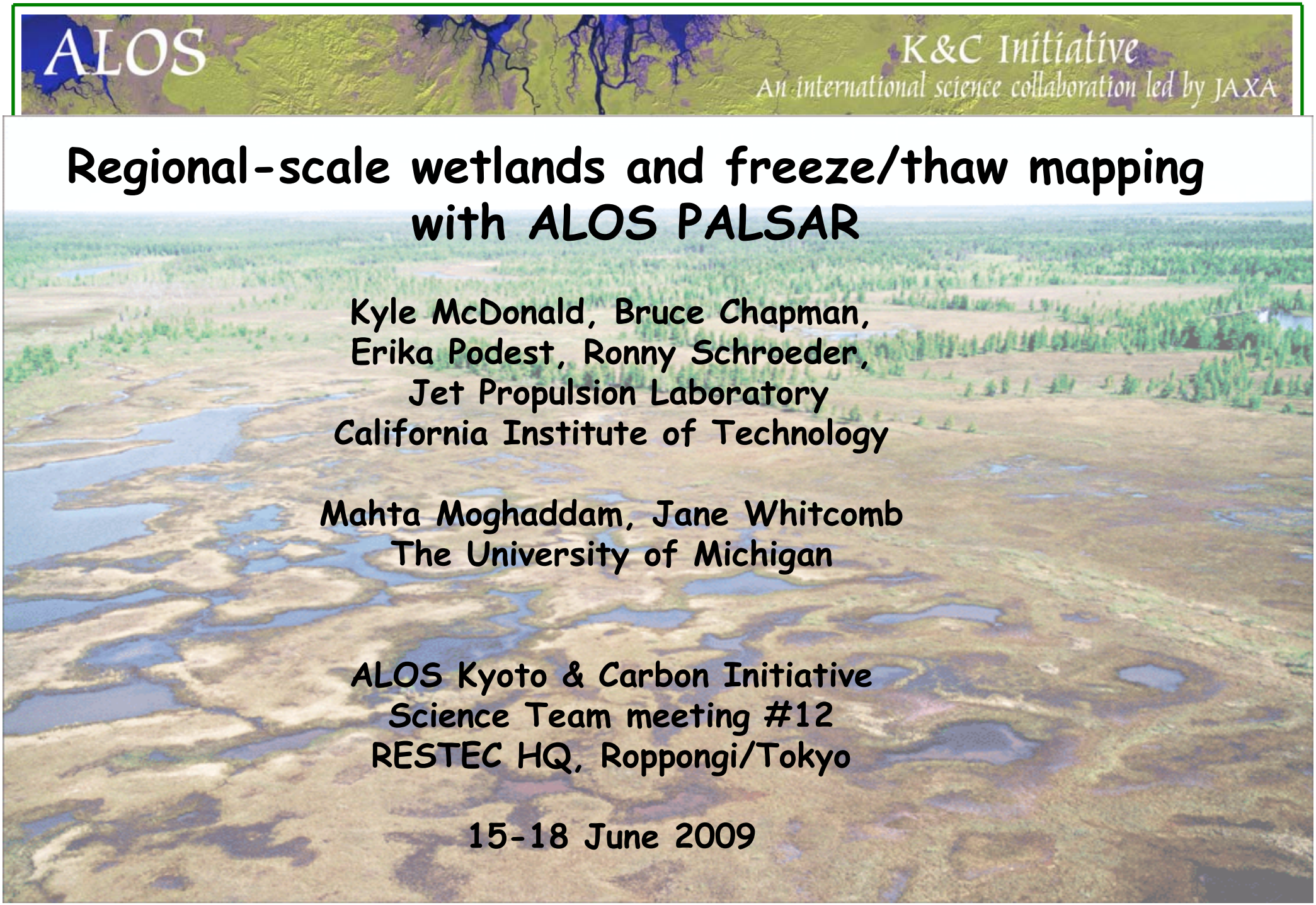

Regional-scale wetlands and freeze/thaw mapping with ALOS PALSAR

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Erika Podest, Ronny Schroeder,
Jet Propulsion Laboratory
California Institute of Technology

Mahta Moghaddam, Jane Whitcomb
The University of Michigan

ALOS Kyoto & Carbon Initiative
Science Team meeting #12
RESTEC HQ, Roppongi/Tokyo

15-18 June 2009

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An Inundated Wetlands Earth System Data Record: Global Monitoring of Wetland Extent and Dynamics

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Nick Davidson (Ramsar)
Lisa Rebelo
(International Water Management Institute)
Martti Hallikainen
(Helsinki University of Technology)

