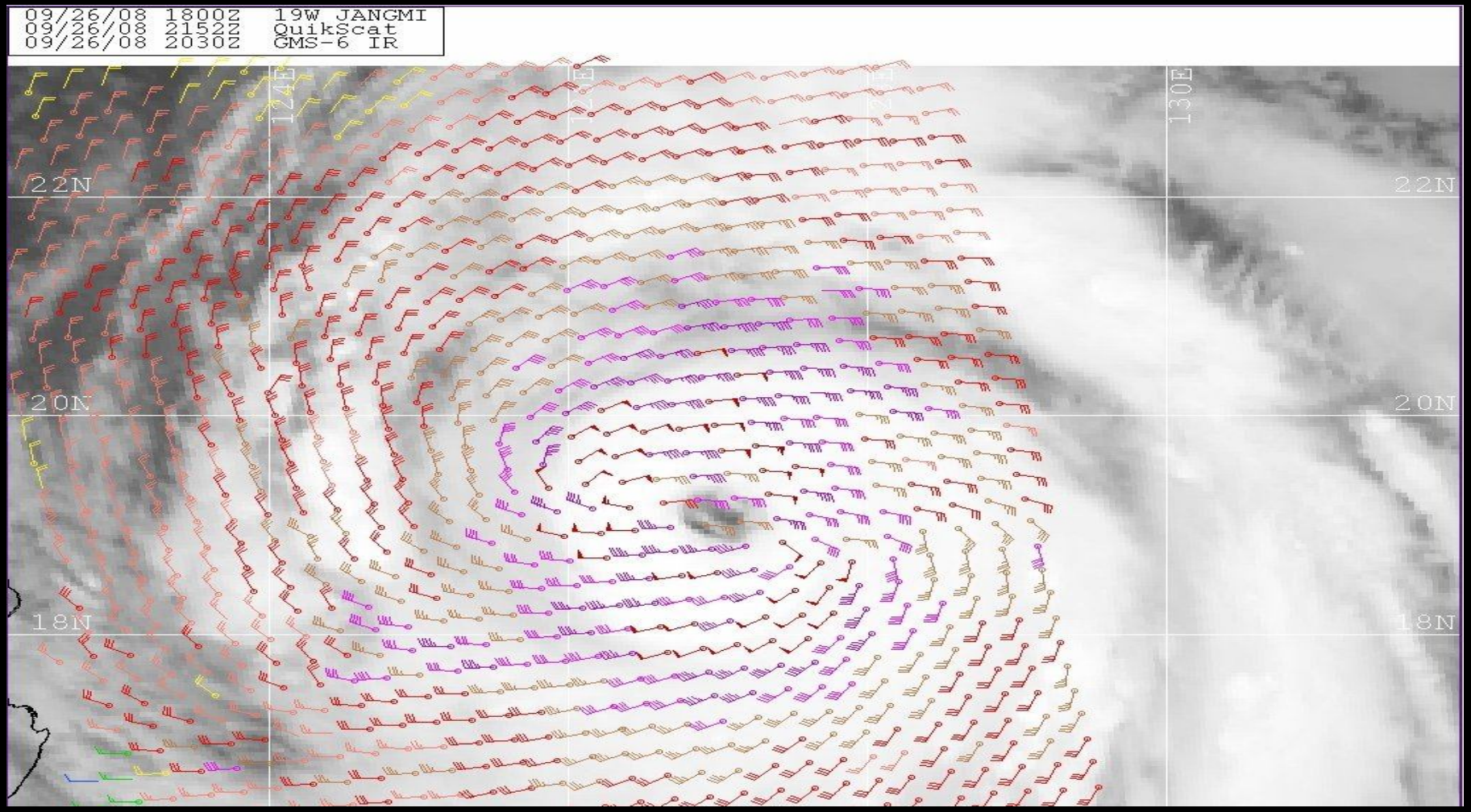
- JTWC Website
- Honolulu Weather
- Guam Weather
- Okinawa Weather

