Background

- Radiosonde data historically recorded at mandatory and significant levels for meteorological purposes.
- Intrinsic resolution much higher.
- Utility of high-resolution data for research purposes highlighted by Allen and Vincent [1995], inspiring SPARC to promote routine archival of high-resolution data worldwide [Hamilton and Vincent, 1995].
- US high-resolution data archived by NOAA at 6-second (~30 m) beginning 1995 – purchased by M. Geller (using NSF funding) and made publicly available at SPARC Data Center http://www.sparc.sunysb.edu (through NASA funding).
- In 2005 NOAA began upgrading the US upper air network to RRS, archiving data at 1-second (~5 m) resolution facilitating improved analysis and new applications

Applications

Access to high-resolution data has facilitated research in many areas leading to peer-reviewed publications.

- Gravity waves
  - Spatial and temporal variations of wave parameters [Wang and Geller, 2003; Wang et al., 2005; Zhang et al., 2010]–
  - Spectral characteristics [Gong et al., 2008; Geller and Gong, 2010; Gong and Geller, 2010]
  - Planetary waves [Wang et al., 2010]
  - Momentum flux (Figure 1)

- Structure of the tropopause [Birner, 2006; Bell and Geller, 2008] (Figure 2)
- Tropical convection in relation to mass flux and water vapor budgets [Folkins and Braun, 2003; Folkins and Martin, 2005]
- Parameterization validation [Folkins et al., 2006]
- Troposphere-stratosphere transport [Corti et al., 2005; Corti et al., 2006]
- Ability of GCMs to resolve key features of the tropical tropopause layer [Gettelman and Birner, 2007]
- Validation of satellite observation techniques [Hayashi et al., 2009]
- Pyrocumulonimbus processes [Fromm et al., 2010]
- Polar regions [Zhang and Seidel, 2011]
- Effects of geomagnetic storms on the lower atmosphere [Mansilla et al., 2011]

New Research Potential

- Very high-resolution data permit analysis of turbulence parameters [Clayson and Kantha, 2008] (Figure 3)
- New applications in fields such as boundary layer research.
- Move from regional to global analyses.

Workshop

The SPARC DC will be hosting a workshop on research applications of high-resolution radiosonde data.
- May 27-29, 2013
- Stony Brook University, NY
- Topics for discussion
  - New applications made possible by increase to 1-second (or higher) resolution
  - Improvements to existing analysis techniques
  - Uncertainties and limitations
  - Collaborations for regional inter-comparison or global studies
- Establishment of collective repository

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References