K&C 22, Phase 3 and 4:

Characterization of wetlands in Ethiopia and Sudan

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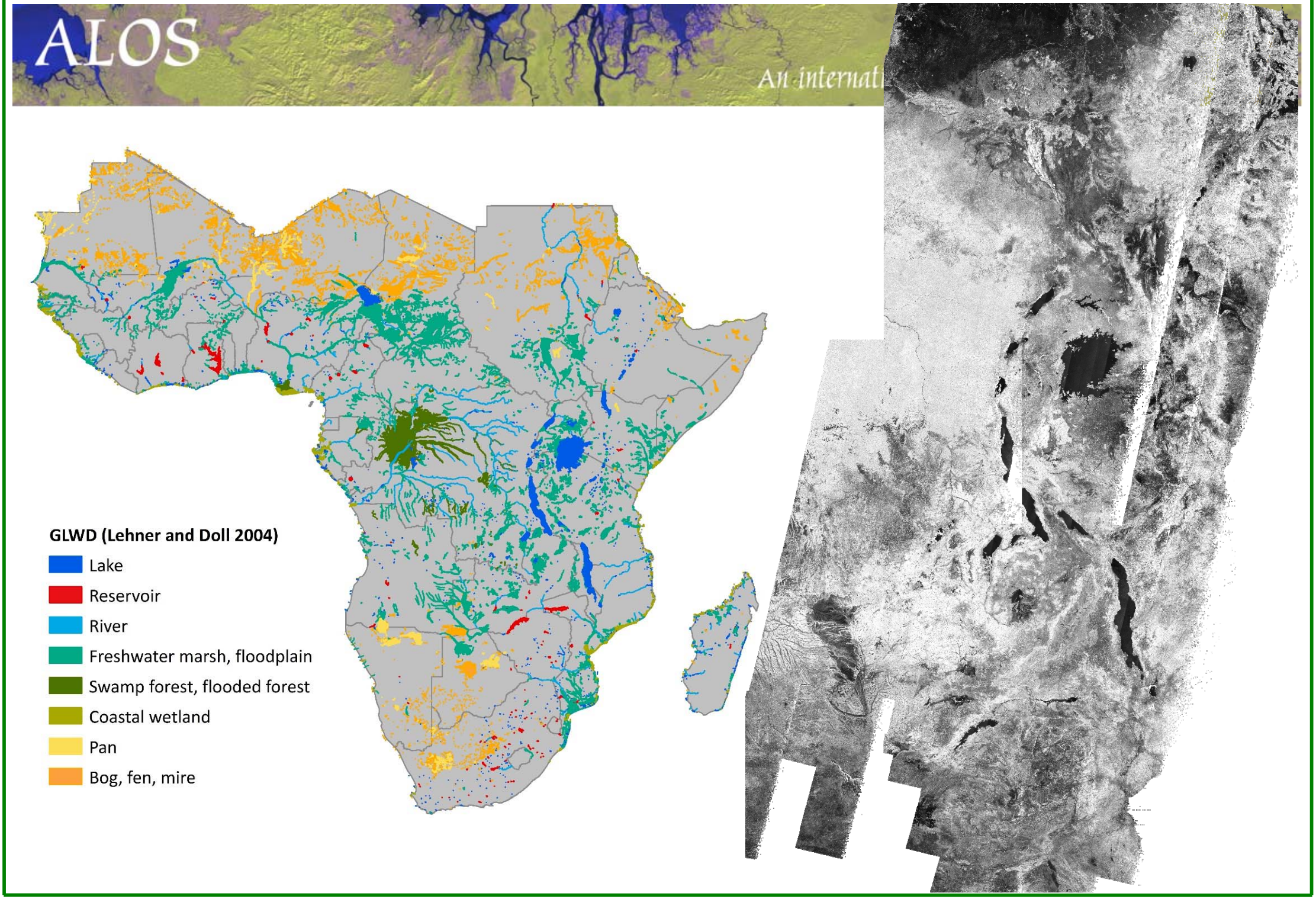
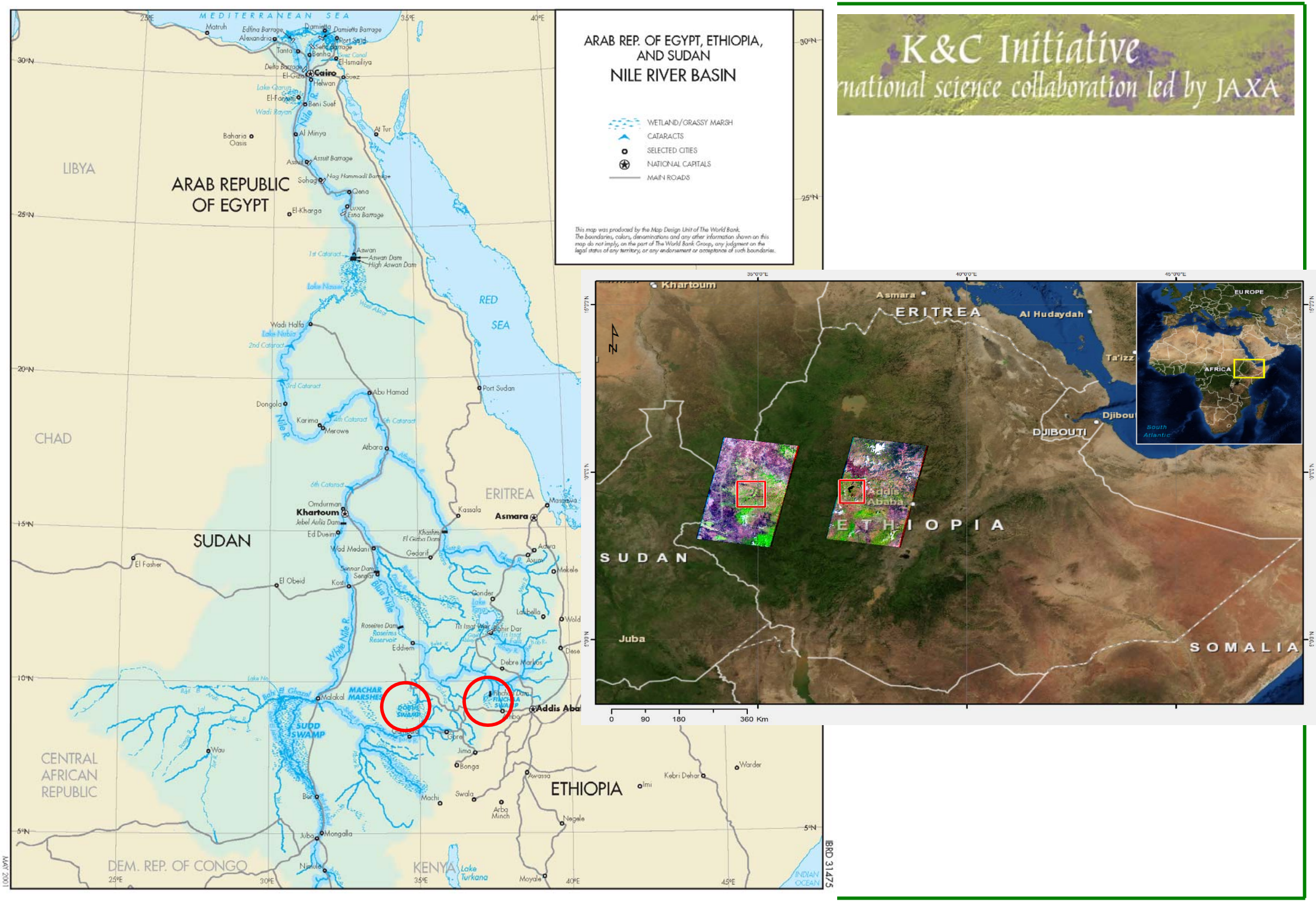
Science Team meeting #22
JAXA TKSC/RESTEC HQ, Tsukuba/Tokyo, February 2016


