**Description of airborne dropsonde data processing from NOAA aircraft during ENRR**

**Version 1**

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NOAA deployed the G-4 during the El Nino Rapid Response (ENRR) 2016 field program (Jan-Feb-March). The G-4 dropped standard meteorological drospsondes (Vaisala RD94) campaign. See Table I for numbers.

**Table I. Numbers of sondes for NOAA aircraft in the 2016 ENRR field campaigns.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Flight No.** | **Date** | **Sondes** | **Max Alt** | **Latitude** | **Type** |
| 01 | Jan 21 | 21 | 14 | -2 to 18 | Wrap |
| 02 | Jan 25 | 20 | 14 | 3 to 18 | Coat hanger |
| 03 | Jan 26 | 32 | 14 | 1 to 18 | Wrap |
| 04 | Jan 29 | 29 | 14 | 6 to 18 | Coat hanger |
| 05 | Jan 30 | 16 | 14 | 7 to 17 | Coat hanger |
| 06 | Feb 2 | 13 | 14 | 0 to 17 | Half wrap |
| 07 | Feb 3 | 26 | 14 | 0 to 15 | Semi-wrap |
| 08 | Feb 12 | 31 | 14 | 0 to 14 | Wrap |
| 09 | Feb 14 | 28 | 14 | 3 to 15 | Open hanger |
| 10 | Feb 15 | 26 | 14 | 1 to 14 | Wrap |
| 11 | Feb 16 | 28 | 14 | 4 to 14 | Open triangle |
| 12 | Feb 17 | 32 | 14 | 4 to 14 | Open triangle |
| 13 | Feb 18 | 23 | 14 | 5 to 18 | Open triangle |
| 14 | Feb 21 | 35 | 14 | 9 to 17 | Triangle |
| 15 | Feb 26 | 26 | 14 | 2 to 17 | Skinny wrap |
| 16 | Feb 27 | 28 | 14 | 3 to 16 | Skinny wrap |
| 17 | Feb 29 | 20 | 14 | 7 to 17 |  |
| 18 | Mar 1 | 26 | 14 | 6 to 18 |  |
| 19 | Mar 3 | 28 | 14 | 3 to 18 |  |
| 20 | Mar 6 | 20 | 14 | 7 to 17 |  |

In this document we will briefly describe the processing that has been done to produce summary files. The sondes generate raw data files. These can be found as follows:

G-4 Dropsondes in individual daily files under *dropsondes\_G4*

<ftp://ftp1.esrl.noaa.gov/psd3/cruises/ENRR/Fairall_processing/dropsondes_G4/>

The dropsondes data are abstracted from the *.frd* files using the MATLAB script *read\_ENRR\_Dropsonde\_raw\_G4.m*. Individual files are read in, the valid data lines are pulled out and remapped into a grid with the first line corresponding to the surface. A new mat file is written for each day with all sondes on that day in one matrix. A single *all* cruise file that contains all of the sonde data is created.

<ftp://ftp1.esrl.noaa.gov/psd3/cruises/ENRR/Fairall_processing/data/>

The files take the form

'jdxh' Year day

'zhh' Height (m) above the surface

'Uhh' Wind speed (m/s)

'rhahh' Relative humidity (%, relative to ice if T<0 C)

'tahh' Temperture (C )

'lathh' Latitude (deg)

'lonhh' Longitude (deg)

'Phh' Pressure (mb)

'qahh' Specific humidity (g/kg)

'udirhh' Wind direction (deg)

jdxh, lathh, lonhh have one value per sonde; the other variables have 4000 values per sonde with NaN’s in the invalid locations. For example, the entire G4 dataset can be read in using

way\_raw\_files='Z:\ENRR\_2015\G4\data\';

sondex=load([way\_raw\_files 'ENRR\_G4\_sonde\_all.mat'], 'jdxh', 'zhh','Uhh','rhahh','tahh','lathh','lonhh','Phh','qahh','udirhh');

rhahhG=sondex.rhahh;

zhhG=sondex.zhh;

UhhG=sondex.Uhh;

tahhG=sondex.tahh;

lathhG=sondex.lathh;

lonhhG=sondex.lonhh;

PhhG=sondex.Phh;

qahhG=sondex.qahh;

udirhhG=sondex.udirhh;

jdxhG=sondex.jdxh;

jk=length(lathhG);

[i mon dttn hr mn sec]=datevec(jdxhG);

Also, for example, the matlab line

i=1;figure;plot(UhhG(:,i),zhhG(:,i),'.');xlim([0 50]);xlabel('U (m/s)');ylabel('Alt (m)');title(['ENRR G4: ' num2str(mon(i)) '/' num2str(dttn(i)) '/' num2str(hr(i)) ' lat=' num2str(lathhG(i)) ' lon=' num2str(lonhhG(i))])

will produce Fig. 1 which is a plot of wind speed vs altitude for the first sonde in the file. A typical G4 sonde will have 1600 lines of data (approximately spaced 8 m in the vertical).

The locations of the G4 dropsondes are shown in Fig. 3.

The MATLAB codes used are at <ftp://ftp1.esrl.noaa.gov/psd3/cruises/ENRR/Fairall_processing/matlab/>



Figure 1. Sample wind speed profile from a G4 dropsonde in ENRR January 22, 2016.



Figure 2. Sample relative humidity profile in ENRR January 22, 2016.



Figure 3. Locations of dropsondes for ENRR for the G-4: Jan 21 to Feb 28.