

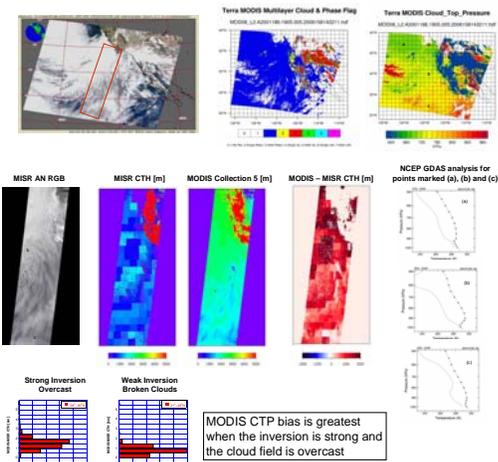
Location of Stratocumulus Cloud-top Heights in the Presence of Strong Inversions

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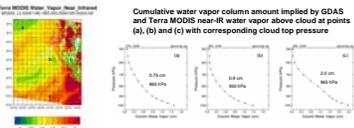
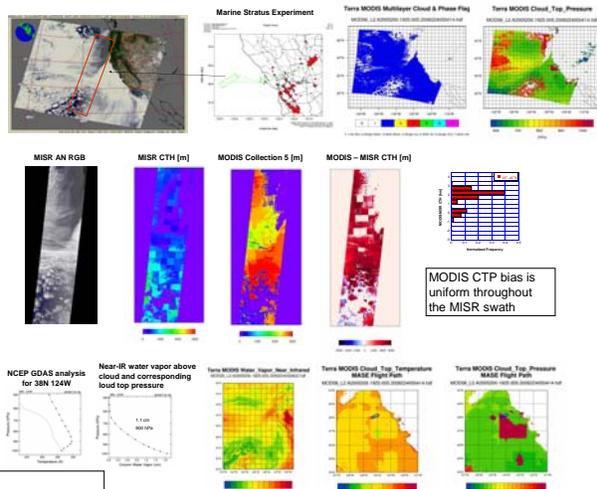
Cloud top pressure is a routine and important product generated by MODIS on Terra and Aqua. Cloud tops are located by the CO₂ slicing technique for high- and mid-level clouds (higher than about the 700 hPa level) and the infrared window brightness temperature (11 μm band) for lower clouds (King et al. 2003, Platnick et al. 2003). Previous studies have shown strong biases in MODIS cloud top heights which, for low clouds, have been attributed to (a) the presence of multiple layers and (b) non-opaque-ness (Naud et al. 2002, 2004, 2005). Here we present results of inter-comparisons of MODIS stratocumulus cloud-top heights with MISR wind-corrected stereo cloud height retrievals (Moroney et al. 2002) and also information from a field campaign. It is shown that the primary cause of bias in the MODIS product results from the misidentification of the appropriate pressure (hence altitude) level corresponding to the window brightness temperature when there is a strong inversion above the cloud top.

Since the inversion can lead to multiple solutions for the cloud top location, a possible remedy is to obtain both (or several) solutions and use additional information to choose the appropriate value. One suggestion is to use the MODIS near infrared water vapor column amount above cloud top (Gao and Kaufman, 2003) as a decision flag. This should be adequate for low clouds as long as the pixels are away from the edge of the cloud field, i.e. some distance from clear ocean. For MODIS on Terra, the MISR geometric cloud top height can be used to select the appropriate solution for the central region of the swath and the solution extended to the entire granule, if possible. In the near future, CLOUDSAT could play the same role for MODIS on Aqua (and perhaps on Terra if the evolution of the cloud field is small) although the calibration points will be restricted to a slice down the center of the MODIS granule.

July 5 2001 1905 UTC



July 19 2005 1925 UTC



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Actual cloud top is at 470 m or 950 hPa. MISR-derived cloud top height just east of the flight track is between 400 and 600 m. Near-IR water vapor above cloud corresponds to 900 hPa or 1000 m.

Temperature and Liquid Water Content Profiles Made During the Racetrack Leg of the MASE Flight on July 19 2005 from 1800 to 1930 UTC

