Satellite Data Assimilation Improves Tropical Cyclone Intensity and Structure

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The Aqua AMSU moisture/temperature, QuickSCAT and GOES-track winds, and SSM/I rain data for Typhoon Tokage were assimilated into a MM5 4DVAR system in a tropical cyclone (TC) reanalysis effort. The top right panel shows that assimilated typhoon intensity (blue) compares very well with actual measurements of minimum central surface pressure (black) and is significantly more accurate than the NCEP final analysis for the time-period shown. The top left panel shows the 4DVAR assimilated radar reflectivity and the bottom panel shows an independent TMI rain rate measured at the same time (9PM on 10/18/2004). Strongest convective activity appears in the north and south quadrant of the eyewall in both panels, and spiral rain bands are simulated reasonably well. So far, 12 typhoons have been re-analyzed. This represents the first effort of fine-resolution tropical cyclone (TC) reanalysis using the latest NASA satellite products. The methodology may be applied to operational models to improve real TC forecast.