Investigating Uncertainties in Satellite Cloud Liquid Water Path Retrievals

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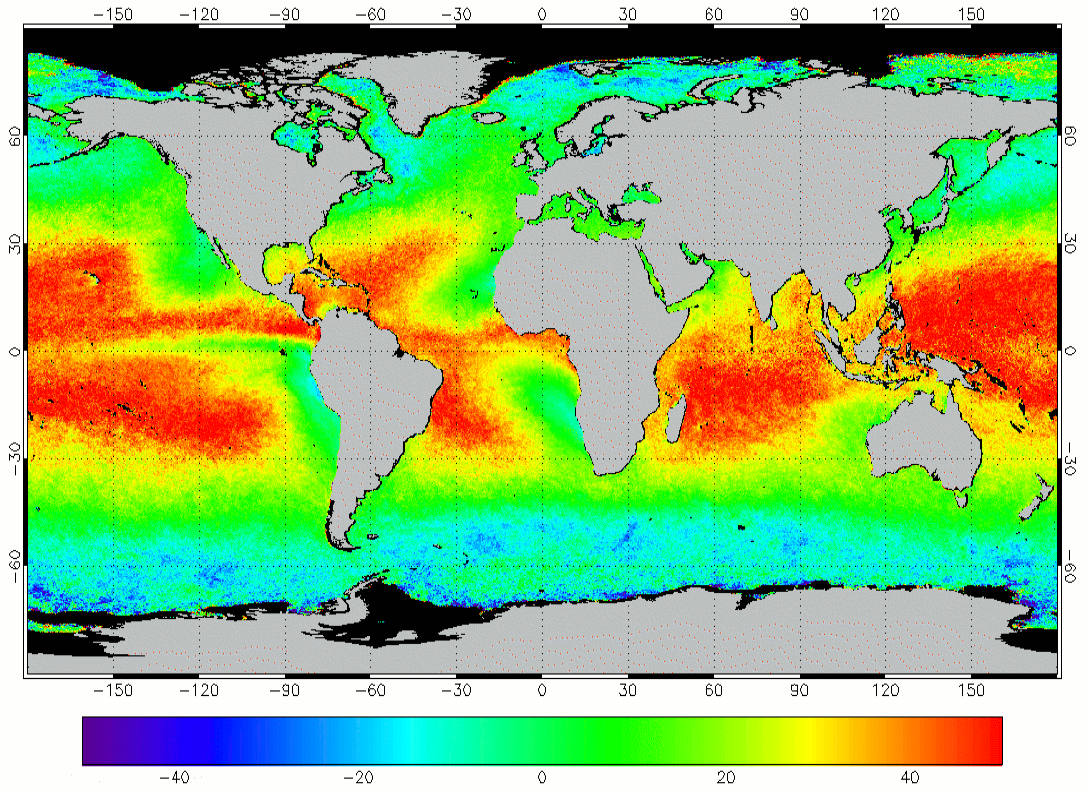
Both observations and climate models show considerable discrepancies in the global distribution of cloud liquid water. My research aims at better constraining this quantity by systematically investigating inconsistencies between microwave and optical cloud liquid water path estimates. The main source of error is cloud-rain separation in microwave techniques and 3D effects in plane-parallel optical retrievals. In addition, both methods suffer from unresolved sub-pixel-scale variability. First, I have identified differences between AMSR-E and MODIS cloud liquid water retrievals as a function of geographic location, cloud fraction, effective radius profile, cloud heterogeneity, solar/view geometry, and rain rate. For example, the figure below shows the global distribution of annual mean AMSR-E – MODIS cloud liquid water path bias.



Annual mean AMSR-E – MODIS cloud liquid water path bias (g/m^2) for 2007

In the next phase of my research, I will attempt to better understand observed retrieval differences, such as structure in the shown bias map, by combining cloud-resolving simulations with a hierarchy of radiative transfer models. My ultimate goal is to make a significant step toward creation of a consensus satellite cloud liquid water climatology that might be more useful in constraining global climate models than existing datasets.