

WindSat — Space Borne Remote Sensing of Ocean Surface Winds

Dr. Peter W. Gaiser

Naval Research Laboratory
peter.gaiser@nrl.navy.mil, 202-767-8253

Dr. Karen M. St. Germain

Naval Research Laboratory, 202-767-8253

Dr. Elizabeth M. Twarog

Naval Research Laboratory
elizabeth.twarog@nrl.navy.mil, 202-767-9130

Abstract: For more than ten years, seven SSM/Is have successfully provided reliable passive microwave data for retrieving environmental parameters such as wind speed, sea ice concentration and age, and integrated atmospheric water vapor. One parameter not provided by microwave radiometers is the ocean surface wind direction. The wind vector affects a broad range of naval missions, including strategic ship movement and positioning, aircraft carrier operations, aircraft deployment, effective weapons use, underway replenishment, and littoral operations. Furthermore, accurate wind vector data aids in short-term weather forecasting, the issuing of timely weather warnings, and the gathering of general climatological data.

Successful aircraft experiments in the 1990s and the high demand for operational ocean surface wind vector data gave impetus to developing a space borne polarimetric microwave radiometer. WindSat is a satellite-based multi-frequency polarimetric microwave radiometer developed by the Naval Research Laboratory for the U.S. Navy and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office (IPO). WindSat is designed to demonstrate the capability of polarimetric microwave radiometry to measure the ocean surface wind vector from space. The sensor provides risk reduction for the

development of the Conical Microwave Imager Sounder (CMIS). In addition, WindSat must perform its wind mission without impairing the capability to measure other environmental parameters currently provided by SSM/I.

The WindSat radiometer operates in discrete bands at 6.8, 10.7, 18.7, 23.8, and 37.0 GHz. The 10.7, 18.7 and 37.0 GHz channels are fully polarimetric, while the 6.8 and 23.8 GHz channels are dual polarized only (vertical and horizontal). It uses a 1.8 m offset reflector antenna and will be launched into an 830-km sun-synchronous orbit. The WindSat design and ground processing algorithms focus on the primary mission of measuring the sea surface wind vector. However, it will produce a unique data set with numerous environmental remote sensing applications.

WindSat is the primary payload on the Air Force Coriolis satellite, which was launched on 6 January 2003. It is in an 840 km circular sun-synchronous orbit. The local time of the ascending node is 1759.

This talk will address the WindSat mission motivation and objectives. Furthermore, the WindSat sensor design and data will be presented. Lastly, this talk will provide an overview of the WindSat ground segment and data flow.