

S05-1

**Retrieval of multilayer cloud physical and optical properties
from infrared measurements**

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An algorithm using several thermal infrared (TIR) bands to detect multilayer cloud and retrieve cloud physical and optical properties including cloud thermodynamic phase is developed. This significantly extends applicability of passive remote sensing and possibly improves accuracy of cloud property retrieval. The method uses the split window bands as well as the carbon dioxide and water vapor absorption bands. Errors in modeled and measured brightness temperatures are evaluated by model-to-model and model-to-measurement comparisons. Top pressure of lower cloud in multi-layer cloud column can be retrieved if the upper cloud optical thickness is less than 6. The optimal estimation method is used to simultaneously infer cloud water path, effective particle radius, and cloud-top pressure. The method is first applied to the Moderate Resolution Imaging Spectroradiometer (MODIS) using 10 TIR bands and compared to MODIS operational product and active remote sensing measurements, showing promising results. Particularly, cloud-top of optically thin cloud is estimated well. The algorithm will be applied to a study of cloud system evolution using frequent observation data by the Advanced Himawari Imager (AHI) onboard the Himawari-8.