

## THE CIRCULAR TRAJECTORY OPTION FOR A FULL SEA CLUTTER AND SHIP SIGNATURE CHARACTERISATION AT L AND X BAND.

*S. Angelliaume<sup>(1)</sup>, J.-F. Nouvel<sup>(1)</sup>, H. Oriot<sup>(1)</sup>, P. Dubois-Fernandez<sup>(1)</sup>, O. du Plessis<sup>(1)</sup>  
Ph. Durand<sup>(2)</sup>, V. Foix<sup>(2)</sup>*

<sup>(1)</sup> ONERA, Salon de Provence – France

<sup>(2)</sup> CNES, Toulouse – France

[Sebastien.Angelliaume@onera.fr](mailto:Sebastien.Angelliaume@onera.fr)

### ABSTRACT

Maritime survey and observation of non-cooperative ships become very important in the current context and spaceborne SAR systems could be used to detect and monitor them. As such, to allow observation of non-cooperative boats with temporal revisits compatible with the objectives of responsiveness of maritime surveillance, the proposed solutions generally moved towards radar operating at very wide swath, which implies grazing conditions of acquisition. But the availability of experimental radar data acquired in such settings is limited.

In collaboration with CNES, a campaign of acquisition using SETHI, the new airborne SAR system developed by the ONERA - the French Aerospace Lab, will take place during the beginning of February 2009 in order to improve the understanding of radar backscatter at grazing angles. The main objective of this dedicated campaign of acquisitions over the Mediterranean Sea, in south of France, is to make very precise measurement of sea clutter and ship backscattered coefficient for numerous conditions of acquisition and to study the potentiality of SAR system for boat detection. During the campaign, a dedicated ship of about ten meters in length will be placed in the region of measurement. Moreover, acquisitions will be made on the maritime road leading to the oil terminal of Fos-sur-Mer and around marinas in order to image non-cooperative ships. The main features of the campaign are the following:

- Three flights between a few days done so as to acquire data with different sea states.
- During each flight, data will be acquired for three incidence angles: steep (50°), intermediate (20°) and grazing (3°).
- SAR images will be acquired at X and L band simultaneously. The X band data are dual polarization data, and L band data are full polarization data.
- The trajectory of most of the data will be circular in order to make measurements over the full 360° azimuth range.

Finally, all the data collected during this campaign will allow us to study the influence of many parameters on the value of sea clutter and the backscatter coefficient of a boat: sea state (wind speed), frequency band, polarization state, incidence angle and more particularly in the grazing configuration, observation angle (compared to the orientation of the cooperative ship and the direction of waves), size of the boat, ...

We will start by describing the sensor, SETHI, and its capability. Then we will detail the acquisition campaign: the flight configuration and the data acquisition, the regions of interest, the in-situ measurements and notes ... Finally, results obtained with the campaign will be presented in a third part: backscattered coefficient of ships, sea clutter measurement and finally detection capability of a boat depending on the parameters of the acquisition.