MONITORING INUNDATION DYNAMICS IN PARANÁ RIVER, ARGENTINA, 
BY C AND L BAND SAR

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ABSTRACT

The Paraná Delta is a region stretching through the final 300 km of the Paraná river basin, covering approximately 17,500 km² [Kandus et al., 2006] and is located between 32°05’S, 60°48’W, and 34°29’S, 58°30’W, close to the city of Buenos Aires. It is a vast macro-mosaic of wetland types, and has a complex hydrological regime determined by the influence of the Paraná and Uruguay rivers and De La Plata estuary. The De La Plata estuary is primarily responsible for the regular flooding of the downstream portion of the region. In this case, the combined effects of wind and tides result in frequent but short (hours-long or day-long) floods. The regime of the Paraná river is determined mainly by the precipitations that take place across its whole watershed, producing seasonal floods that affect the whole region.

In spite of the recognized importance of wetlands and the large volume of satellite observations available, the potential of satellite techniques to detect inundated wetlands and to quantify their seasonal and spatial dynamics has not yet been systematically assessed. Estimates of inundation in vegetated areas are even more difficult to determine and few publications address this complex subject.

This paper analyses the SAR response of wetland ecosystems under different environmental conditions and at two different frequencies. To this aim, we exploited the opportunity of observing the same inundation phenomena by two currently available SAR systems, such as ENVISAT ASAR (C band) and ALOS Palsar (L band). The main question we addressed is if it is also possible to map the changes in water level below vegetation, in which cases and for what type of ecosystems.

It is well known that depending on vegetation structure and soil condition, it is possible to observe strong changes in the SAR response. A typical flooded area will be seen dark in the image, but a flooded forest may be observed as a bright target in the same flood event. Combining observations and interaction models, we discuss which are the differences in the categories that can be discriminated in a flooding event between C and L bands.

The results obtained for C band are similar to the ones reported previously in the same area [1]. Increasing water level is characterized by an increase and then a decrease in the backscattering coefficient of vegetation. An increase when water level changes the soil from saturated to flooded condition and a decrease when the water covers the vegetation. It has been shown using interaction models how this complex behavior is a function of vegetation type and structure (forest, marsh) and observation parameters (frequency, incidence angle) [2].
The new ALOS Palsar L Band results shown in this work generally agree with what is expected from model simulations and previous results from literature. In marshes, the increase in the water level is always seen as a decrease in the backscattering coefficient, since the reduction of emerged biomass reduces the available mater for the wave to interact with. In forest, an increase in water level (from a saturated soil to a flooded one) is related to an increase in the backscattering coefficient, since the soil-trunk interaction mechanism becomes dominant. Models simulations relate this increase to the increase in soil reflectivity.

In this paper, we discuss the different and complementary information contained in the wetland images of the different sensors (different frequencies), and how this information could be used to derive a more reliable water level map of the wetland.

REFERENCES
