COMPARING WIND SPEED RETRIEVALS FROM GPS REFLECTOMETRY WITH SFMR SURFACE WIND SPEEDS IN HURRICANE IKE (2008)

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A number of airborne experiments have been performed during the last decade that studied a sensitivity of GPS reflected signals to ocean surface roughness both for steady, uniform wind conditions [1, 2], and for hurricane conditions [3, 4]. A theoretical model [5] is available that relates the characteristics of reflected signals to the slope statistics, and from there, to a near-surface wind speed, if the local wind is the only source of sea roughness at the footprint location. Still a lot of work needs to be done to make this technique more reliable, robust and accurate for operational needs.

Recently, a compact system, able to record raw GPS intermediate frequency (IF) samples, has been designed and tested by the GNSS group at the CU/Aerospace Science Engineering. Such an approach provides the most fundamental measurement, enabling the most advanced and complete post-processing, with data volumes on the order of 1GB/minute.

On September 10 and 11, 2008 this GPS bistatic system was flying on board of the NOAA WP-3D research aircraft (N42RF, "*Kermit*") which collected research-mission data on Hurricane Ike in Gulf of Mexico. The aircraft flew through the hurricane at about 5000 meters performing a characteristic flight track comprising of several radial lags that transverse the hurricane eye at different azimuthal angles. The GPS bistatic radar was recording raw data practically over the entire two flights collecting about 800 GB of data. After the flights the hard drives with data have been sent to the lab for post-processing, and the correlation waveforms for both direct and reflected signals were retrieved from the raw data for all available satellites.

As it is follows from the theoretical model [5], the shape of the correlation waveform, and the slope of its trailing edge depends on rms of L-band limited ocean surface slopes. Empirical spectral models for well-developed seas relate the slope rms to the local wind speed. However, wave fields generated by hurricanes do not follow such a simple rule. System of swells generated by various parts of the hurricane complicates the picture and makes the problem of wind retrieval non-trivial. Presence on board of the aircraft of the Step Frequency Microwave Radiometer (SFMR) allowed making comparisons between wind retrievals obtained with the SFMR and the GPS bistatic radar. The paper will present results and discussions of such comparisons.

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