Applications for Near-Real Time Satellite Cloud and Radiation Products

**Introduction**

With increases in computer capabilities & satellite imager data availability, near-real time (NRT) products generated from satellite data are becoming more common & finding more applications. At NASA LaRC, we have been providing satellite-based cloud and radiation parameters in NRT for over a decade. As these analytical datasets become more widely known, researchers have been using them to improve their nowcasts and forecasts of weather and other atmospheric phenomena. The products, their availability and some of their current applications are summarized in this poster.

**On smartphones:** [http://cloudsgate2.larc.nasa.gov](http://cloudsgate2.larc.nasa.gov)

**Available products**

- All products are available at pixel level; some are also averaged to particular grids. Averaging is flexible.
  - **Standard, Single-Layer VTS/SST**
  - **Multilayer:** CO2 chan only (GOES-12 & later)

**Products**

- **Upper & Lower Cloud**
  - Effective temperature
  - Optical depth
  - Temperature:
  - Phase:
  - Height:
  - Ice or liquid water path
  - Pressure
- **Cloud effective particle size**
- **Cloud properties:** temperature, phase, height, effective droplet size, optical depth, & LWP define icing probability & intensity for clouds not covered by cirrus. Results compare well with airborne reports. Areas of unknown have cirrus clouds. Use of multilayered cloud data can reduce unknown clouds.
- **Cloud properties** are being tested for assimilation into the experimental GEOSat retrievals.
- **RGB, b) multilayer ID, c) Lower cloud height (km), d) Upper level height (km)**

**Availibility**

On the web: [http://cloudsgate2.larc.nasa.gov](http://cloudsgate2.larc.nasa.gov)

**References**

- Bedka et al. (2010) - Objective satellite-based detection of overshooting tops (OTs) that are indicative of severe weather. OTs are identified in GEOSat retrieved T and T_d differences. Results are shown in terms of cloud top temperature and height within boundaries of black lines.
- Scarino et al. (2012) - Deriving surface skin temperatures using IR BT, BT gradients (texture), and WRF assimilating GOES CWP data are being tested at NSSL for the ARM SGP domain. Observations used for cloud clearing in NCEP RAP & the experimental ESRL RAP hourly analyses. Observations used for cloud clearing in NCEP RAP & assimilation of GOES and IR imager data at the ARM SGP domain. Observations used for cloud clearing in NCEP RAP & assimilation of GOES and IR imager data at the ARM SGP domain.
- Jones et al. (2012) - Evaluation of a forward operator to assimilate cloud water path from GEOSat retrievals into WRF-DART. Submitted, Mo. Wea. Rev.

**Assimilation & Forecasting**

- **NCEP/RSM Rapid Refresh (RAP) Model**
- **GFS, RAP Cloud-Top Height Analysis (CTH)**
- **GFS Cloud-Top Height Analysis (CTH)**
- **Modis (MODIS)**

**Introducing data available in pixel view:**

- **Top:** Clear-sky surface skin temperature & LI when cirrus is present, expanding capability of rough weather. Current methods have difficulty operating in these conditions. Results are shown in terms of cloud top temperature and height.
- **Bottom:** Multilayer ID (single or 2-layer) effective temperature, optical depth, thickness, ice or liquid water path, pressures.

**Products & availability**

- **Near Real Time Satellite Cloud and Radiation Products**
  - All products are available at pixel level; some are also averaged to particular grids. Averaging is flexible.
  - **Standard, Single-Layer VTS/SST**
  - **Multilayer CO2 channel only (GOES-12 & later)**

**Nowcasting for Aviation Safety & Management**

- **Airframe Icing Potential**
- **Convective & Lightning Initiation**
- **Overshooting tops**

**Overcasting for Aviation Safety & Management**

- **Airframe Icing Potential**
- **Convective & Lightning Initiation**
- **Overshooting tops**

**Other applications**

- Cloudy-sky aerosols
- Icing forecast model assimilation
- Surface radiation budget, solar energy
- 12 or 13.3 µm Temp
- 3.7, 6.7, 10.8 µm Temp
- Broadband Albedo
- µ
- m Temp
- µ
- m
- 0.65, 1.6 µm Reflectances

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- R. Reichle, M. Rienecker, A. da Silva, P. Norris
- S. Benjamin, T. A. Jones

**Pilot Reports (PiReps). Areas of unknown have cirrus clouds. Use of multilayered cloud data can reduce unknown clouds.”**

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