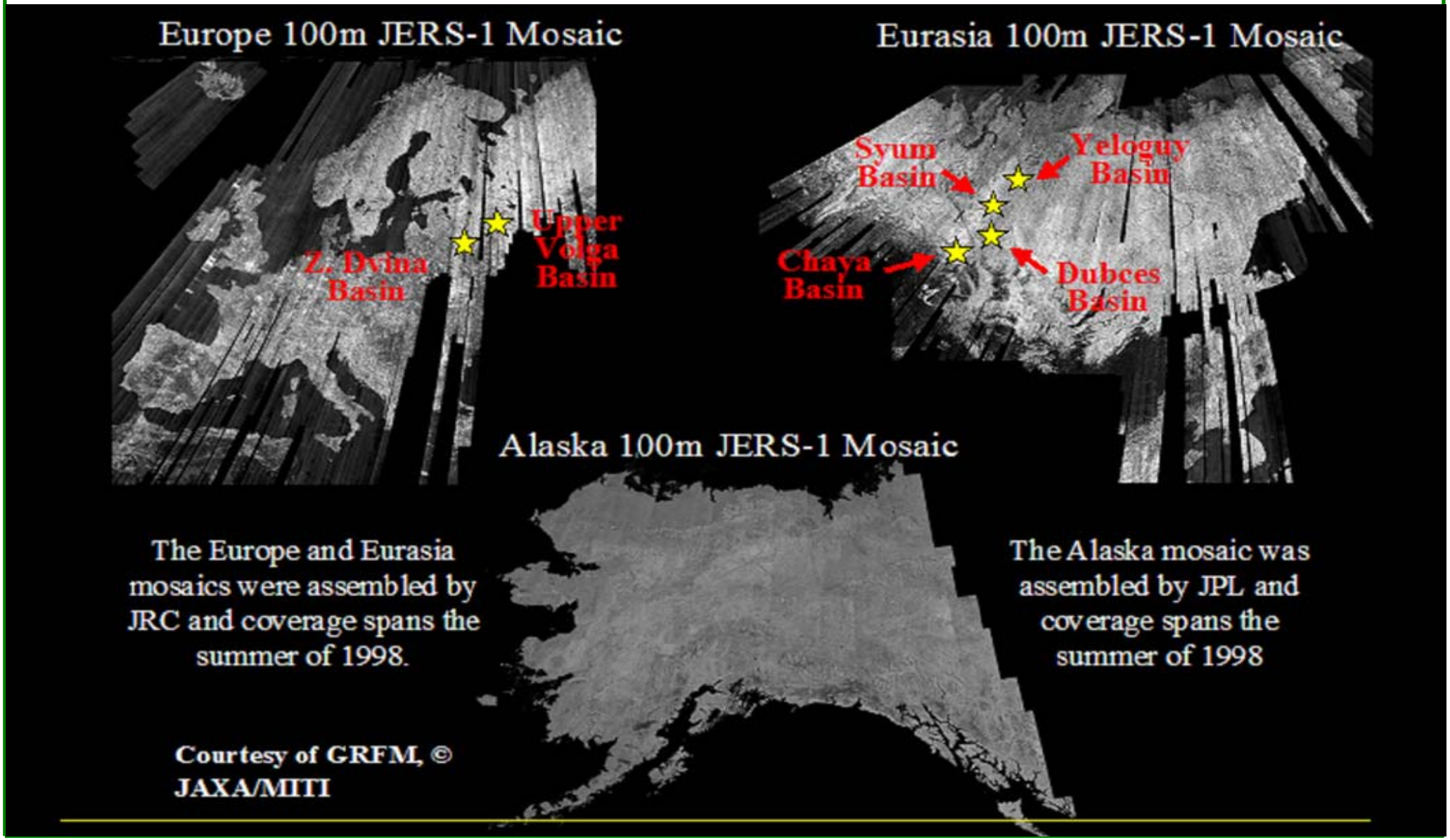
Components of the Inundated Wetlands Earth System Data Record

I. Regional inundated wetlands data sets from Synthetic Aperture Radar (SAR)
- Spatial coverage: Major global wetland regions, 100m resolution
- Temporal coverage: 1-2 year time series at 17-to-46 day intervals during 2006-2009 † ‡
- Retrospective 1990's-era from archived JERS data covering Alaska, Canada, Amazon
1. Wetland extent (maximum inundatal area, including water bodies).
2. Wetland vegetation type (Non-vegetated, Herbaceous, Shrub, Woodland, Forest).
3. Inundation state (Flooded, Non-flooded; 17-46 day intervals) ‡
4. Annual inundation duration

II. Global monthly inundation data sets derived from multiple satellite data sources
- Spatial coverage: Global, 25 km resolution (SSMI, ERS scatterometer, AVHRR, AMSR-E, MODIS, QuikSCAT)
- Temporal coverage: Monthly monitoring with annual summaries, 1992-2009 †
1. Globally gridded (0.25º) monthly inundated area fraction
2. Globally gridded (0.25º) annual inundation duration

† The domain of the 25-km and 100-m data sets excludes permanently frozen regions and seasonally frozen landscapes during the frozen season, although data from frozen seasons is used to improve classification accuracy.

