PRESTO Update – NE DOLWG September 2017

Ryan Decker NASA/MSFC Natural Environments Branch/EV44
BJ Barbre Jacobs/EV44
James Brenton Jacobs/EV44
John Orcutt Jacobs/EV44

ryan.k.decker@nasa.gov
Background

• NASA’s Space Launch System (SLS) is using vertically complete atmospheric measurements in vehicle design analyses and day-of-launch (DOL) operations support
  – Designing the vehicle using wind energy spectral content not dependent on instrumentation source
  – Using measured winds as input for DOL I-Load Update (DOLILU) vehicle trajectory and loads assessments
  – Allows for multiple data sources to be used in DOLILU assessments

• The United States Air Force Eastern Range (ER) at Cape Canaveral Air Force Station provides atmospheric data through network of weather balloons and Doppler Radar Wind Profiler (DRWP) instruments
  – Automated Meteorological Profiling Systems (AMPS)
    • Low Resolution Flight Element (LRFE)
    • High Resolution Flight Element (HRFE)
  – Jimsphere
  – Tropospheric DRWP (TDRWP) – NASA owned
  – 915 MHz DRWP

• MSFC Natural Environments (NE) branch has developed software (Profile Envision and Splice Tool (PRESTO)) to produce vertically complete profiles from available sources
PRESTO Input/Output Example

Spliced Profile Sources:
- Earth Global Reference Atmosphere Model (GRAM) mean monthly winds
- AMPS LRFE
- 48-MHz TDRWP
- 915-MHz DRWP
Project Deliverables & Milestones

• PRESTO development requires compliance with NASA Software Engineering Requirements (NPR 7150.2B) standard
  – Project documentation
    • Approved
      – Software Development Plan
      – Software Requirements Specification
      – Software Design Document
      – Software Test Plan
      – Software Version Description
      – Software User Manual
      – Software Maintenance Plan
  – Test cycles
    • Unit Testing – Completed 10/16
    • Acceptance Testing – Completed 4/17
    • End-to-End Testing – Completed 6/17
  – Technical reviews
    • Software Design Review – Completed 4/16
    • Test Readiness Review – Completed 3/17
    • Acceptance Review – Completed 8/17

• Delivered PRESTO v1.6 to SLS in August 2017
Forward Work

• Update PRESTO TDRWP read routine based on the results of the SLS TDRWP certification results

• Integrated subsystem testing of software in DOLILU process
PRESTO Inputs

Please enter starting and ending Year, Date, and Time

- Data Directory
- Splice Directory
- Deliverable Directory
- GRAM Directory
- Beginning Year
- Beginning Month
- Beginning Day
- Beginning Time (Zulu)
- Ending Year
- Ending Month
- Ending Day
- Ending Time (Zulu)

Search Quit
PRESTO Main

Wind Speed vs Height

Selected Spliced Profiles Composition:

LR2016_174_1041
PS_2016_174_1009
Splice20160922_case1
MeanWorth20GRAW2010 june

Filter Wavelength 3000 meters

ryan.k.decker@nasa.gov
PRESTO Header Output

1. Splice – lets the user know it’s a splice file
2. Filter: - displays the filter wavelength
3. mdtf_filenames: - the MDTF filenames of the input data (not including GRAM)
4. wind_sources: - the source and release time (and Radar site and QC info) of all inputs in the spliced order
5. wind_splice: - the wind splice altitudes
6. thermo_sources: - the thermodynamic sources (LR and GRAM only)
7. thermo_splice: - the thermo splice altitude
8. units: - the units of the data in the file
9-12. Content for software reading PRESTO data
13-6101. PRESTO data
PRESTO Splicing Flowchart

"High Source"
- TDRWP Profile
  - Interpolate to 10 m
  - Fill & Flag gaps where data is missing
  - Flag excessively large gaps (> half the filter wavelength)
  - Check for overlap

"Low Source"
- LR wind Profile
  - Interpolate to 10 m
  - Fill & Flag gaps where data is missing
  - Flag excessively large gaps (> half the filter wavelength)

Output data to 30 m intervals
- Gaussian weighting to GRAM above measured
- 1-D linear interpolation between profiles

Error message appears
- Check shear
  - 1-D interpolation across the shear over larger interval
  - Pass
  - Fail

Fill & Flag gaps where data is missing
- Pass
- Fail