

USE OF DUAL SEASON JERS-1 SAR MOSAICS AND FUZZY LOGIC TO OIL SPILL ENVIRONMENTAL SENSITIVITY INDEX MAPPING IN CENTRAL AMAZONIA

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ABSTRACT: This work introduces an innovative approach using time series of JERS-1 SAR images to develop a Temporal Environmental Sensitivity Index for fluvial oil spills (ISAT) designed to consider hydrological variations in Central Amazonia. Radar mosaics derived from the Global Rain Forest Mapping Project (GRFM), for the dry (September 1995) and wet (May 1996) seasons, were used for this purpose. In the study area (Coari Terminal, Amazonas State), water level varies up to 14 meters, inducing landscape changes that are vastly distributed in space, mostly from dry forest in the dry season to flooded forest, in the wet season. The USTC algorithm (Unsupervised Semivariogram Textural Classifier) was applied to discriminate the following cover types: water, flooded vegetation, flooded forest, and dry forest. Maps depicting these classes were made for each season and then overlaid, thus generating sixteen classes of landscape change. A risk analysis method using linguistic rules of the “if-then” type was used to remap the landscape change, yielding new maps for classes of confidence and severity of change. These rule-sets constituted the basis for the construction of a risk matrix and for the definition of ISAT. Membership functions were used to define fuzzy boundaries for the landscape change classes. This procedure was based on ISAT calculations considering average backscatter values in the dual season GRFM mosaics for each of those classes. The final product consisted of ISAT maps for exponents $m=1,2$ and $m=1,8$. The results demonstrate the potential of the proposed methodology for operational use in oil spill monitoring systems in Central Amazonia.

KEYWORDS: JERS-1 SAR, Environmental Sensitivity Index, Amazonia.