‡ PALSAR ScanSAR mode has 46-day exact repeat orbit with 17-day sub-cycles.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Europe 100m JERS-1 Mosaic
Z. Dvina Basin
Upper Volga Basin
Eurasia 100m JERS-1 Mosaic
Syum Basin
Yeloguy Basin
Chaya Basin
Dubces Basin
Alaska 100m JERS-1 Mosaic
The Europe and Eurasia mosaics were assembled by JRC and coverage spans the summer of 1998.
The Alaska mosaic was assembled by JPL and coverage spans the summer of 1998
Courtesy of GRFM, © JAXA/MITI

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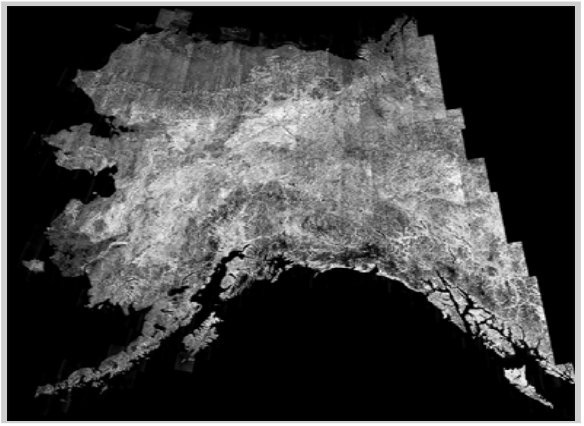
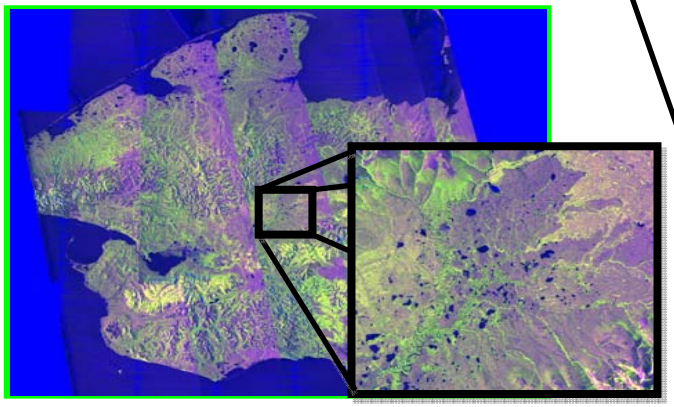
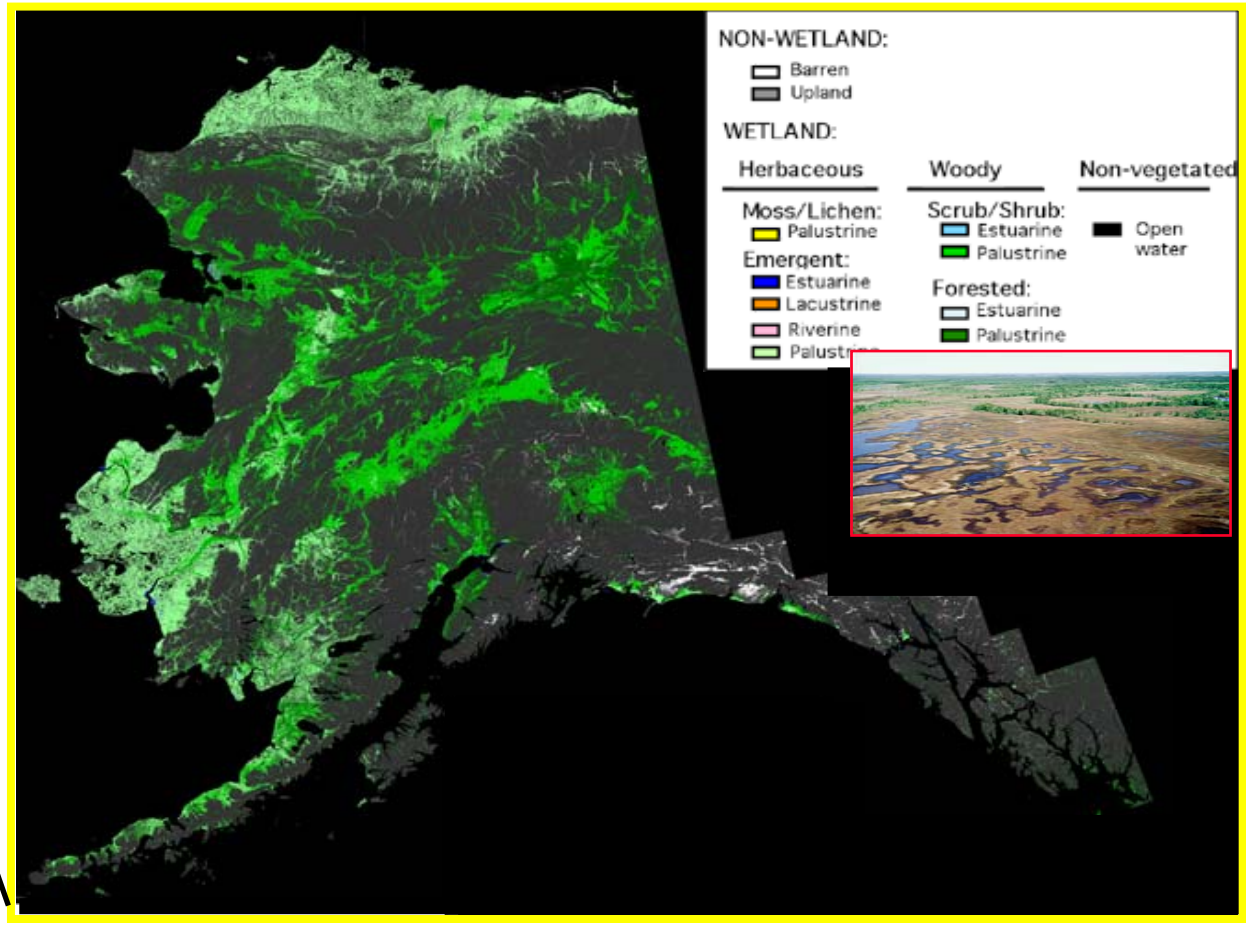
JERS-1 SAR Mosaic



