ASSEMBLY OF AN INUNDATED WETLANDS EARTH SYSTEM DATA RECORD: GLOBAL MONITORING OF WETLANDS EXTENT AND DYNAMICS

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1. ABSTRACT

Wetlands exert major impacts on global biogeochemistry, hydrology, and biological diversity. The extent and seasonal, interannual, and decadal variation of inundated wetland areas play key roles in ecosystem dynamics. Despite the importance of these environments in the global cycling of carbon and water and to current and future climate, the extent and dynamics of global wetlands remain poorly characterized and modeled**,** primarily because of the scarcity of suitable regional-to-global remote-sensing data for characterizing their distribution and dynamics. Spaceborne microwave remote sensing offers effective tools for characterizing wetlands since it is particularly sensitive to surface water and to vegetation structure, and it allows monitoring large inaccessible areas on a temporal basis regardless of atmospheric conditions or solar illumination.

As part of a NASA Earth science project, we are constructing a global-scale Earth System Data Record (ESDR) of inundated wetlands to facilitate investigations on their role in climate, biogeochemistry, hydrology, and biodiversity. The ESDR is comprised of two complementary components. The first component consists of fine-resolution, 100 meter, maps of wetland extent, vegetation type, and seasonal inundation dynamics, derived from Synthetic Aperture Radar (SAR) for continental-scale areas covering crucial wetland regions. For the contemporary-era mapping we will utilize newly available data (HH/HV) from the Phase Array L-Band SAR (PALSAR) sensor mounted on the Advanced Land Observing Satellite (ALOS). This satellite, built and operated by the Japanese Space Agency (JAXA), has been collecting data since early 2006. The wetland products will be generated using legacy algorithms already developed and tested with similar datasets. The algorithms are based on an object-oriented image segmentation approach and a statistically based decision tree classifier [1]. This approach follows directly from previous work on mapping of tropical and boreal wetlands with SAR data from the Japanese Earth Resources (JERS-1) satellite [2] [3] [4] [5].

The second component is comprised of global monthly mappings of inundation extent at ~25 km resolution. These products will be derived from multiple satellite remote sensing observations including coarse resolution passive and active microwave sensors and optical data sets (e.g. ERS and SeaWinds-on-QuikSCAT scatterometers, AVHRR, MODIS) optimized specifically for inundation detection. A

clustering model and a mixture model comprise the classification and fractional inundation calculations of the algorithm used [6] [7]. The monthly data will be used to construct annual summary products, including maximum spatial distribution and area, and annual inundation duration of inundated wetlands. Comparative analyses of the high-resolution mosaic products and low-resolution inundation mappings will be conducted to harmonize the ESDR components.

We will incorporate the 100-meter SAR based datasets of wetland features to validate and quantify the accuracy of the lower resolution datasets to ensure consistency within the ESDR products. Accuracy assessment of the fine scale regional wetlands data sets will take advantage of high-resolution wetlands maps available through collaborators.

We present details of ESDR construction including remote sensing algorithm application, cross-product harmonization, and planned data set distribution. The status of current efforts to assemble this ESDR, including data processing, wetland classification efforts, and open water change mappings derived from L-band data for the state of Alaska and select basins in Eurasia are presented. This ESDR will provide the first accurate, consistent and comprehensive global-scale data set of wetland inundation and vegetation, including continental-scale multi-temporal and multi-year monthly inundation dynamics at varying scales.

Portions of this work were carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

2. REFERENCES

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