BBHRP Testbed for Cloud Retrieval Evaluation

Sally McFarlane, Tim Shippert

Pacific Northwest National Laboratory

Eli Mlawer

Atmospheric and Environmental Research, Inc

Brief BBHRP History

- Developed by Mlawer et al. (2002) as an extension of clear-sky LW Quality-Measurement Experiments (QMEs), which led to improved understanding of LW spectral measurements and modeling
- Designed to provide broadband closure analysis plus vertical profiles of LW and SW heating rates for all sky conditions
- Past focus on analysis of BBHRP residuals has identified issues and led to improvements in various input datasets
- Part of original BBHRP plan was to create 'test suite' for improved retrievals through analysis of closure results (Mlawer et al. 2002)
- As part of research and development, several cloud retrievals have been run through BBHRP at SGP and Shupe-Turner retrieval run at NSA (talks by Matt and Eli, next session) – this work has shown the utility of BBHRP as a testbed
- BBHRP is now at mature-enough stage that the testbed idea can be developed as an ARM community tool for evaluation of PI retrievals

Testbed Concept

- Use of BBHRP framework as a community testbed for evaluation of PI retrievals provides:
  - Consistent set of radiative transfer calculations, input fields, and observed fluxes for evaluation of PI retrievals
  - Benchmark set of calculations based on standard BBHRP runs
  - Auxiliary inputs; PI only has to provide retrieval dataset to be evaluated, rather than developing full set of model inputs
  - Use of Infrastructure resources to run radiative transfer computations
- Initial application to cloud retrievals; but could test any aspect of input (aerosol, atmospheric state, etc.)

Available Test-bed Periods

- PIs can submit retrievals for any periods for which all standard inputs are available and reference version of BBHRP has been run
- Inputs to current reference version (v1.5) of BBHRP are:
  - atmospheric profile information (MergedSounding + TOMS ozone)
  - cloud properties (MicroBase)
  - surface properties (spectral albedo)
  - aerosol properties (AerosolBestEstimate)
  - measured surface/TOA fluxes (for analysis/evaluation of results; BEFlux/QCRad and GOES/CERES)
- Current reference periods available:
  - Mar 2000 – Feb 2001 at SGP
  - Mar – Aug 2004 at NSA
  - Working on expanding time periods of reference calculations
- For non-reference periods, PIs have to provide ALL inputs:
  - Pt. Reyes, CLOWD intercomparison (Comstock talk)

Testbed 'Protocol' (under development)

Science PI:

- Requests a 'testbed' run
- Puts retrieval in required netCDF format
- Sends input files to Tim
- Analyzes initial results
  - Identify errors in input datasets – such as unit problem
- Submits input datasets for entire test period of interest
- Performs analysis on results

Infrastructure (translator, developer):

- Prioritize testbed requests
- Assist/advise on format issues
- Run simple checks on datasets:
  - Variables outside physical limits
  - Missing variables, etc.
- Run short test case and provide output to PI
- Performs full BBHRP run
  - Produces output datasets
  - Produces standard set of analysis plots (including comparisons to reference run)

Current Testbed Efforts

- Complete documentation of BBHRP process and input datasets (website and technical report)
- Improved modularization and updates to code to make processing more efficient
- Modification of scripts to allow more flexible specification of input time periods
- Development of simple set of checks for input datasets
- Development of standard set of analysis plots
- Beginning CLOWD Pt Reyes intercomparison with testbed (organized by Comstock/Vogelmann/Turner)

More Information

- Basic BBHRP documentation: http://engineering.arm.gov/~shippert/BBHRP/
- Test-bed website (under construction:)
- Input dataset formats http://engineering.arm.gov/~shippert/BBHRP/doc/BBHRP_input_formats.html
- Interested in submitting retrieval to testbed?
  - Contact Sally.McFarlane@pnl.gov