ALOS
An internat
GLWD (Lehner and Doll 2004)
Lake
Reservoir
River
Freshwater marsh, floodplain
Swamp forest, flooded forest
Coastal wetland
Pan
Bog, fen, mire



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- **Investigate the use of multi-source data (optical and SAR imagery, terrain data, vegetation and wetness indices, field data) for characterizing and mapping wetlands in the Ethiopian Highlands**
- **Evaluate the effectiveness of the Random Forest (RF) classifier for mapping broad wetland types in comparison to Maximum Likelihood and Neural Network classifiers**
- **Develop an understanding of the dynamics of wetland functioning in tropical ecosystems and their response and adaptation to natural factors and anthropogenic factors**

Data Type	Data Details	Year and Season
ALOS-PALSAR	Fine Beam Single mode (FBS), HH, 12.5 m , level 1.5 FB Dual mode, HH and HV, 12.5 m, level 1.5	2009, 2010, 2011 – Dry 2008, 2009, 2010 – Wet
ALOS-AVNIR	4 bands (B,G,R,NIR)	2009 – Dry
ALOS-PRISM	DSM 5 m res.	ALOS-PRISM
SRTM	DEM 90 m res.	
Landsat TM-5	6 bands (B,G,R,NIR, MIR5,MIR7), 30 m res.	2010 – Dry 2009, 2010, 2011 – Wet
Terrain Derivatives	Slope, Plan convexity, Min. curvature, etc.	Slope
Image Textures	Mean, Variance, Entropy, etc.	Landsat Variance:
Vegetation/ Water Indices	NDVI, EVI, EVI2, WDVI, etc.	