Monterey Operations Center
(831) 656-3569

Guam Aircraft Coordination Center
(671) 653-0235

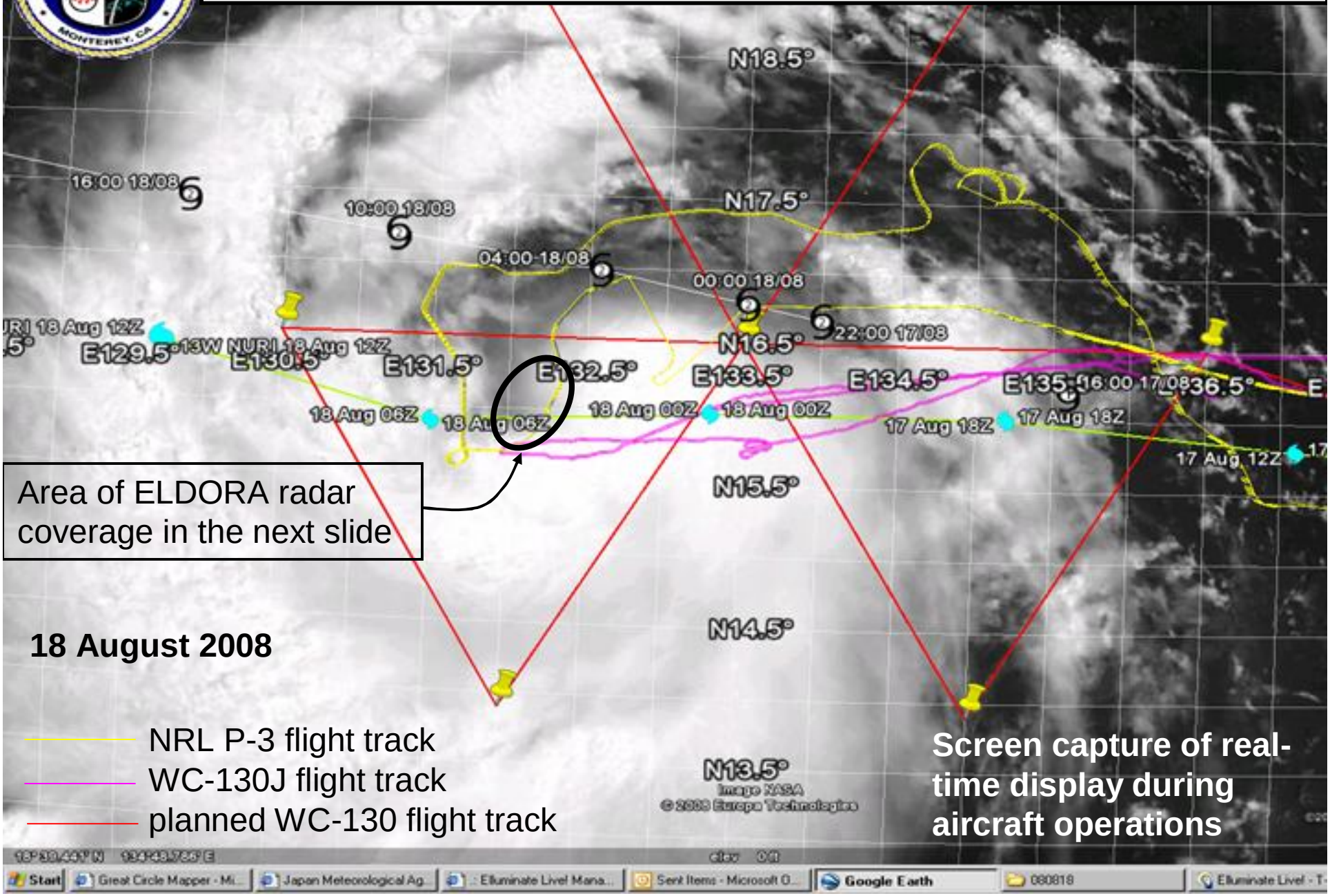
Comments

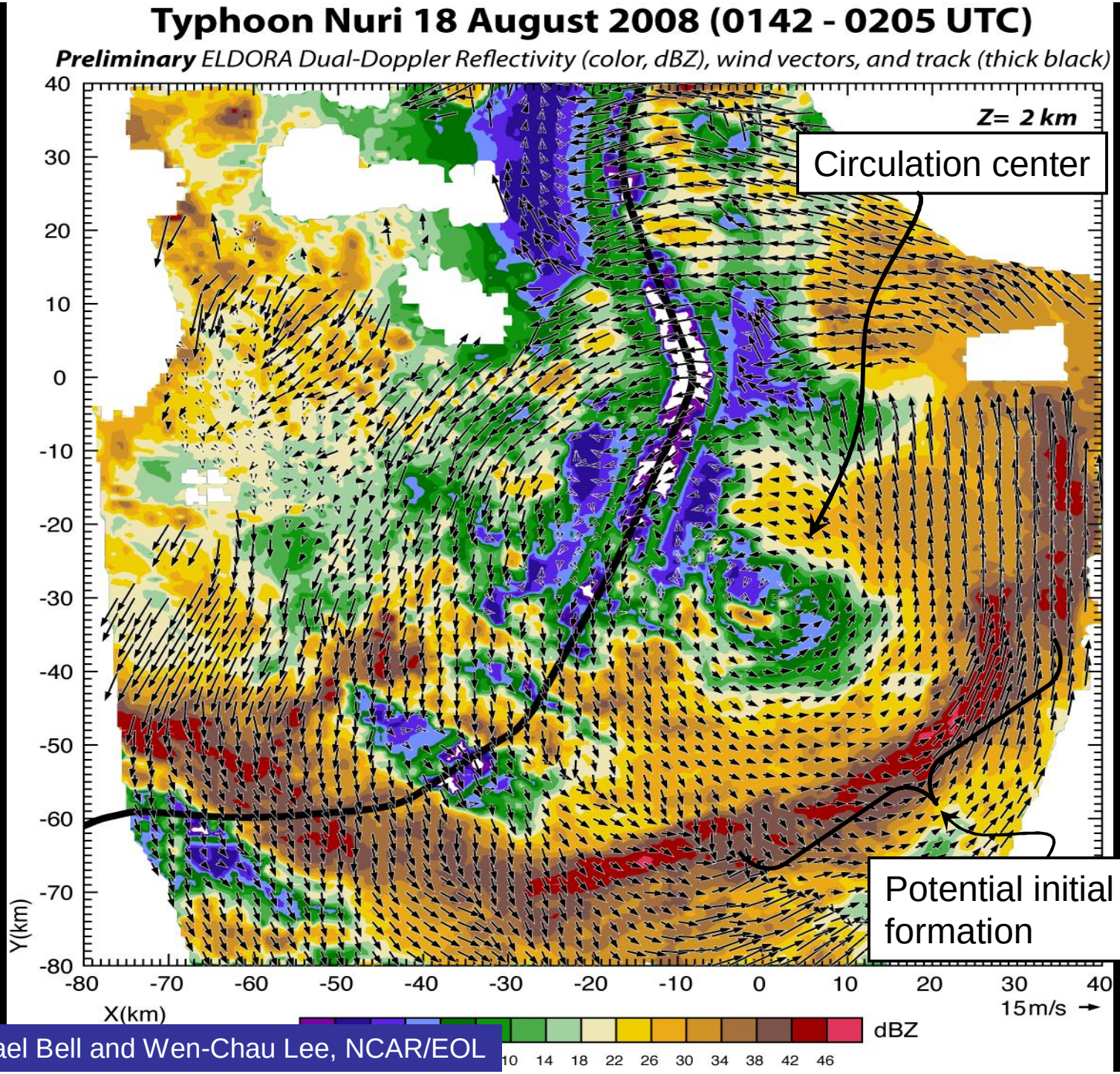
Primary source of all products used during the field Campaign: observations (satellite, aircraft, etc.), NWP products



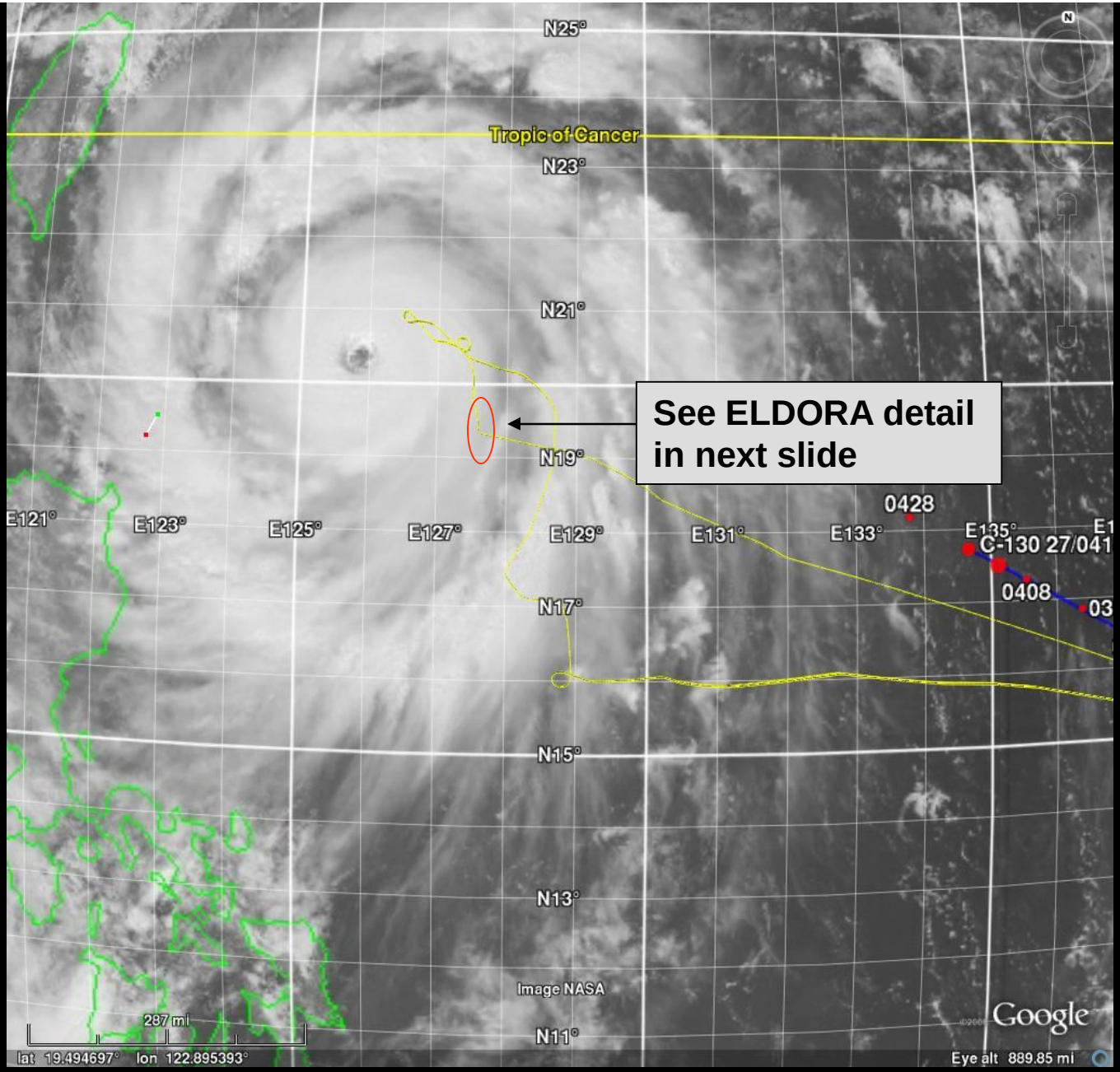
Quickscat satellite derived winds overlay on MTSAT IR
26 Sept 08, 2152 UTC

