Liquid Water content in Clouds

Cloud Liquid Water (CLW) is created through the Microwave Integrated Retrieval System (MIRS), which uses the same algorithm for several polar-orbiting satellite microwave sensors, such as ATMS or AMSU-A/MHS. This product is a compilation of the retrieved liquid water profile, and is effective day or night, in all weather conditions, and over all surface types.

CLW estimates the amount of non-precipitating liquid water that is contained in a vertical column of atmosphere. In combination with the freezing level it can be used to locate high concentrations of super-cooled water for assessing the risk of freezing drizzle or aircraft icing.

High concentrations of liquid cloud droplets: this can be used to locate area of potential freezing drizzle or aircraft icing.

Liquid moisture pattern not obscured by high clouds: suspended liquid water often occurs in lower levels of the atmosphere which is more apparent in microwave channels.

Fills gaps in upper air observations: provides a more complete spatial distribution of liquid moisture compared to total moisture in the atmosphere.

Impact on Operations

Emitted energy in the microwave is very weak compared to infrared requiring a larger sensor footprint.

Limitations

Coarse resolution: microwave sensors have large surface footprints.

May be missing or misleading in mixed or heavy precipitation: the strong scattering signal of ice and rain can mask the liquid water signal in the lower troposphere.

Does not differentiate super-cooled water droplets: a freezing level and moisture profile is needed to determine a super-cooled moisture layer.

Greater CLW uncertainty over land: the higher surface emissivity of land reduces the CLW signal.

Although most CLW is non-precipitating, higher values may be caused by rain.

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**CLW Interpretation**

1. Areas of high non-precipitation CLW (green/yellow/red)
2. Areas of low non-precipitating CLW (brown/tan)
3. NUCAPS soundings with good CrIS & ATMS data. (green)
4. NUCAPS sounding with good ATMS input but CrIS failed QC.
5. NUCAPS where both CrIS & ATMS failed QC.
6. NUCAPS sounding selected (purple circle)
7. NUCAPS sounding identifies elevation and depth of supercooled cloud water layer.

**CLW and TPW:**

TPW shows the total moisture distribution while CLW identifies areas where suspended moisture is primarily liquid. Together, they can provide a better microphysical picture. In the example below a large concentration liquid cloud droplets are occurring behind the area with the greatest TPW. Note that CLW is missing in the region of highest TPW due to mixed or heavy precipitation.

**Resources**

NOAA OSPO MIRS Home Page
http://www.ospo.noaa.gov/Products/atmosphere/mirs/index.html

COMET/MetEd Microwave Remote Sensing Course
https://www.meted.ucar.edu/training_course.php?id=15

MIRS Algorithm Description
http://www.ospo.noaa.gov/Products/atmosphere/mirs/algo.html

Hyperlinks not available when viewing material in AIR Tool