



A 4-D Cloud Water Product from Operational Satellite Data



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Goal

- Develop technique to estimate cloud water content (CWC) profiles from Geostationary satellite data (4-D cloud water fields)
- Evaluate technique with CloudSat data

Approach

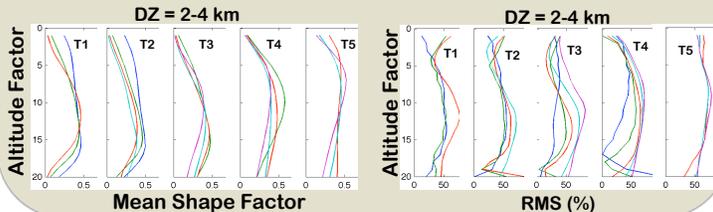
- Develop Climatological Cloud Water Content Profiles (shape factors) from CloudSat RVOD product
- Derive CWC profiles from geostationary satellite data over the ARM SGF
 - high spatial and temporal resolution
 - shape factors constrained with GOES-derived cloud boundaries and cloud water path (CWP)

CloudSat Climatological CWC Profiles May - July, 2008; 20 - 50°N, 65 - 150°W

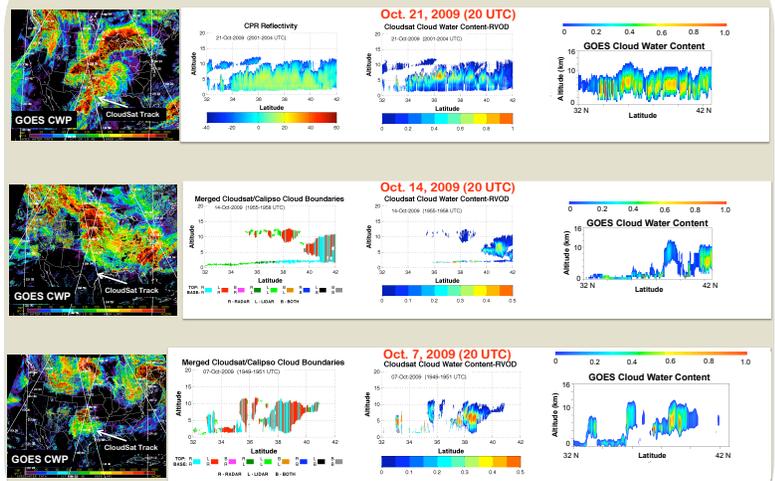
Cloud Binning Procedure

Category	1	2	3	4	5	6
DZ (km)	0-1	1-2	2-4	4-7	7+	-
T (K)	<220	220-235	235-250	250-273	273+	-
CWP (gm ⁻²)	<50	50-250	250-750	750-1500	1500-3000	3000+

- CWP ≤ 50 g/m²
- 50 < CWP ≤ 250 g/m²
- 250 < CWP ≤ 750 g/m²
- 750 < CWP ≤ 1500 g/m²
- 1500 < CWP ≤ 3000 g/m²
- CWP > 3000 g/m²

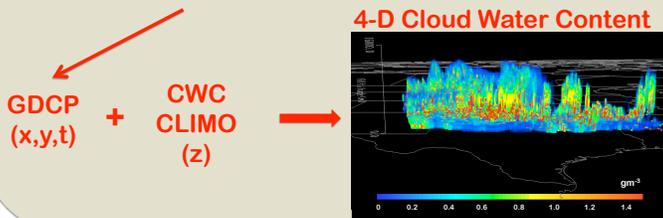
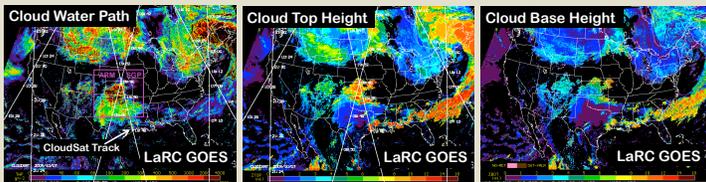


GOES Comparisons with CloudSat Cross-sections along-track thru ARM SGF



Application to GOES for 4-D CWC Estimate Oct. 7, 2009

3-D GOES Derived Cloud Products (GDPC)



- CloudSat providing critical information on vertical distribution of clouds but doesn't provide the spatial and temporal resolution needed for direct use in many applications
- 4-D distribution of cloud water derived from operational weather satellites looks promising and could benefit a variety of weather related applications
- Instantaneous uncertainties are on the order of 25-50%, which is less than model uncertainties in many cases
- More work needed to improve technique, including refinements to climatology and improved screening of CloudSat data to account for retrieval uncertainties.
- Product could be used to test/improve cloud models on a regional scale.

References

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Acknowledgements

This research is supported by Interagency agreement, DE-AI02-07ER64546, between DOE and NASA Langley Research Center

Data were obtained from the Atmospheric Radiation Measurement (ARM) Program sponsored by the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research, Climate and Environmental Sciences Division and from the CloudSat Data Processing Center

Satellite derived cloud products are available from [HTTP://WWW-PM.LARC.NASA.GOV](http://www-pm.larc.nasa.gov)