TCS-08
Third flight into the Pre-TY Nuri (13W) tropical disturbance

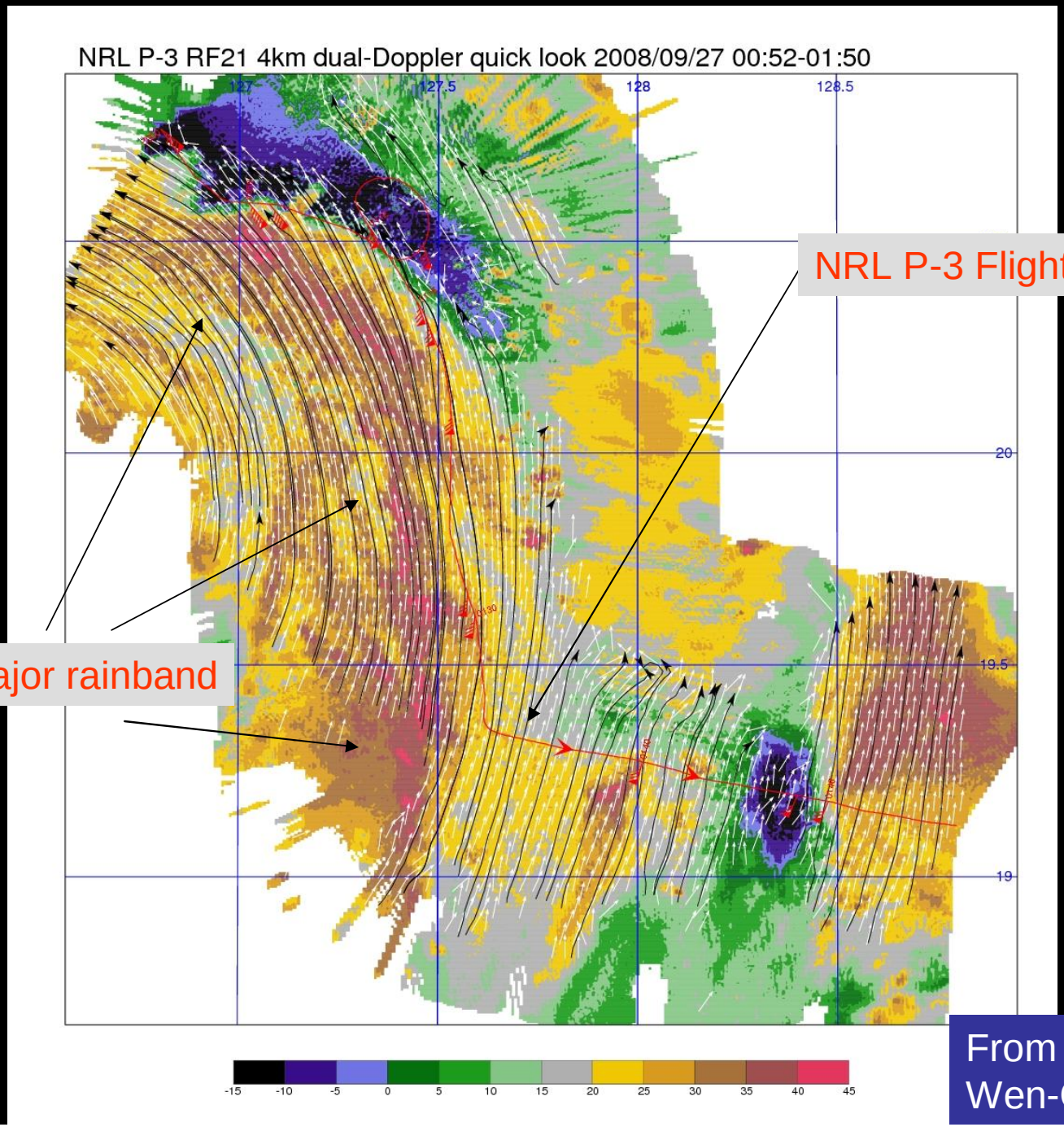




From Michael Bell and Wen-Chau Lee, NCAR/EOL

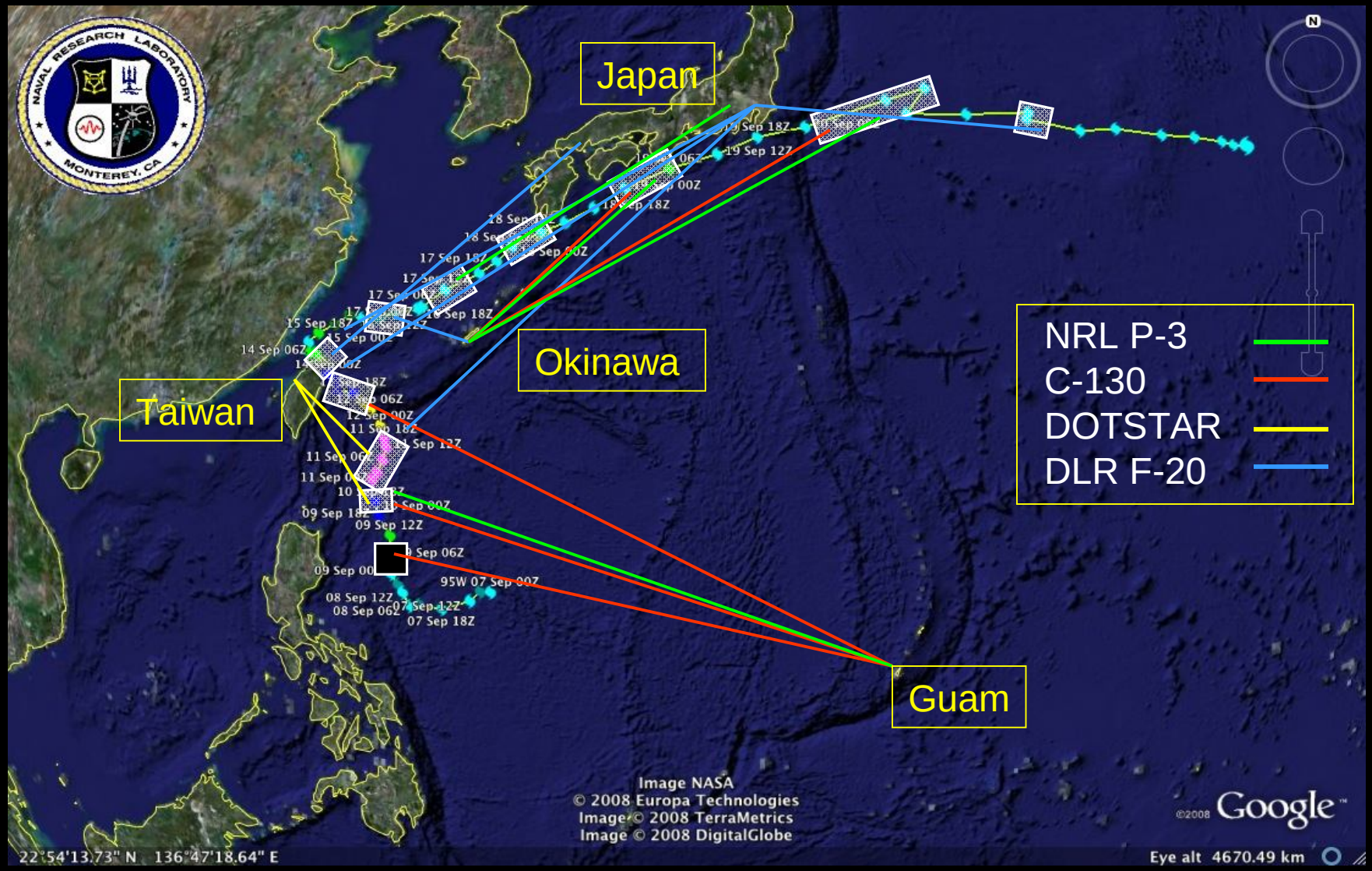


NRL P-3 ELDORA operations in vicinity of STY Jangmi
