

The WindSat Calibration/Validation Plan and Early Results

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Abstract: The WindSat radiometer was launched as part of the Coriolis mission in January 2003. WindSat was designed to provide fully polarimetric passive microwave measurements globally, and in particular over the oceans for ocean surface wind vector retrieval. Due to prohibitive risk and cost associated with an end-to-end pre-launch absolute radiometer calibration (i.e. from the energy incident on the main reflector through the receiver digitized output) it was important to develop an on-orbit calibration plan that verifies instrument conformance to specification and, if necessary, derive suitable calibration coefficients or sensor algorithms that bring the instrument into specification. This is especially true for the WindSat Cal/Val, in view of the fact that it is the first fully polarimetric spaceborne radiometer.

This paper will provide an overview of the WindSat Cal/Val Program. The Cal/Val plan, patterned after the very successful SSM/I Cal/Val, is designed to ensure the highest quality data products and maximize the return on the available Cal/Val resources. The Cal/Val is progressive and will take place in well-defined stages: Early Orbit Evaluation, Initial Assessment, Detailed Calibration, and EDR Validation. The approach allows us to focus efforts more quickly on issues as they are identified and ensures a logical progression of activities. At each level of the Cal/Val the examination of the instrument and algorithm errors becomes more detailed. Along with the WindSat Cal/Val structure overview, we will

present the independent data sources to be used and the analysis techniques to be employed.

During the Early Orbit phase, special instrument operating modes have been developed to monitor the sensor health from the time of instrument turn-on to a short time after it reaches stable operating conditions. This mode is uniquely important for the WindSat since it affords the only opportunity to examine all of the data in the full 360 degree scan and to directly assess potential field-of-view intrusion effects from the spacecraft or other sensors on-board the satellite and evaluate the spin control system by observing the statistical distribution of data as the horns scan through the calibration loads.

The next phase of the WindSat Cal/Val consists of an initial assessment of all sensor and environmental data products generated by the Ground Processing Software. The primary focus of the assessment is to conduct an end-to-end review of the output files (TDR, SDR and EDR) to verify the following: proper functioning of the on-line GPS modules, instrument calibration (including Antenna Pattern Correction and Stokes Coupling) does not contain large errors, EDR algorithms provide reasonable products, and there are no major geo-location errors.

This paper will provide a summary of the results of the Early Orbit and Initial Assessment phases of the WindSat Cal/Val Program.