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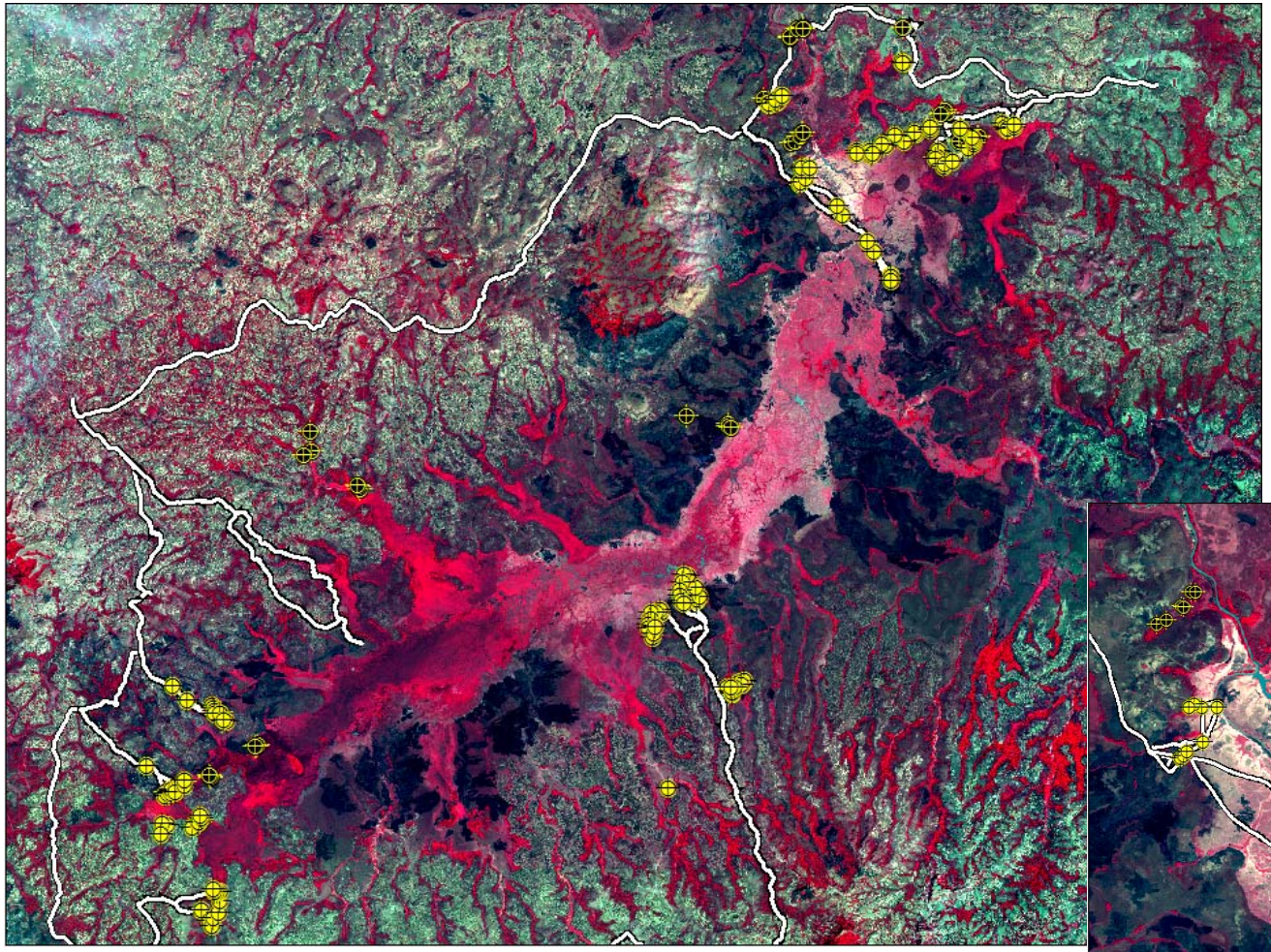