27 Sept 08, 0400 UTC

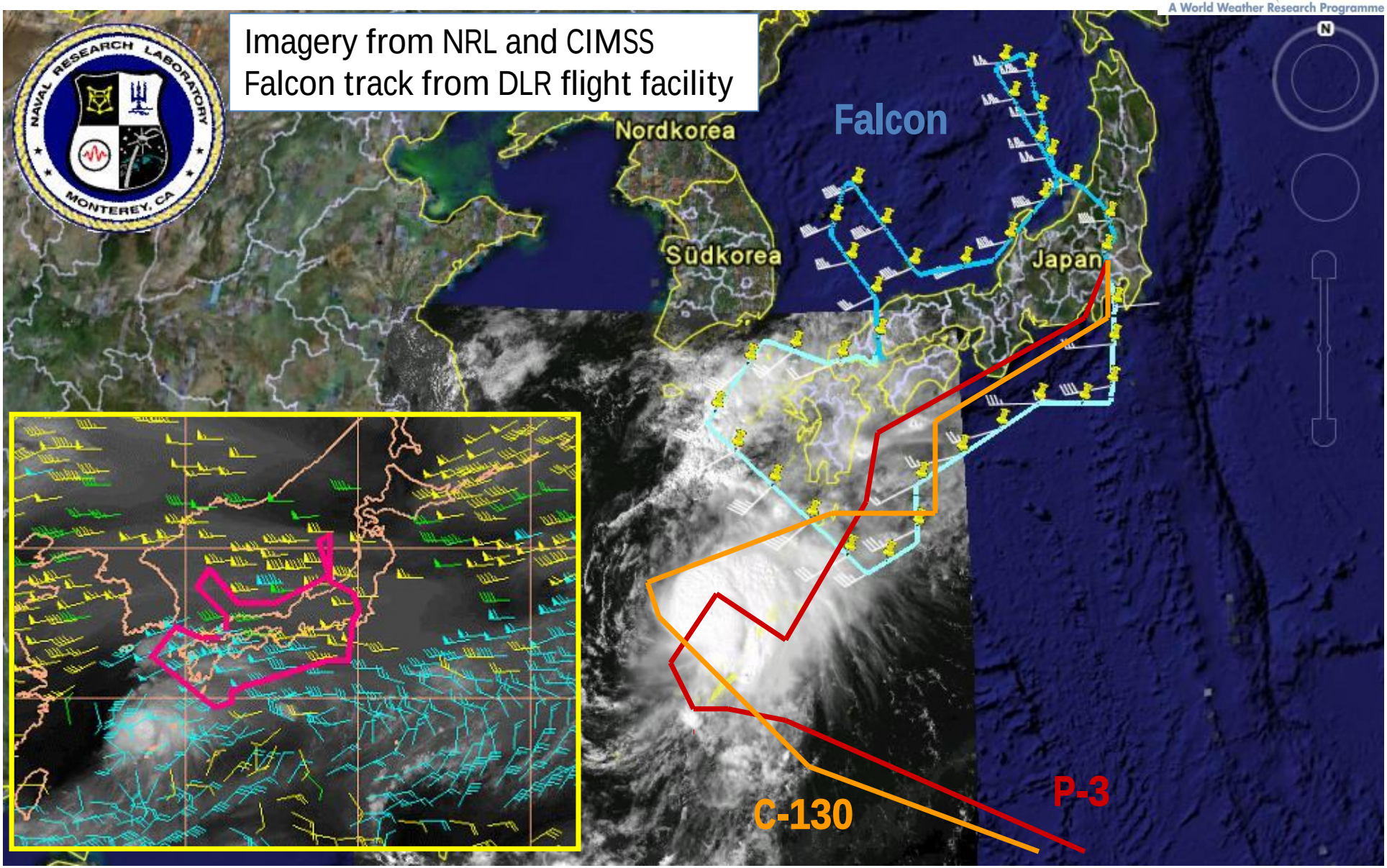


From Michael Bell and Wen-Chau Lee, NCAR/EOL

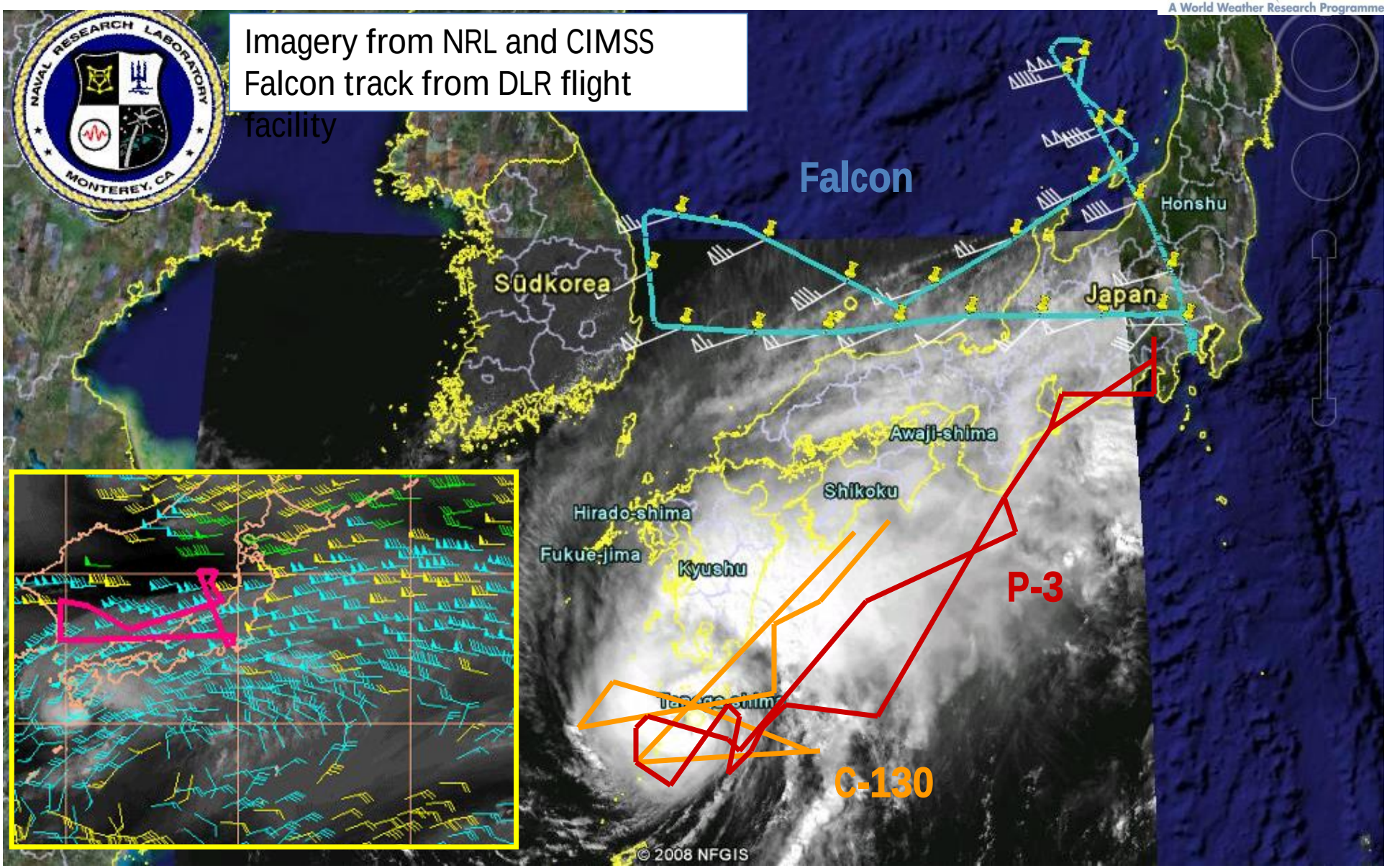
TYSinlaku T-PARC/TCS-08 aircraft sampling strategy including forward deployment (9-21 Sept 2008)



