CG WaveS Data Management Plan

Data management and archiving services supporting the CG WaveS research program, and subsequent users of CG WaveS measurements and related data, will be provided by NCAR EOL following the procedures employed for the 2014 DEEPWAVE measurement program. The CG WaveS link will be: https://www.eol.ucar.edu/field_projects/CG_WaveS, and will include all data obtained by HIAPER in-situ and remote-sensing instruments, as well as all supporting environmental data.

a. Data Summary

In-situ data will include HIAPER flight parameters, state variables, u, v, w, T, and p, and species measurements, e.g. "fast" ozone, CO, and H_2O, at their respective sampling frequencies, typically ~0.2-25 Hz. These data will be archived by EOL as was done for DEEPWAVE.

HIAPER remote-sensing measurements will include the following:

1) Na resonance lidar radial winds viewing 20^o forward from zenith along the HIAPER flight tracks from ~16-25 km (beginning 2 km above flight altitude),
2) Rayleigh lidar temperatures from Rayleigh backscatter from ~25-60 km viewing vertically, but limited by aerosols at the lower altitudes, and
3) OH imaging of GW responses at ~87 km viewing vertically and upward from each side, thus providing continuous cross-track coverage, employed for flight guidance.

More details on the lidar data are provided below.

Ground-based data currently archived, or to be archived, will include the following:

1) radiosonde 2-D wind, temperature, and humidity at all sites within the CG WaveS RAO throughout the flight program, archived in the NCAR Eol standard formats.
2) NEXRAD 3-D backscatter power, radial velocities, and rainfall rates spanning the duration of each research flight, employing the standard formats for these data, and
3) Midwest state mesonet data, where applicable, again in their standard formats.

Other environmental data will include the following:

1) GFS forecasting of "next-day" meteorological fields and mesoscale deep convection activity employed for flight planning,
2) MERRA-2 and NAVGEM reanalyses for larger-scale, and higher-altitude environmental context, and
3) AIRS imaging of GW structures at multiple altitudes in the stratosphere near the onset, and following, each research flight.

b. HIAPER Lidar Details

The CG WaveS lidar data will be collected in the NCAR EOL HIAPER mission database (https://data.eol.ucar.edu) in a fashion similar to the previous DEEPWAVE mission, but with the data and resolution optimized for stratospheric altitudes.

For example, the aircraft lidar temperatures from 30-60 km collected during DEEPWAVE in June and July 2014 is located at https://data.eol.ucar.edu/dataset/379.034. These data are in netCDF format and contain time vs. altitude arrays of temperature (and temperature error) from 30-60 km at 5-minute time cadence and 3-km actual vertical resolution (reported every 1 km). Included are the Data Quality Report and an example IDL code for reading the netCDF files.

For CG WaveS, we will report radial winds and temperatures on 1-min temporal (~15 km) and 1-km altitude resolution from 16 to 35 km with 5-min/1-km, 2-min/3-km, and 1-min/5-km resolution data from 35 to 60 km. This data will be in the same netCDF format using the same IDL code. We will add a Python routine to read the data, as well.

Calibration/Validation: We will check the spectral calibration of the double-edge magneto-optic filter before, during, and after the campaign by scanning the low power fiber-coupled output of the 589-nm transmitter laser. This laboratory-grade laser has a 10-MHz linewidth calibrated to 1 MHz absolute zero-point accuracy using sodium vapor saturation spectroscopy. We will validate the temperatures and winds up to 30km using flights near standard nighttime radiosonde launches. The wind calibration will also be checked by turning the plane and retracing the same path in the opposite direction to check the derived horizontal wind. We can check the wind zero point by switching the DEMOF receiver fiber to the vertical telescope and checking if the time integrated vertical wind is zero. Temperatures above 30 km will be validated against NASA SABER and other satellite data sets. The DEEPWAVE Rayleigh lidar temperatures compared quite well with radiosondes, SABER, and ECMWF model runs and we expect the validation to be easier for CGWaveS given the much higher density of radiosonde observations over the central United States.

Special Data Products: Outside researchers who are interested in other derived lidar data products for their research or products at other space/time resolutions will be encouraged to contact the Bifford Williams at GATS to ensure a full understanding of the constraints and limitations of the data products.

c. HIAPER OH Imaging

Real-time OH imaging employed for in-flight guidance will also be archived as for DEEPWAVE and geo-located to allow contributions to subsequent analyses. These data will also be provided in the same data formats as provided for DEEPWAVE.