Plinius Conference Abstracts,
Vol. 11, Plinius11-145, 2009
11th Plinius Conference on Mediterranean Storms

Remote Measurements of the Atmosphere with High Spatial Resolution

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Global atmosphere-ocean models are now operating at 3.5 km resolution and mesoscale weather prediction models operating at 1.7 km resolution have been used for the analysis of hurricanes. One can expect that weather prediction models will operate at resolutions better than 5 km during the coming decade. Microwave sensors have contributed valuable information about rainfall and sea surface winds. The Precipitation Radar (PR) onboard the Tropical Rainfall Measuring Mission (TRMM) can address this need. However it may be nearing the end of its life, and its replacement by the Global Precipitation Measurement (GPM) mission is expected no earlier than 2013. Recently the four Italian Cosmo-SkyMed, and the German Terra-SAR X-band synthetic aperture radars (SAR's) have displayed rain distributions with resolution better than 0.5 km. The Quickscat also now provides distributions of rainfall and sea surface winds with 2.5 km resolution.

We will describe rainfall retrieval algorithms, show rainfall distributions retrieved from Terra-SAR, and discuss errors in those measurements. We will also describe multi-frequency radar measurements of sea surface winds and rainfall during hurricanes.

Although most remotely sensed rainfall and wind data can be expected to be obtained from satellites, unmanned aerial vehicles (UAV's) with one week cruising duration and $\sim$180 kg payloads flying at 18 km height may become attractive platforms from which severe weather can be tracked with high resolution.