EARTH OBSERVATION SYMPOSIUM (B1)
Future Earth Observation Systems (2)

Author: Dr. Céline Tison
CNES, France

Mr. Thierry Amiot
Centre National d'Etudes Spatiales (CNES), France
Prof. Danièle Hauser
CNRS-LATMOS, France
Mr. Castillan Patrick
Centre National d'Etudes Spatiales (CNES), France
Mrs. Nathalie Corcoral
CNES, France
Mr. Laurent Rey
Thales Alenia Space Espana, France
Dr. Vivien Enjolras
Thales Alenia Space Espana, France

SWIM, ON-BOARD CFOSAT, FOR A GLOBAL MONITORING OF THE WAVES

Abstract

The Chinese and French Space Agencies are jointly carrying out an innovative mission, CFOSAT (China France Oceanography Satellite project) devoted to the monitoring of the ocean surface and its related science and applications. CFOSAT will embark, for the first time, both a wind and a wave scatterometers, enabling a simultaneous measure of the wind and the wave vectors with a global coverage. Feasibility and Preliminary Design phases (A/B phases) were successfully achieved from 2006 until 2009. The project started Detailed Design phase C beginning of 2011 which will be immediately followed by the Manufacturing Phase D in mid-2013. The launch and the Assessment Phase completion should lead to deliver a fully validated system on orbit in 2015.

The primary objective of CFOSAT is to monitor ocean surface winds and waves so as to improve: wind and wave forecast for marine meteorology, ocean dynamics modeling and prediction, climate variability knowledge, fundamental knowledge of surface processes, etc. As an opportunity, CFOSAT will also be used to complement other satellite missions for the estimation of land surface parameters (in particular soil moisture and soil roughness), and polar ice sheet characteristics. The satellite embarks two payloads; both are Ku-band (13.2 to 13.6 GHz) radar scanning around the vertical axis:

- the wave scatterometer SWIM, a rotating 6-beams radar at small incidence (0 to 10) ,
- the wind scatterometer SCAT, a fan-beam radar at larger incidence angles (45 and 49).

In this paper, after a short presentation of the CFOSAT mission and the associated scientific requirements, a focus on the wave scatterometer SWIM (Surface Wave Investigation and Monitoring) instrument, developed by Thalès Alenia Space under CNES contract, will be done. The main objective of SWIM is to provide directional wave spectra. SWIM is a Ku-band real aperture radar. It illuminates the surface sequentially with 6 incidence angles: 0, 2, 4, 6, 8 and 10 with an antenna aperture of approximately 2. In order to acquire data in all azimuth orientations, the antenna is rotating at a speed rate of 5.6 rpm. The six beams enable to measure several geophysical parameters:

- all beams: estimation of backscattering coefficient profiles from 0 to 10 of each surface,
- nadir beam (0): estimation of SWH and wind sea surface, similarly as nadir altimeter,
- 6, 8 and 10 (spectrum beams): estimation of the 2D wave spectra.