ALOS PALSAR – Seward Peninsula

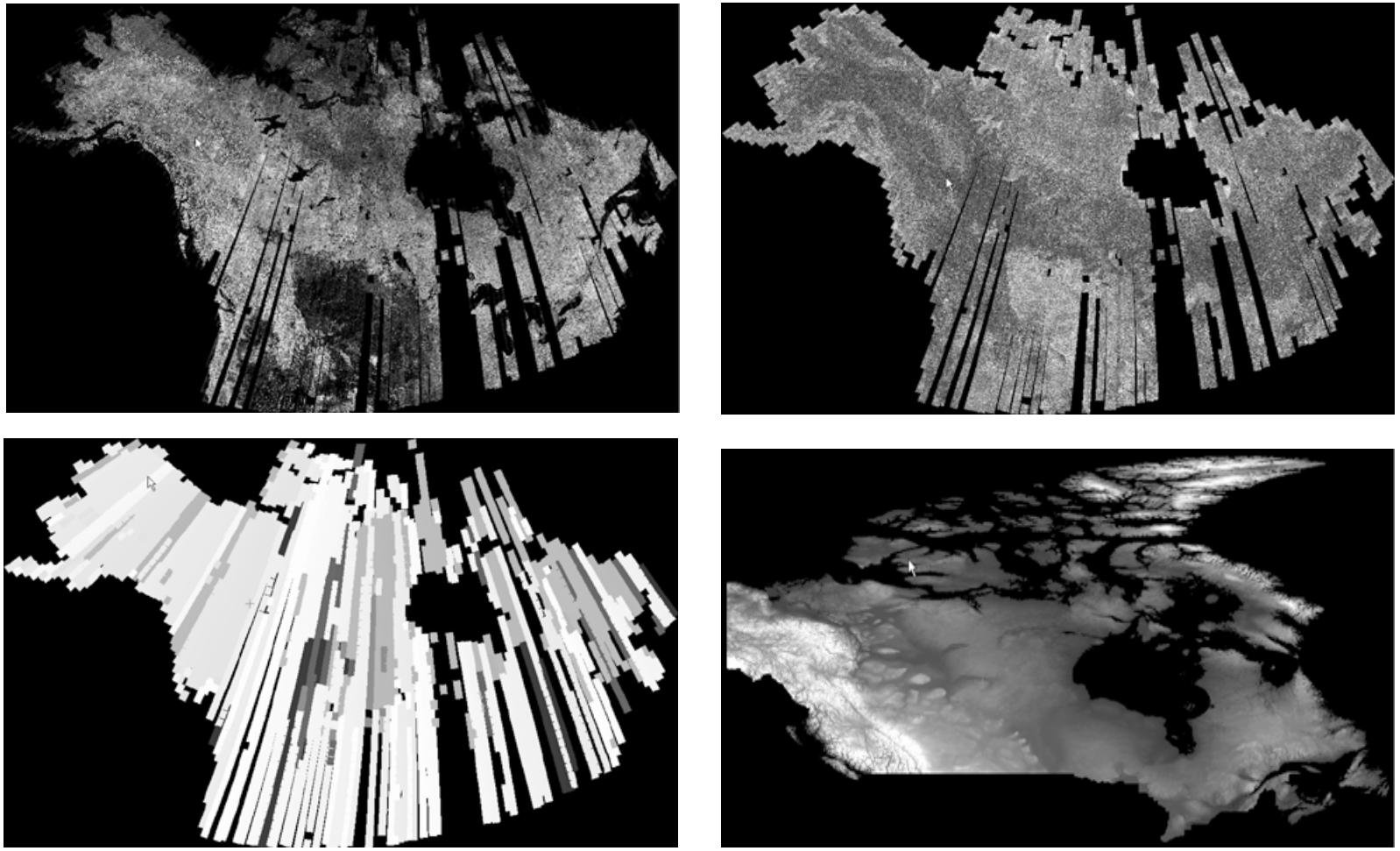


Red: HH
Green: HV
Blue: HH/HV
50m pixels

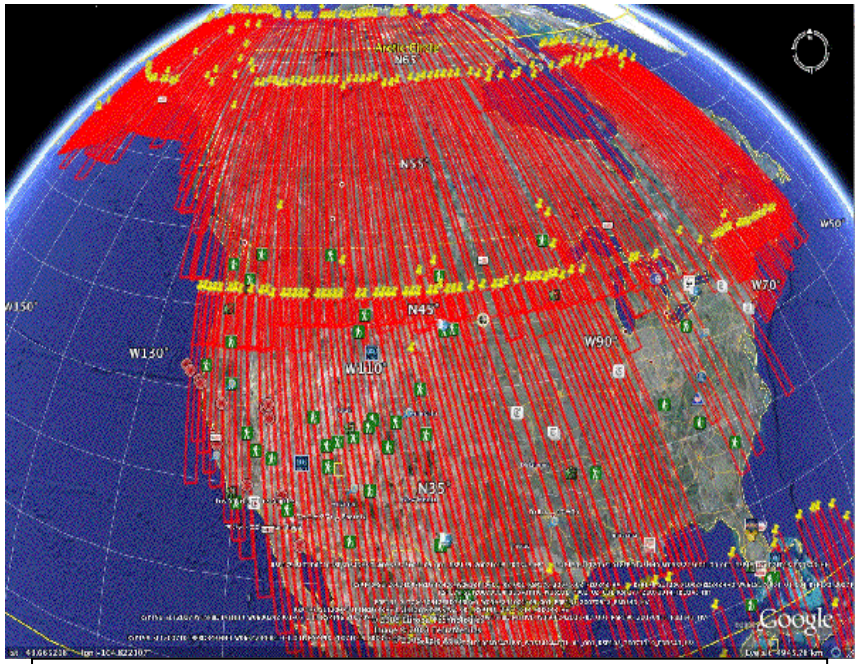


A 100-meter resolution wetlands map of Alaska has been developed using JERS-1 SAR imagery. A statistically based decision tree classification scheme was applied using multiple data layers to develop the regional-scale map. Data layers employed include maps of wetlands ground reference data, DEM, JERS SAR-based open water maps, SAR acquisition date, and image texture.

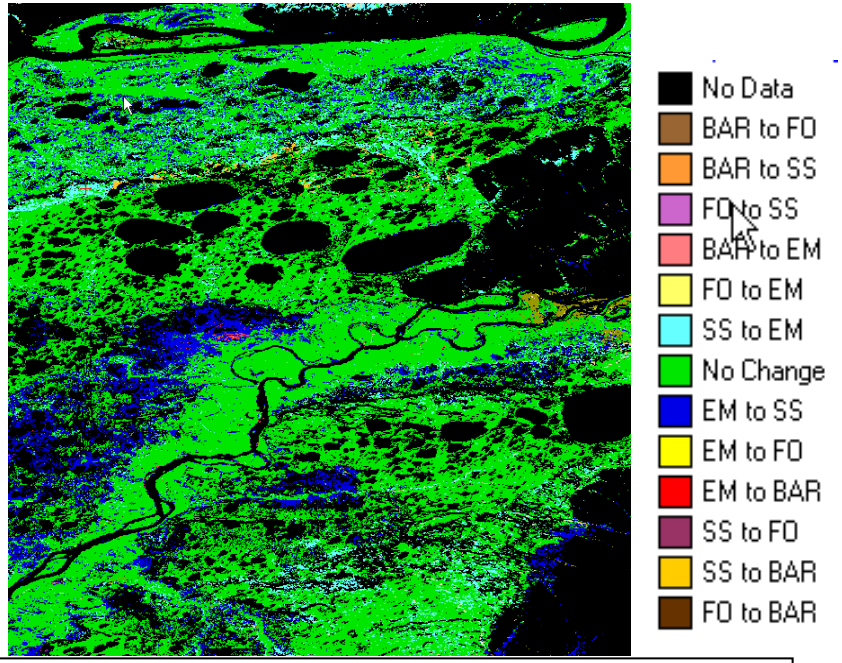
Whitcomb, Moghaddam, McDonald, Kellndorfer, and Podest, 2009



(a) JERS summer image mosaic, (b) JERS summer texture mosaic, (c) JERS date-of-acquisition ancillary layer, (d) Canada DEM.



PALSAR dual-pol coverage and processed data over nrth America, acquired in 2007.