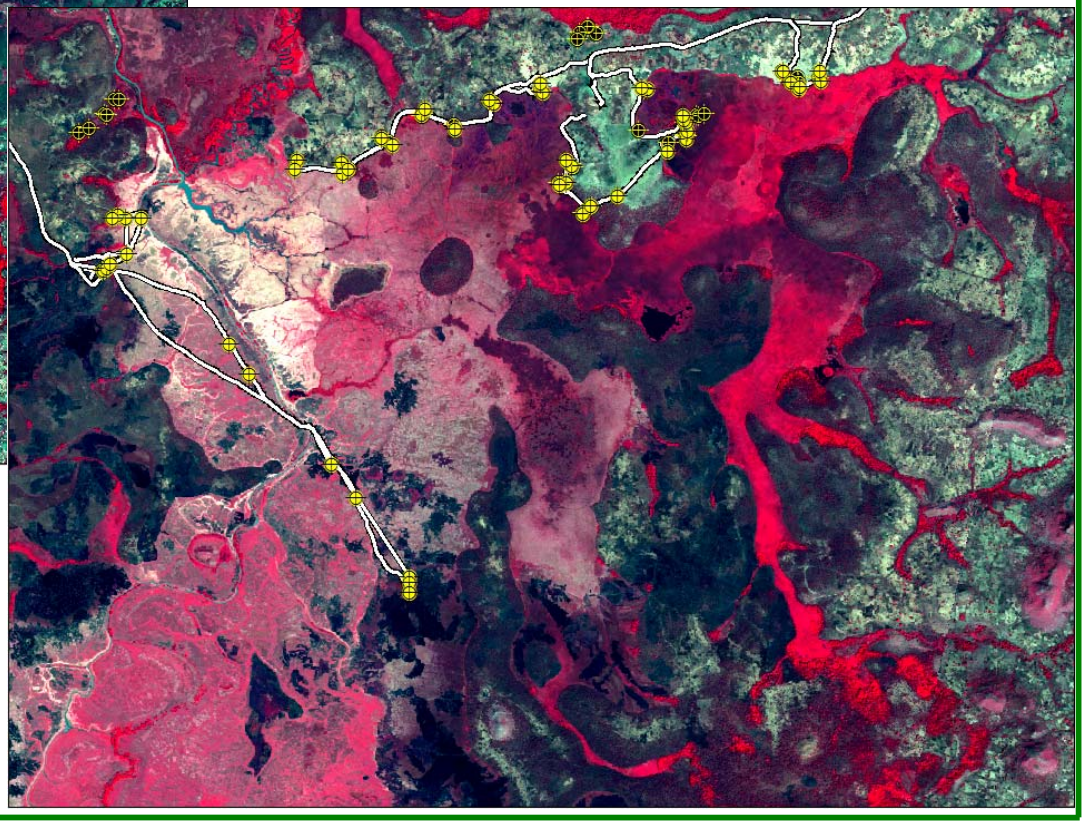
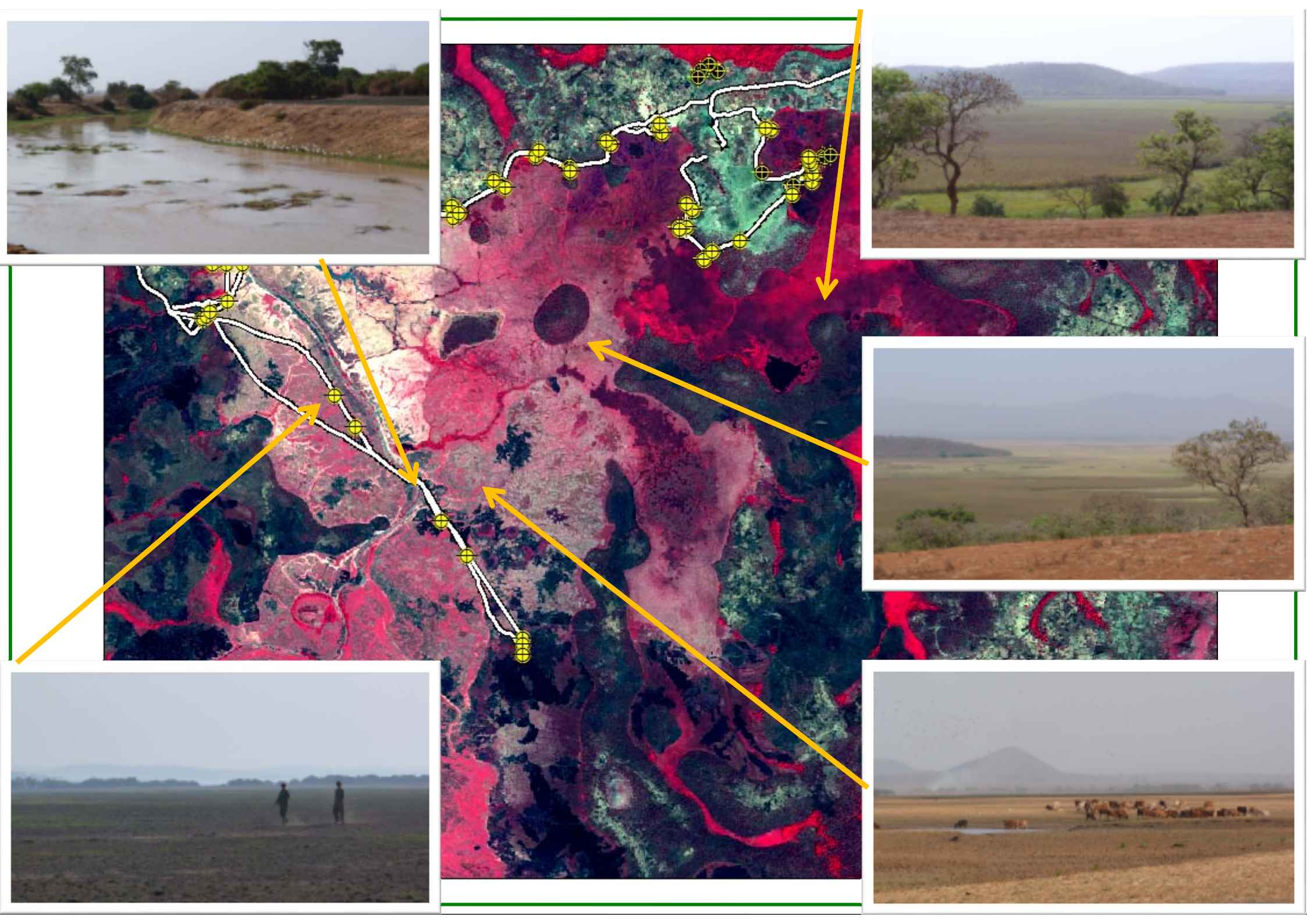


