**An analysis of NCEP GFS low clouds over the eastern tropical oceans using satellite and ground-based measurements**

Cloud properties and their vertical structure have been a major issue for meteorological studies due to their impacts on both the hydrologic cycle of the Earth and adiabatic heating. Persistent marine stratus clouds over the eastern tropical oceans have not yet been resolved well in most climate and weather forecast models. The objectives of this study are to diagnose the performance of National Centers for Environmental Prediction (NCEP) Global Forecast System (GFS) model cloud simulations and to identify possible causes of the discrepancies in cloud fields using different types of satellite retrievals and ground-based measurements.

Mistreatment of such marine stratocumulus clouds in the GFS model leads to an overestimation of upward longwave flux and an underestimation of upward shortwave flux at the top-of-atmosphere. With respect to input data biases, the temperature field from the GFS is comparable to that obtained from both satellite retrievals and ground-based measurements, but the GFS relative humidity field shows a wet bias in lower atmosphere. To improve simulations of low-level clouds, an experiment is performed by using GFS model's original atmospheric fields with a different cloud parameterization scheme. The new approach generates a large quantity of marine stratocumulus clouds over the eastern tropical oceans as well as low cloud amounts in the other regions around the world. Such results are expected to help improve the inherent problems of the GFS cloud parameterization scheme and to gain insights into the method in determining cloud fraction.