Global Monitoring of Wetland Extent and Dynamics

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Wetlands exert major impacts on global biogeochemistry, hydrology, and biodiversity. The extent and seasonal, interannual, and decadal variation of inundated wetland area play key roles in ecosystem dynamics. Wetlands contribute approximately one fourth of the total methane annually emitted to the atmosphere and are identified as the primary contributor to interannual variations in the growth rate of atmospheric methane concentrations. Climate change is projected to have a pronounced effect on global wetlands through alterations in hydrologic regimes, with some changes already evident. In turn, climate-driven and anthropogenic changes to tropical and boreal peatlands have the potential to create significant feedbacks through release of large pools of soil carbon and effects on methanogenesis. 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.

We are constructing an Earth System Data Record (ESDR) of Inundated Wetlands to facilitate investigations on the role of inundated wetlands in climate, biogeochemistry, hydrology, and biodiversity. The ESDR will enable advances in understanding the role of wetlands in 1) global cycling of methane, carbon dioxide and water, 2) interactions among climate, greenhouse-gas emissions, and water exchange, 3) climate change effects and feedbacks, 4) maintaining ecological health and biodiversity of critical habitats, and 5) management of water resources for long-term sustainability. The ESDR will provide the first accurate, consistent and comprehensive global-scale data set of wetland inundation and vegetation, including continental-scale temporal and multi-year inundation dynamics at multiple scales. Each component of the ESDR has been designed to facilitate a range of studies by addressing gaps in data and understanding of the role of inundated wetlands in important cycles and processes. The regional high-resolution component derived from the SAR observations provide key information needed for regional- to continental-scale studies focusing on biogeochemistry, hydrology, plant and animal biodiversity, water resource management, and long-term sustainability of wetland ecosystems. The monthly, ~25 km inundation data set, spanning almost two decades, represents a unique, comprehensive source of quantitative information to support analyses and modeling of wetlands in global cycling of methane, carbon dioxide and water, and in simulating interactions among climate, greenhouse-gas emissions, and water exchange for past, current and future time periods.

I. Regional inundated wetlands data sets from Synthetic Aperture Radar (SAR)

Harmonization of Data Products

Methodology: Wetlands vegetation mapping with PALSAR datasets

A decision tree classification approach is used to classify the SAR data. Ancillary datasets including DEMs and Landsat imagery may be included within the classification construct to support mappings of wetlands ecosystems. The classifications depict open water and principal vegetation classes (e.g. non-vegetated, herbaceous, shrub, woodland forest) and their associated inundation state. The examples shown here were generated from fine-beam PALSAR data provided through the K&C project and the AUIG.

Comparisons of aggregate high resolution ALOS PALSAR surface water fraction (open water plus inundated vegetation) with AMSR-E/QuikSCAT for July 11, 2006 across the Western Siberian Lowland transect.

ESDR Components:

1) Fine-resolution (100m) maps of wetland extent, vegetation type, and seasonal inundation dynamics, derived from ALOS PALSAR, for continental-scale areas covering crucial wetland regions.

2) Global mapping of inundation extent at ~25 km resolution and high temporal fidelity for 1992-2009, derived from multiple satellite observations.

Comparison and validation of these data sets will ensure self-consistency within the ESDR. Accuracy assessment of the ESDR regional inundated wetlands data sets takes advantage of high-resolution wetlands maps to be made available through K&C initiative collaborators.
As this is a poster aimed at JAXA management, use large and eye-catching PALSAR data.

If multi-pass, multi-temporal or mosaic data have been used, please use it to illustrate the regional-scale aspect of your results (which is what makes K&C different from the PI programme).