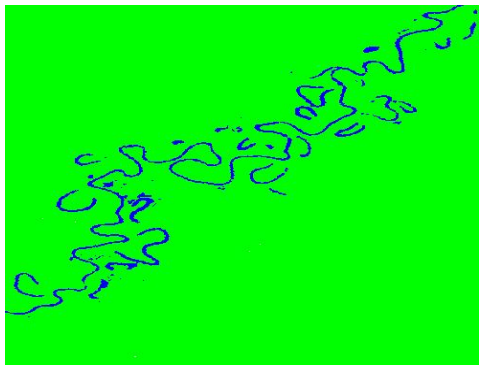
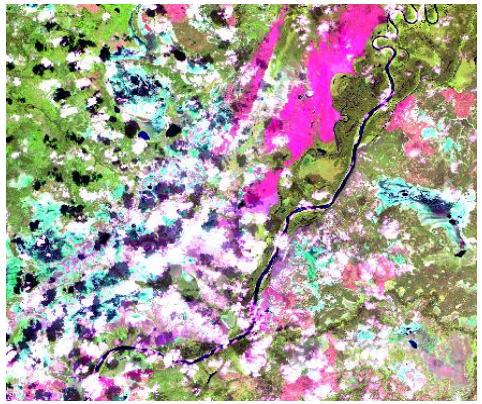
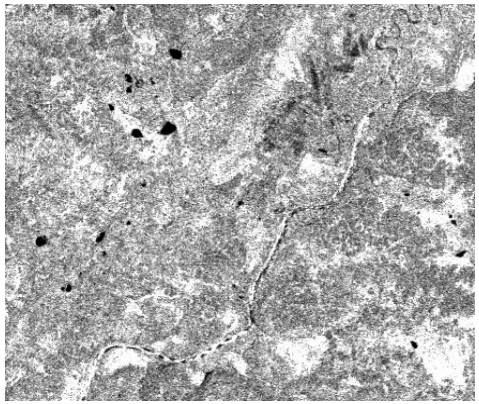
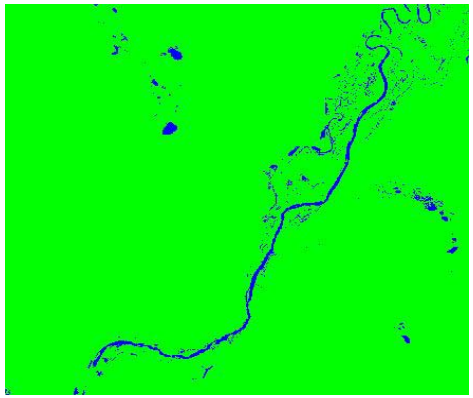


Decadal change in vegetated wetlands in a region within the Seward Peninsula, western Alaska. BAR=barren, FO=forested, SS=scrub/shrub, EM=emergent.

Synergy Between Radar and Optical Data

Landsat | **Palsar** | **Open Water Product**



At L-band, open water appears dark. Areas with little or no vegetation also appear dark and may be confused as open water. Optical wavelengths can differentiate bare surfaces from open water. However, cloud coverage is a common problem with optical data whereas radar data is impartial to it. The synergistic use of optical and radar data is of great advantage for detecting open water.

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Palsar

Landsat

DEM

NDVI

Slope

Landsat/Palsar Fused

Chaya Basin

Images and derived products have been coregistered to a common projection and 30 meter resolution.

Image Segmentation, Training data

eCognition.

