



Analysis of surface water flow in a tropical floodplain in Colombia using InSAR techniques

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Surface water flows in floodplains of large tropical rivers are difficult to study and model due to the lack of hydrologic stations, especially in remote areas where access is limited. Interferometric Synthetic Aperture Radar (InSAR) has been used to estimate water level changes in wetlands with promising results, presenting great potential for the analysis of surface water flow. The present study focuses in the floodplains of the Atrato River basin, Colombia, one of the rainiest and most biodiverse ecosystems in the world. The expansion of agricultural and mining activities in the area have put at risk these ecosystems and a detailed knowledge of the hydrologic dynamics is fundamental for the implementation of adequate management and conservation strategies. In the present study, we used SAR interferometry from ALOS-PALSAR data between 2008 and 2010 to analyze the spatial distribution and temporal fluctuations of surface water flow and evaluate the conditions of hydrological connectivity in the area. We found that in the lower part of the basin, floodplain flow and water level are conditioned by fluctuations in the level of the main channel, while in the middle part of the basin, the topography and tributaries are the main regulators of surface water flow. In addition, we found that change in water level upstream is explained by up to 82% of the phase difference in the floodplain obtained from the interferograms, indicating adequate hydrological connectivity and characterizing nearly “pristine” hydrological conditions. This study constitutes the first analysis with InSAR techniques for the study area, and provides valuable information required to understand the complex spatial and temporal patterns of surface water flow that here occur.