- Field surveys were conducted during the wet season in 2010 (August, September), and in the dry season in 2012 (March, April).



- 20×20m plots on transects from uplands to wet boundary at 'representative' and accessible sites
- Observations at each plot: Hydro- geomorphology and ecology, plant community composition and structure, land cover/use



Class and code	Description
Aquatic Bed (AB)	Open water, ponds and streams, permanent or seasonal
Wet Prairie / Meadow (WM)	Meadows dominated by Graminoids (including C_4 grasses), mixed with herbaceous species; may be difficult to distinguish from 'Sedge Meadow'
Marsh Emergent (ME)	Marsh areas dominated by sedges, medium to tall emergent communities, found in association with area dominated by tall, dense grasses
Papyrus Swamp (PS)	Swamp dominated by Papyrus cyperus, a 3-4m tall plant forming dense permanent extensive cover, found on waterlogged soils or floating mats.
Shrub Marsh (SM)	Area dominated by medium to tall Fabaceae shrubs forming mainly small patches found associated with Papyrus Swamp
Forested Wetland (FW)	Seasonally inundated Syzygium g. / Ficus spp. forest
Woodland (WDL)	Combretum c. /Terminalia b. woodland; Coffea arabica shrubs found in denser forested areas found along wetland boundaries
Forest (FOR)	Densely forested area, small patches mainly found in 'remote areas', i.e., higher altitudes (mountain tops), steep slopes, away from inhabited areas
Agriculture / Farmlands (AGR)	Area of crops dominated by maize/sorghum , guizotia v. (herbaceous), and tef grass
Open (OPE)	Open area dominated by bare land with sparse short grass

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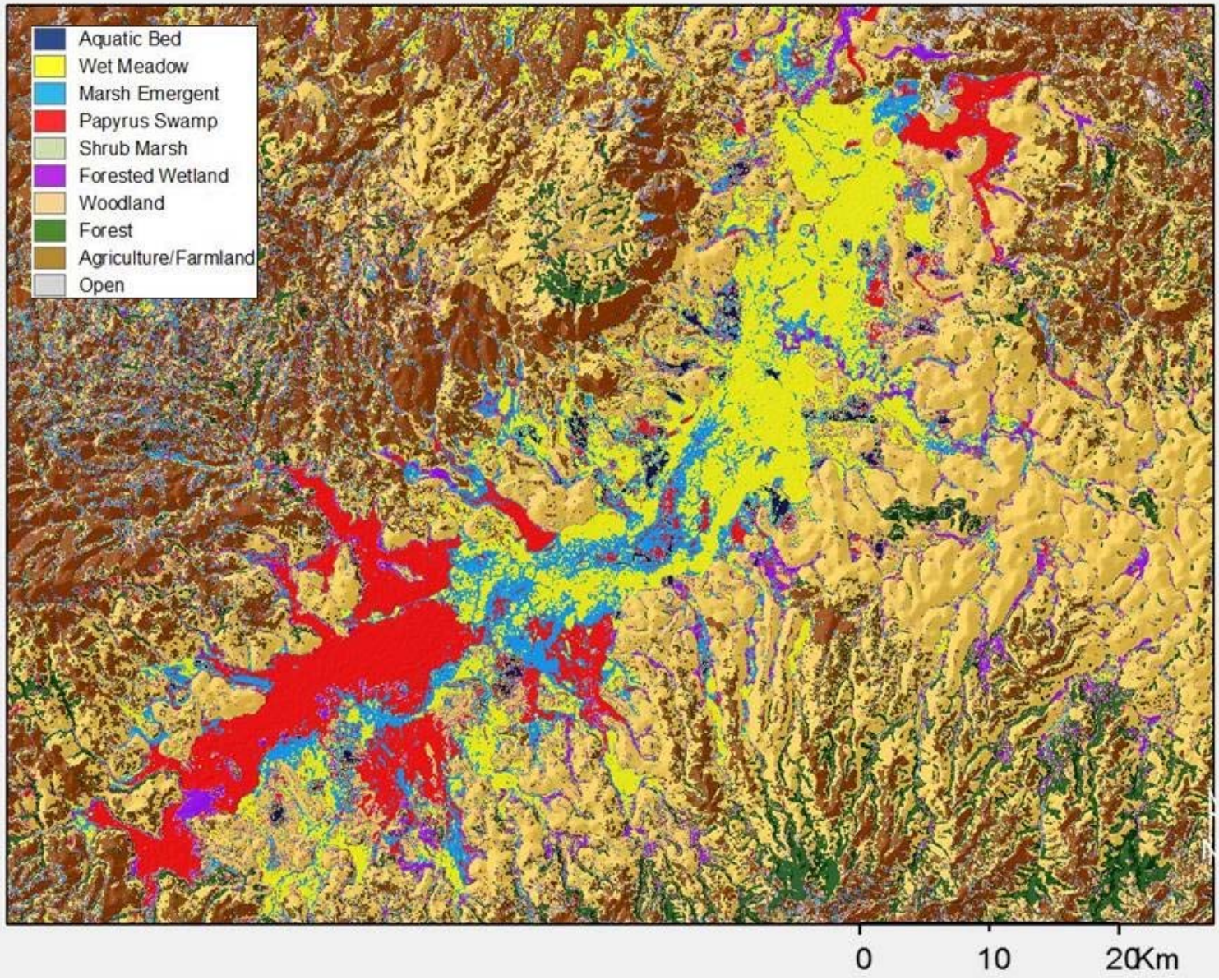