Decision Tree Classifier

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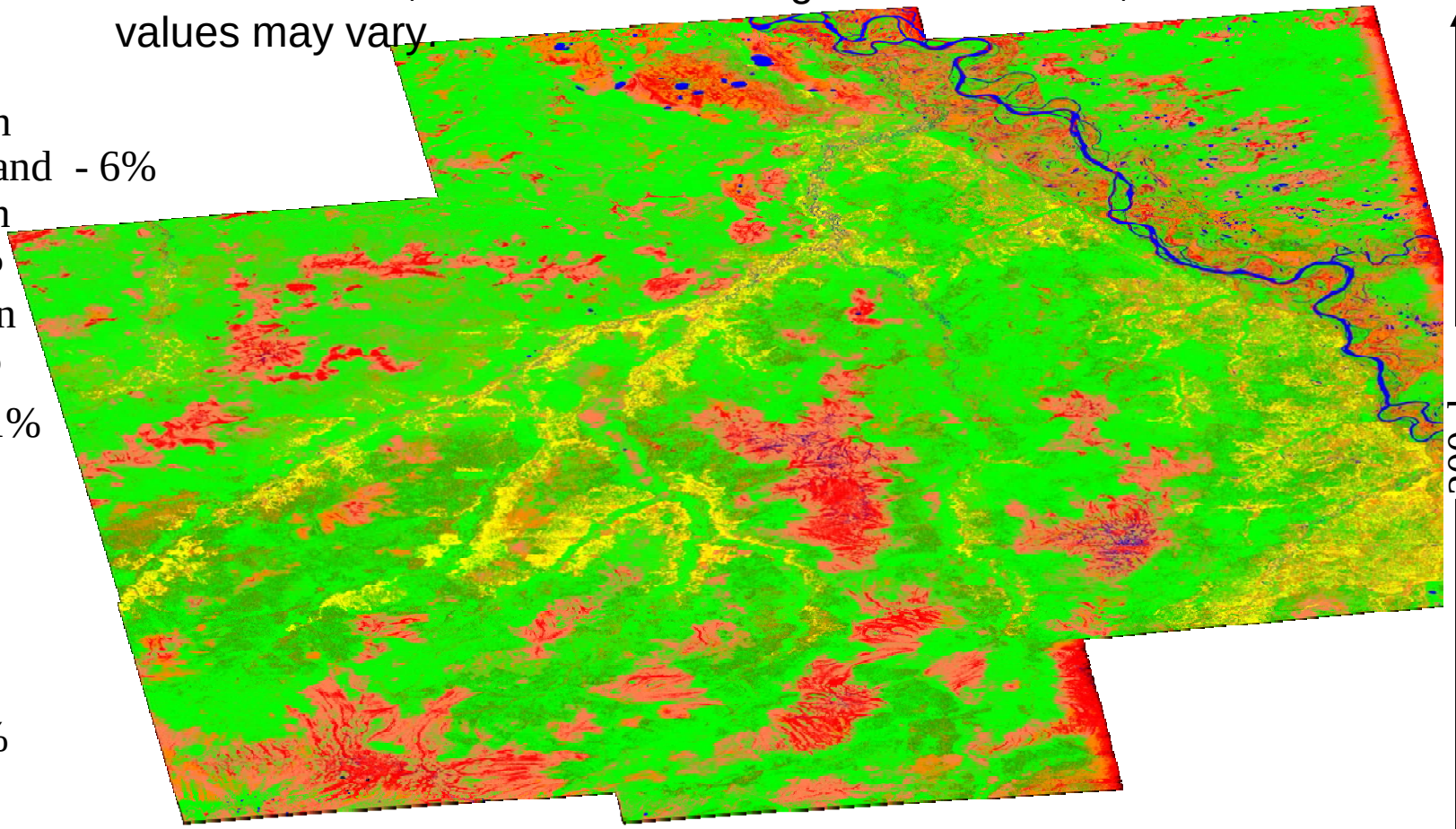