3 plane ET mission (Sinlaku) 17.09.08 ~05 UTC

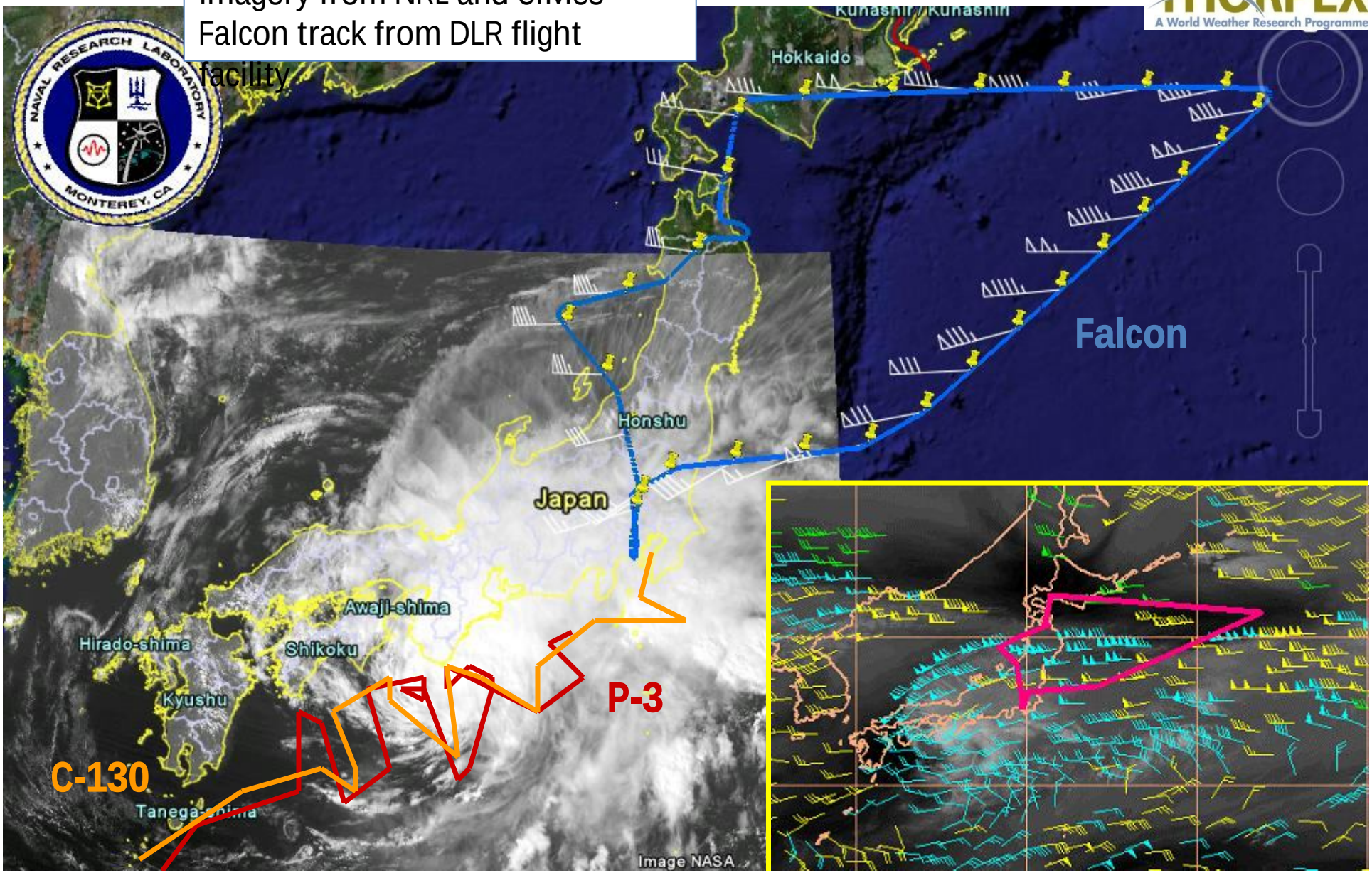


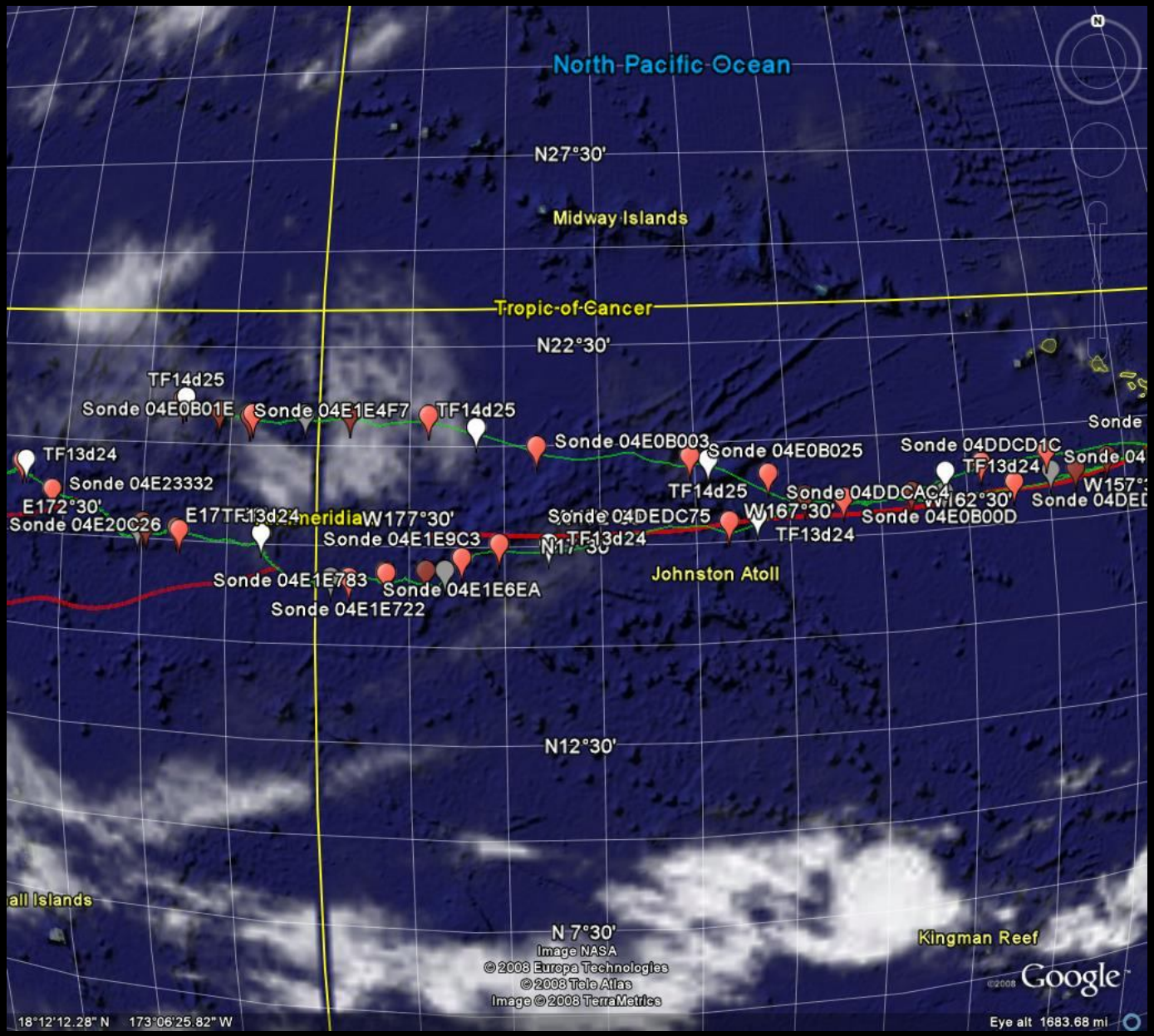
3 plane ET mission (Sinlaku) 18.09.08 ~ 05 UTC