- A global inventory of permanent and temporary surface waters at a spatial resolution of the order of 1 km has yet to be achieved with current technologies and represents a “grand challenge” of the earth monitoring sciences

- Existing estimates of global wetland extents are highly dissimilar, there is a lack of baseline information using consistent, coherent and current observations

- Global Inundation Extent from Multi-Satellites (GIEMS) measurements are expressed as the inundated fraction of an equal area grid of 27.8-km cell resolution at the monthly time-scale over a multi-year time period
  - suitable for global hydrological modeling and surface gas exchange models
  - too coarse for hydro-ecological applications that require discriminating between individual and distinct inundation boundaries

- The process of downscaling, i.e. the conversion of coarse remote sensing data to a finer spatial resolution by means of spatial disaggregation, represents a promising prospect for producing higher resolution global surface water maps

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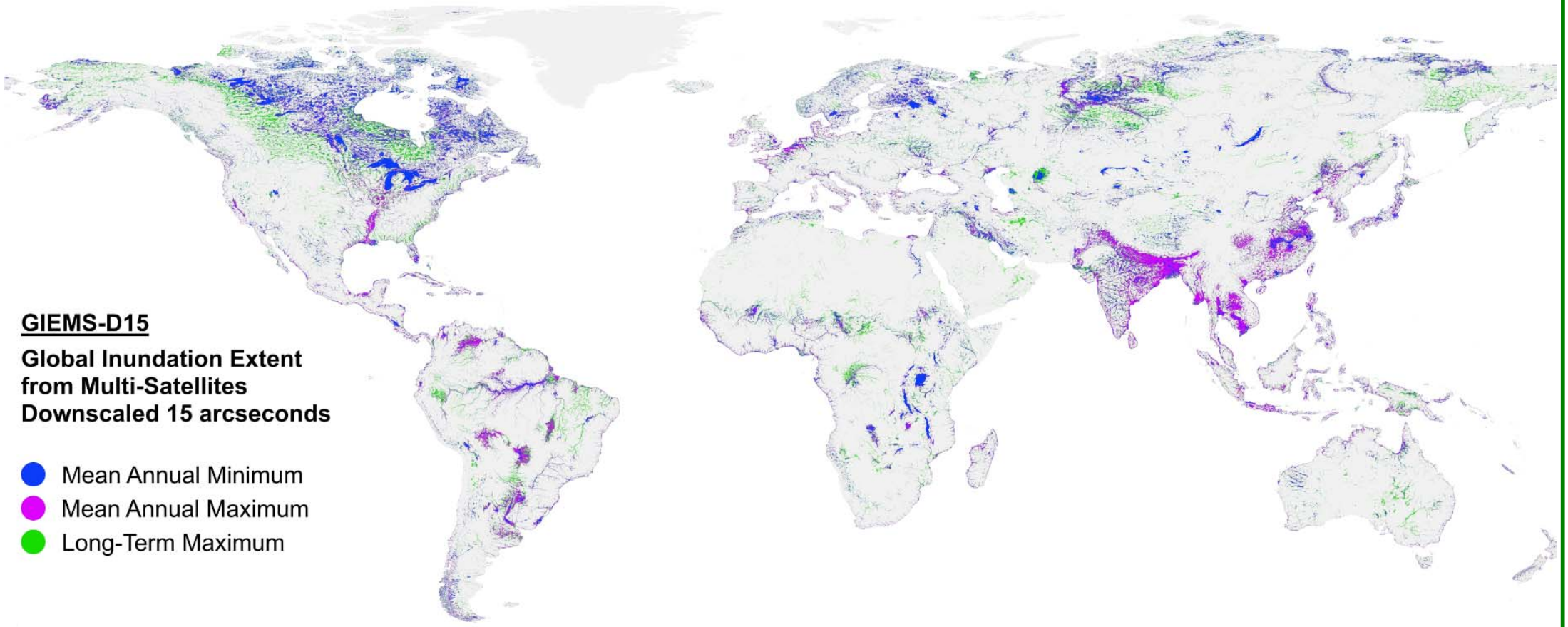
A globally applicable method for downscaling coarse resolution surface water estimates