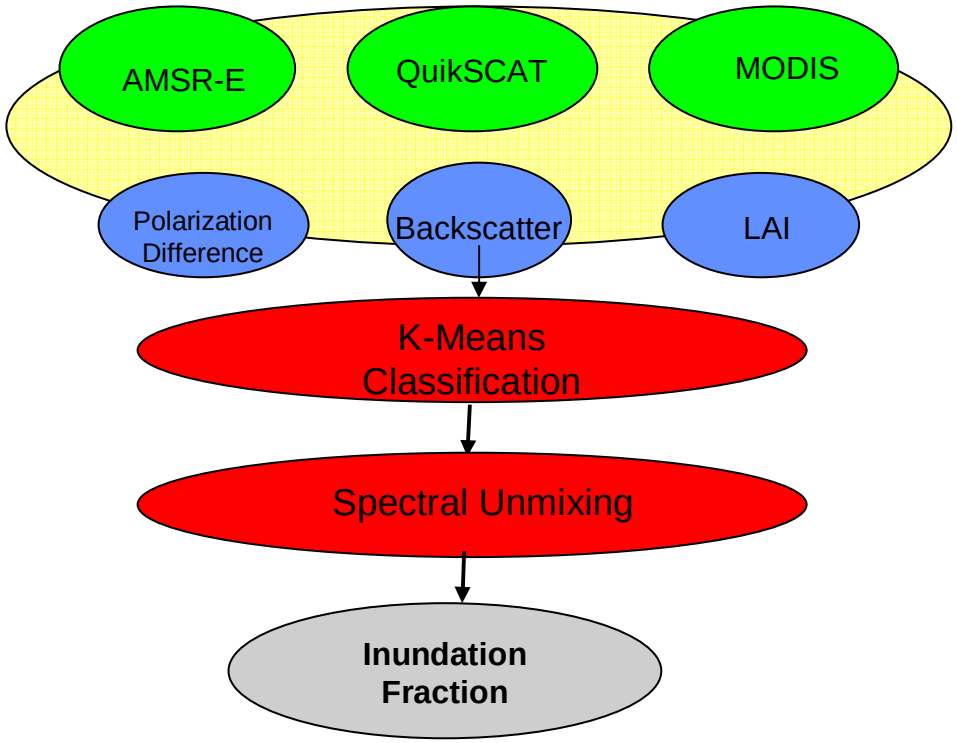
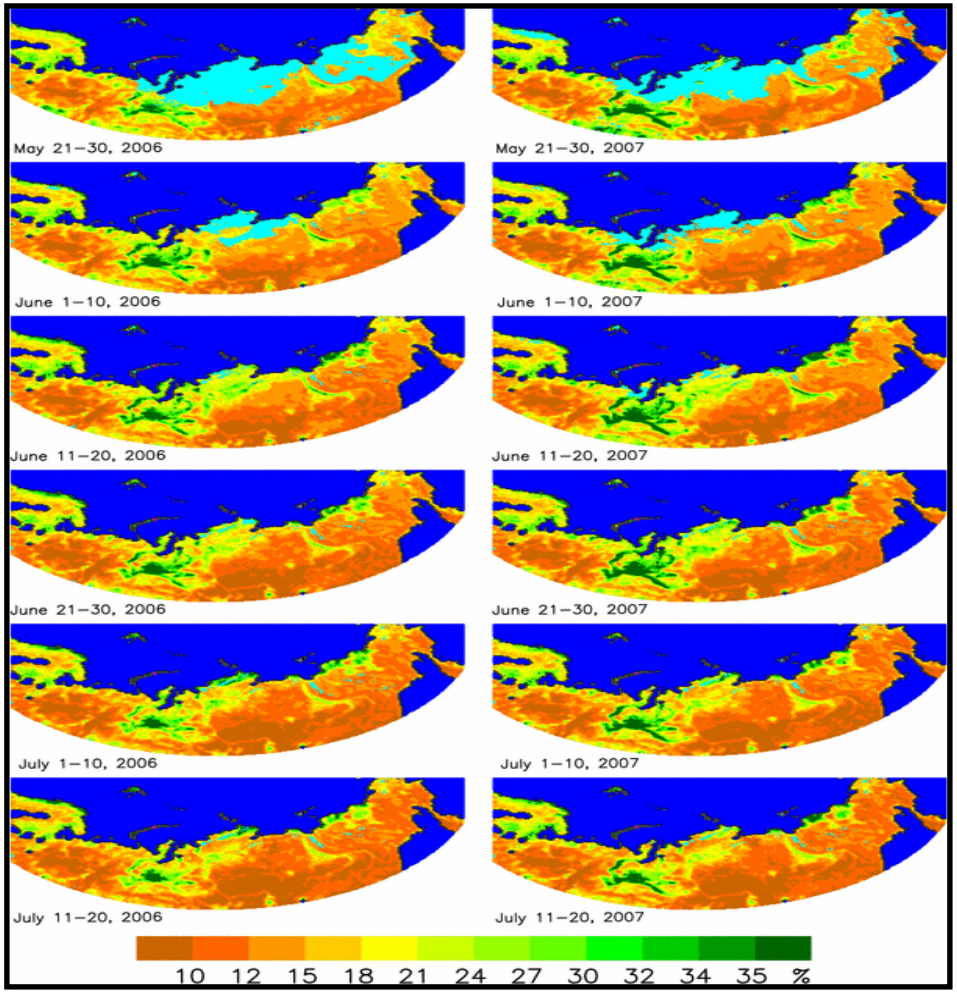
Chaya Basin