3 plane ET mission (Sinlaku) 19.09.08 ~ 05 UTC

Imagery from NRL and CIMSS
Falcon track from DLR flight facility



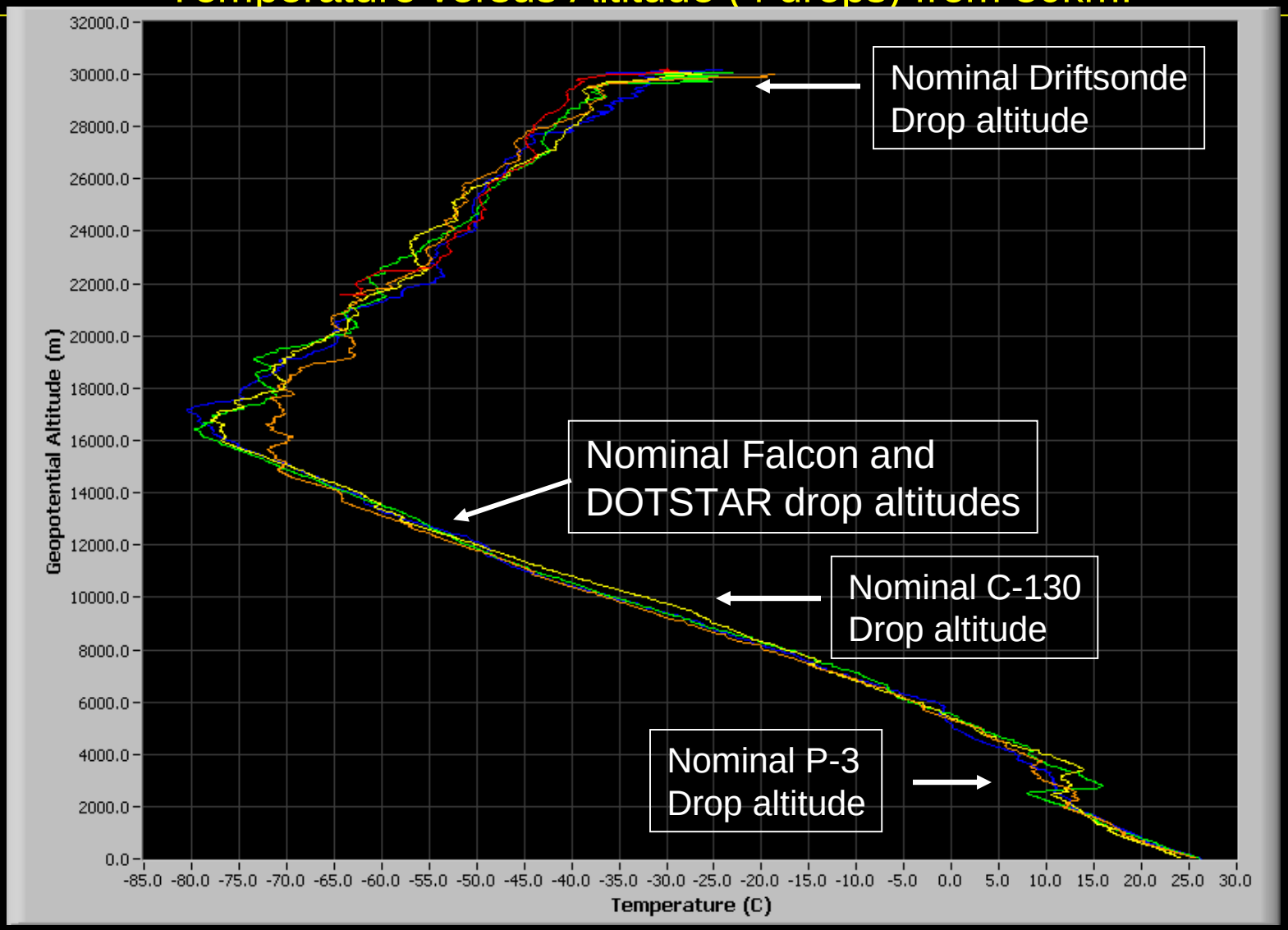


Driftsonde Balloon track on Google Earth
23 Sept08 0000UTC

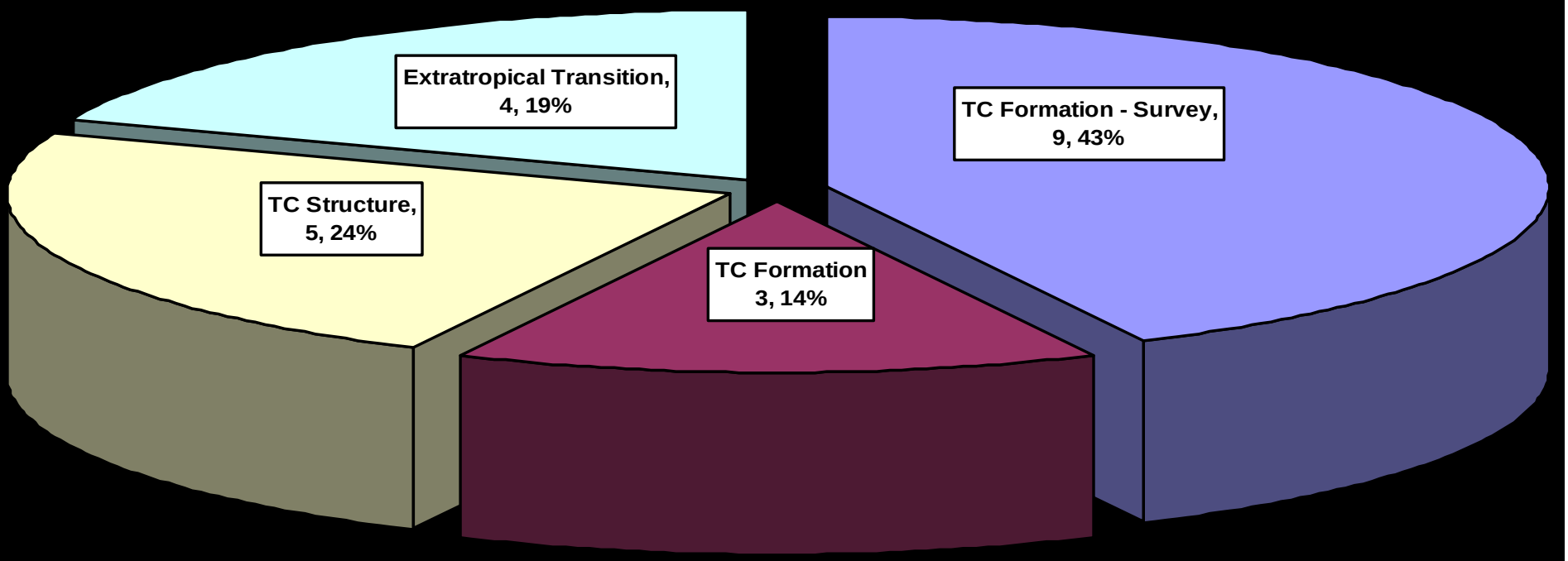
T-PARC Driftsonde Soundings

Soundings from the lower Stratosphere

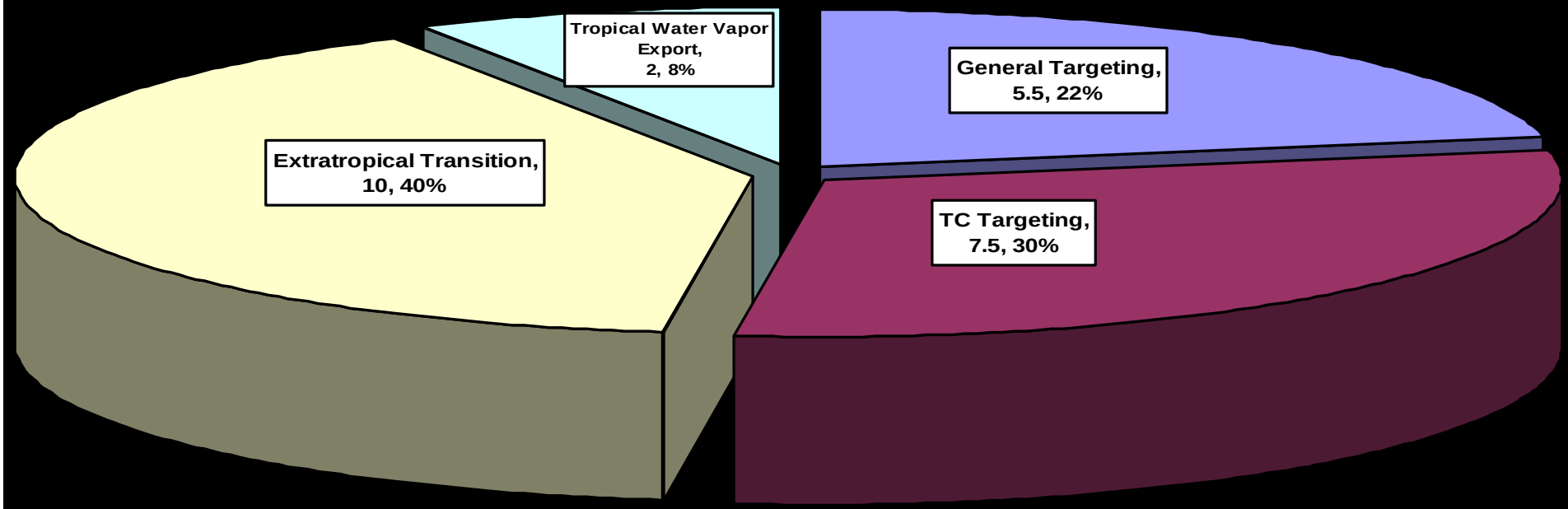
Temperature versus Altitude (4 drops) from 30km!



NRL P-3 Missions per Objective



DLR FALCON Missions per Objective

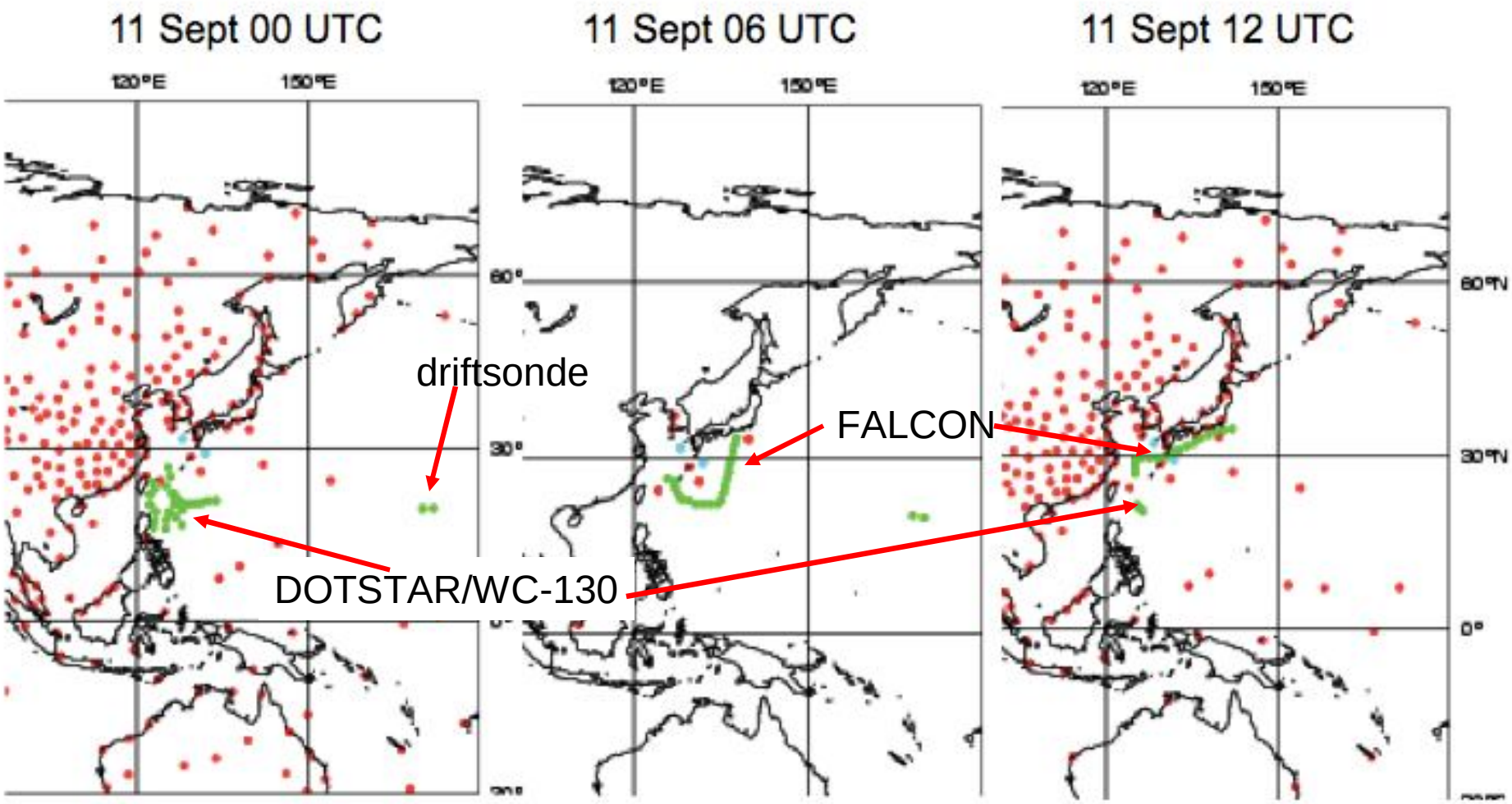


Dropsondes:

- **WC-130**
  - **604 total**
  - **564 good**
  - **AXBTs**
    - **229 total**
    - **191 good**
- **NRL P-3**
  - **489 total**
- **DLR FALCON**
  - **338 total**
- **DOTSTAR**
  - **162 total**
- **TOTAL:**
  - **1593 dropped (subject to QC)**

ECMWF Data Coverage

Data from all aircraft and driftsonde transmitted to operational weather centers

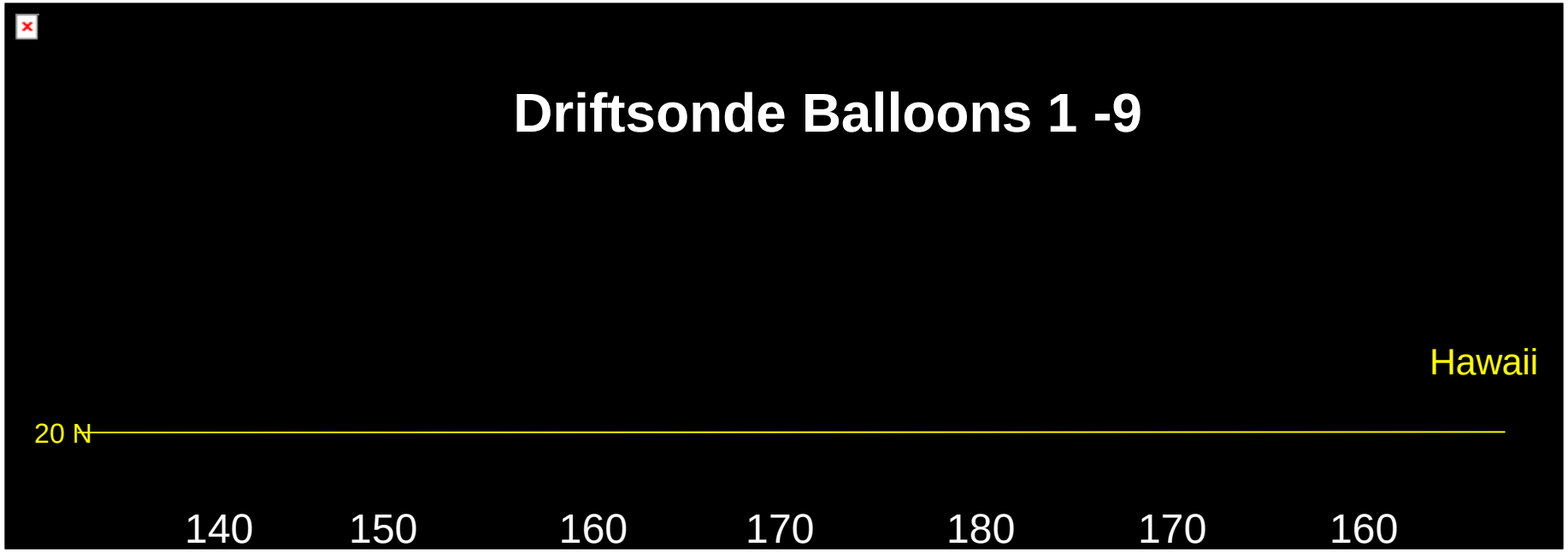


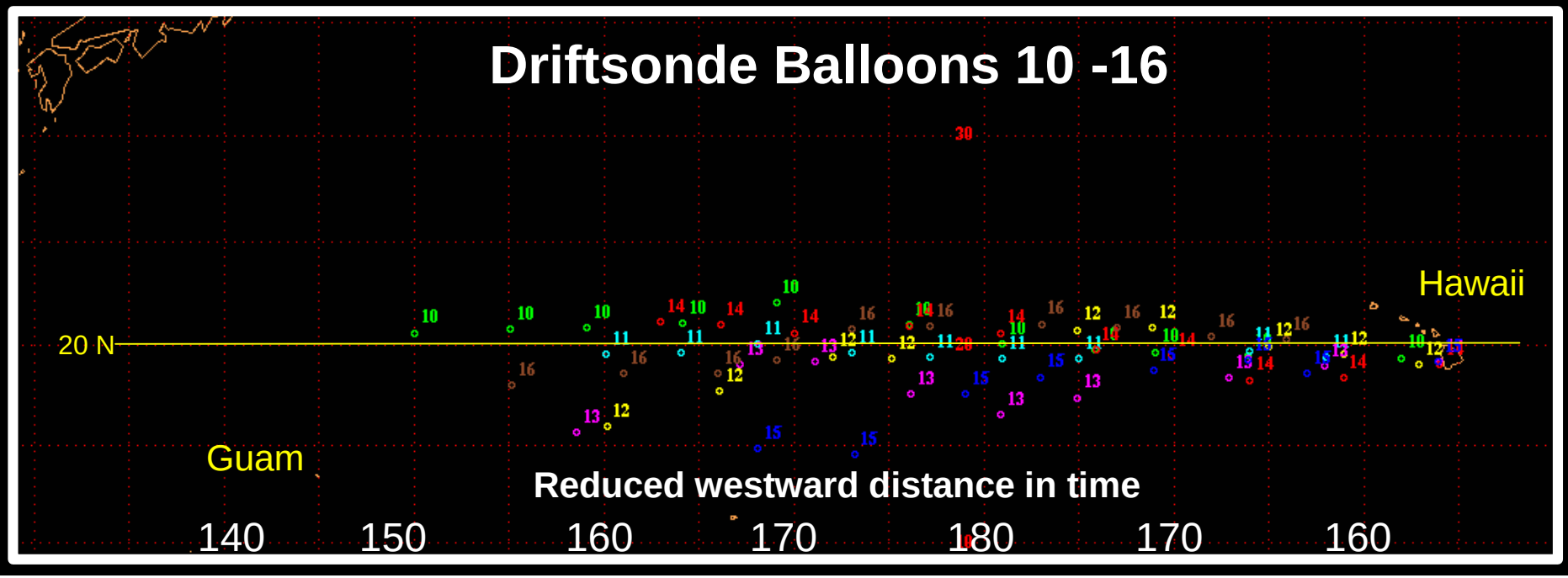
Preliminary Summary of Driftsonde Operations

