HIGH VERTICALLY RESOLVED RELATIVE HUMIDITY

Statistical Regression

Physical Iteration Retrieval

Validation with coincident dropsondes from location-to-location.

The retrieval improvement based on the EOF statistical regression through physical iteration is only contributed by IASI measurements as the minimum information methodology is used. A high resolution atmospheric structure is very well captured by IASI measurements (retrievals); not only in the troposphere but also in the boundary layer.

SUMMARY AND FUTURE WORK

A State-of-the-art retrieval algorithm dealing with all-weather conditions has been applied to satellite instruments retrieving cloud/surface and atmospheric parameters with a “higher” spatial resolution (single field-of-view). First of many case studies of IASI (29 April 2007) indicate that atmospheric conditions were captured coherently; and IASI retrieval comparison with radiosonde is very encouraging. Excellent agreement between IASI retrieval and dropsondes is obtained showing that atmospheric spatial variation is well captured by IASI measurements. This work has laid a foundation for some critical studies such as retrieval algorithm refinery, satellite remote instrument validation and inter-comparison, and risk reduction study for future instrument development.

RETRIEVAL METHODOLOGY

PART A: REGRESSION RETRIEVAL (Zhou et al., 2005)

Using a global training database to diagnose 0-2 cloud layers from radiosonde relative humidity profile: A single cloud layer is inserted into the input radiosonde profile. Approximate lower-level cloud using opaque cloud representation.

Use parameterization of balloon and aircraft cloud microphysical data base to specify cloud effective particle diameter and cloud optical depth.

Different cloud microphysical properties are simulated for some radiosonde using random number generator to specify visible cloud optical depth within a reasonable range. Different habitats can be specified (Hexagonal columns assumed here).

Use LBLRTM/DISORT “lookup table” to specify cloud radiative properties.

Spectral transmittance and reflectance for ice and liquid clouds interpolated from multi-dimensional look-up table based on DISORT multiple scattering calculations.

Compute EOFs and Regressions from cloudy radiance data base:

Regress cloud properties, surface & atmospheric profile parameters against radiances EFOs.

PART B: 1-D VAR PHYSICAL RETRIEVAL (Zhou et al., 2007)

A one dimensional (1-d) variational solution with the regularization algorithm or the minimum information method, is chosen for physical retrieval methodology which uses the regression solution as the initial guess.

Cloud microphysical parameters, namely effective particle diameter and visible optical thickness, are further refined with the radiances observed within the 10.4 μm to 12.5 μm window region.

REFERENCES