Accuracy assessment was based on validation pixels not used for training. Accuracy varied between 2% and 20% according to class. However, because of limited ground truth data, these values may vary.



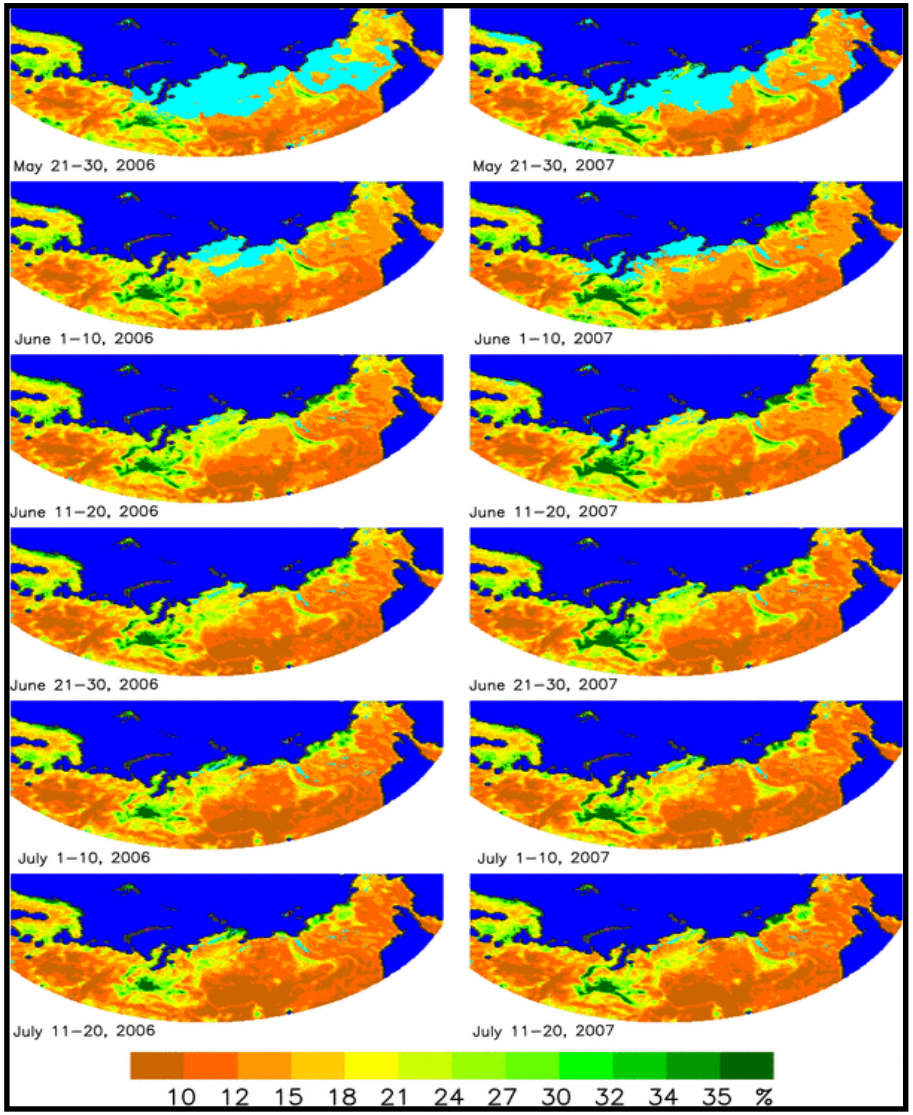
Global inundation data sets derived from multiple satellite data sources





Algorithm construct utilizing contemporary sources for derivation of monthly inundated area fraction data sets. Inundated area fraction employs data from multiple satellites to derive estimates of wetland extent and inundated area.

Northern Eurasia Inundation Fraction: 2006 – 2007



Comparison of ASMR-E/QSCAT with PALSAR