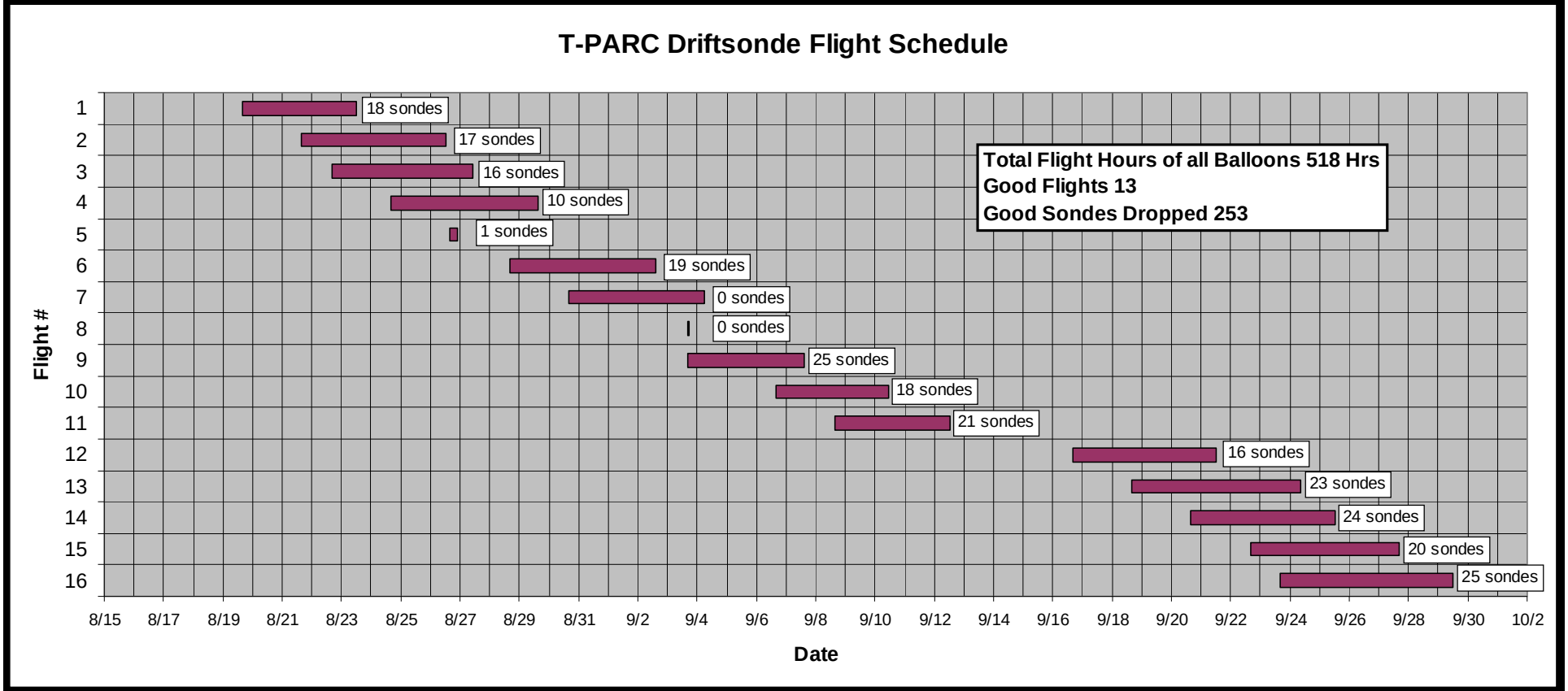
- 13 Gondolas flown (38x13 = 494 sondes)
- 34 sondes ejected at launch
- 66 sondes not attempted to drop
- 394 sondes available to drop

- Good Drops: 252 64% (of 394)
- Failed to release: 117 29.7% (of 394)
- Questionable data: 26 6.6% (of 394)

Slide by Terry Hock, NCAR


Driftsonde Balloons 1 -9
Hawaii
20 N
140
150
160
170
180
170
160


Driftsonde Balloons 10 -16
Hawaii
20 N
Guam
Reduced westward distance in time
140
150
160
170
180
170
160


T-PARC Driftsonde Flight Schedule
Total Flight Hours of all Balloons 518 Hrs
Good Flights 13
Good Sondes Dropped 253
18 sondes
17 sondes
16 sondes
10 sondes
1 sondes
19 sondes
0 sondes
0 sondes
25 sondes
18 sondes
21 sondes
16 sondes
23 sondes
24 sondes
20 sondes
25 sondes
Flight #
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
8/15
8/17
8/19
8/21
8/23
8/25
8/27
8/29
8/31
9/2
9/4
9/6
9/8
9/10
9/12
9/14
9/16
9/18
9/20
9/22
9/24
9/26
9/28
9/30
10/2
Date

T-PARC TCS-08 Project Firsts

- First operation of WC-130Js at 31,000 ft altitude except when penetrating a mature TC
  - Dropped sondes and AXBTs from high altitude
  - Timed with passage of polar-orbiting satellites for satellite intensity validation
- First systematic targeting operation in the WPAC
  - Comparison of several methods from a variety of operational and research organizations
  - Multiple aircraft
  - ECMWF/UKMO Data Targeting System
- First four plane operation in a WPAC TC
- First buoy drop in front of a WPAC TC
  - Two TCs
  - First time a category 5 TC passed over buoys dropped in its path
- First systematic observations of full extratropical transition process
  - Multiple aircraft and land-based radar
  - Timed with satellite overpass

EOL T-PARC Firsts (A Truly Team Effort)

- EOL support in a global project setting across the Pacific Rim
  - Operations center in Monterey (FPS, CDS)
  - Driftsonde launch facility in Hawaii (ISF, DFS, CDS)
  - Aircraft coordination center in Guam (RSF, ISF, CDS, RAF, FPS)
  - Forward deployment of aircraft in Japan (5 Facilities)
- Successful relay of NRL dropsondes to the ground and onto GTS in near real time (ISF, CDS, RAF)
- Sampling of typhoons with ELDORA (RSF,TDF, RAF, CDS)
- Coordinated measurements with NRL and USAF 53rd Weather Wing (5 Facilities)
- Upgraded communications and data products allowed NRL independent sampling of 4 typhoons (RSF, RAF, CDS,FPS)

EOL T-PARC Firsts (A Truly Team Effort) (continued)

- EOL/CNES driftsonde deployment in the west Pacific (ISF, DFS, CDS)
- Autonomous Driftsonde Facility Operations via web/satellite in quasi-real time) (CDS, ISF)
  - Designed for PI & student operators
  - “Control” release of sondes
  - Engineering data for system status/health monitoring
  - Tracking data display for scientific and ATC use
  - Sounding database on the web
  - Status of sending data to GTS & QC’ed data
- First EOL Project portrayed on YouTube (T-PARC cast)

T-PARC Lessons and Considerations to Improve EOL Field Project Support

Military Interactions

- EOL dependent on NRL and USAF staff to make arrangements; wouldn't have succeeded without NRL, USAF and NPS involvement
- Excellent NRL flight support and local interactions
- Consider military liaison dedicated to project (e.g. Vance liaison in IHOP) when operating out of military bases
- More formal agreements with military ahead of time to avoid different interpretation of rules
- Involvement of NRL pilot(s) in planning activities ahead of campaign for consistency;
- Joint NRL/EOL risk assessment
- NP4 training in WA preferable to other locations; medical clearances slow

T-PARC Lessons and Considerations to Improve EOL Field Project Support

Staffing Support

- TiMREX & T-PARC series impacted preparations; added to staff fatigue in the field;
- Need to better monitor/adjust/react to changes in staffing needs and requirements
- Re-assess crew duty guidelines for non-NCAR operated aircraft based on job category, safety, day vs night time operations, number of flight hours per week etc.
- Standardize overtime and time in the field across facilities
- Consider how to better evaluate and assess staff fatigue
- More training opportunities for new/unfamiliar staff (test flights before and during project)

T-PARC Lessons and Considerations to Improve EOL Field Project Support

EOL Project Manager Duties and Responsibilities

- Better define responsibility & authority of PM in multi-facility deployment; similar to RAF PM role?
- Add level of supervision/accountability for staff in the field (coordinated with supervisors/facility managers)
- Need more flexibility reg. on-site staff tasking as need arises
- Define on-site coordination with PI and NRL crew early in process
- Significant (perceived and real) pressure on EOL crew to fly after weeks of no weather, instrument problems etc

T-PARC Lessons and Considerations
Additional EOL Discussions

Communications/Interactions

- Planning meetings **ARE** open to all EOL staff; minutes with action items posted to project website
- Disconnect between information in feasibilities/Ops Plan/EOL Project Book – revisit project with all parties (incl. PIs) involved shortly before field phase
- EOL to consider Elluminate-like communications tool (VOC)

T-PARC Lessons and Considerations to Improve EOL Field Project Support

NRL P3 and Instrumentation

- Revisit facility preparation timelines and support
- ELDORA excellent but complex system; suffered from shortage of essential staff during preparations and in-field support
- Consider ELDORA ground test facility
- RAF instrumentation (ADS, in situ sensors) require upgrades
- Satellite communications worked well, increased bandwidth essential for TPARC
- Balance payload with need for operator seats
- Remote facility/instrumentation access; web interface software for facilities (e.g. driftsondes)

T-PARC Lessons and Considerations
Additional EOL Discussions

Operating in a global environment

- Flexibility in staff travel options during campaigns (open TAs, exception to travel policy, “big pocket book for PM”)
- International calling plans and cell phones for everybody in the field (incl. email access?)
- 24/7 contact/assignments during ops in different time zones essential.

Data

- EOL support for real-time data to the GTS
- Field catalog implementation was excellent

T-PARC Lessons and Considerations
Additional EOL Discussions

Logistics

- Access to base “relatively” smooth for a military installation
- Hotel arrangements fine
- Car rental (if not Hertz) requires UCAR contract involvement; oversight in planning
- Ops Center in Guam “underutilized” especially during daily planning meetings; consider mtg room at hotel in future
- CNES logistical arrangements insufficient
- Consider ways to increase travel flexibility during field deployments

TPARC Debriefing

Comments and Questions