Fluet-Chouinard, E., B. Lehner, L.-M. Rebelo, et al., 2015. Development of a global inundation map at high spatial resolution from topographic downscaling of coarse scale remote sensing data, Remote Sensing of Environment 158:348-361

KC Phase 4: Project objectives

Project objectives:

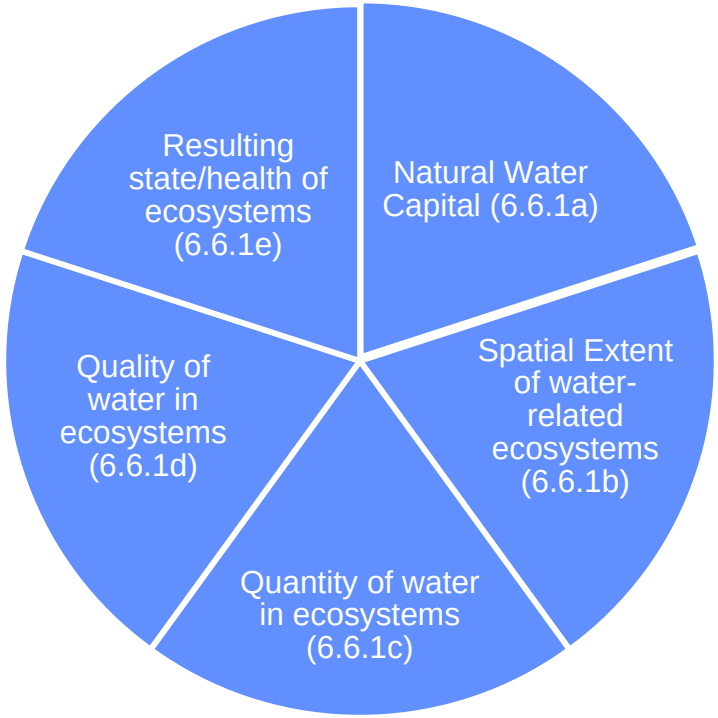
- Mapping regional scale patterns of flooding and inundation
- Characterization of individual wetland ecosystems

Relevance to the K&C objectives:

- Activities are of direct relevance to the Ramsar ***Convention*** on wetlands of international importance, and demonstrate the application of L-band SAR for wetland assessment, inventory and monitoring
- The deliverables will provide information required for ***conservation*** of wetlands

Project deliverables and milestones:

- Maps of
  - Minimum water extent (open water, flooded vegetation)
  - Maximum water extent (open water, flooded vegetation)
  - Seasonal variations in inundation
  - Analysis of intra as well as inter-annual variations and changes occurring to the wetlands during the full time period of analysis (2007 – 2018)



The indicator for 6.6.1 is: *Percentage of change in water-related ecosystems extent over time*

Definition (UN-Water December 2015): Percentage of change in water-related ecosystems extent over time (% change/year). The indicator would track changes over time in the extent of wetlands, forests and drylands, and in the minimum flows of rivers, volumes of freshwater in lakes and dams, and the groundwater table. The Ramsar Convention's broad definition of "wetland" is used, which includes rivers and lakes, enabling three of the biome types mentioned in the target to be assessed - wetlands, rivers, lakes - plus other wetland types. Implementation of this monitoring would be the responsibility of UNEP supported by CBD and the Ramsar Convention through GEMI, on behalf of UN-Water.

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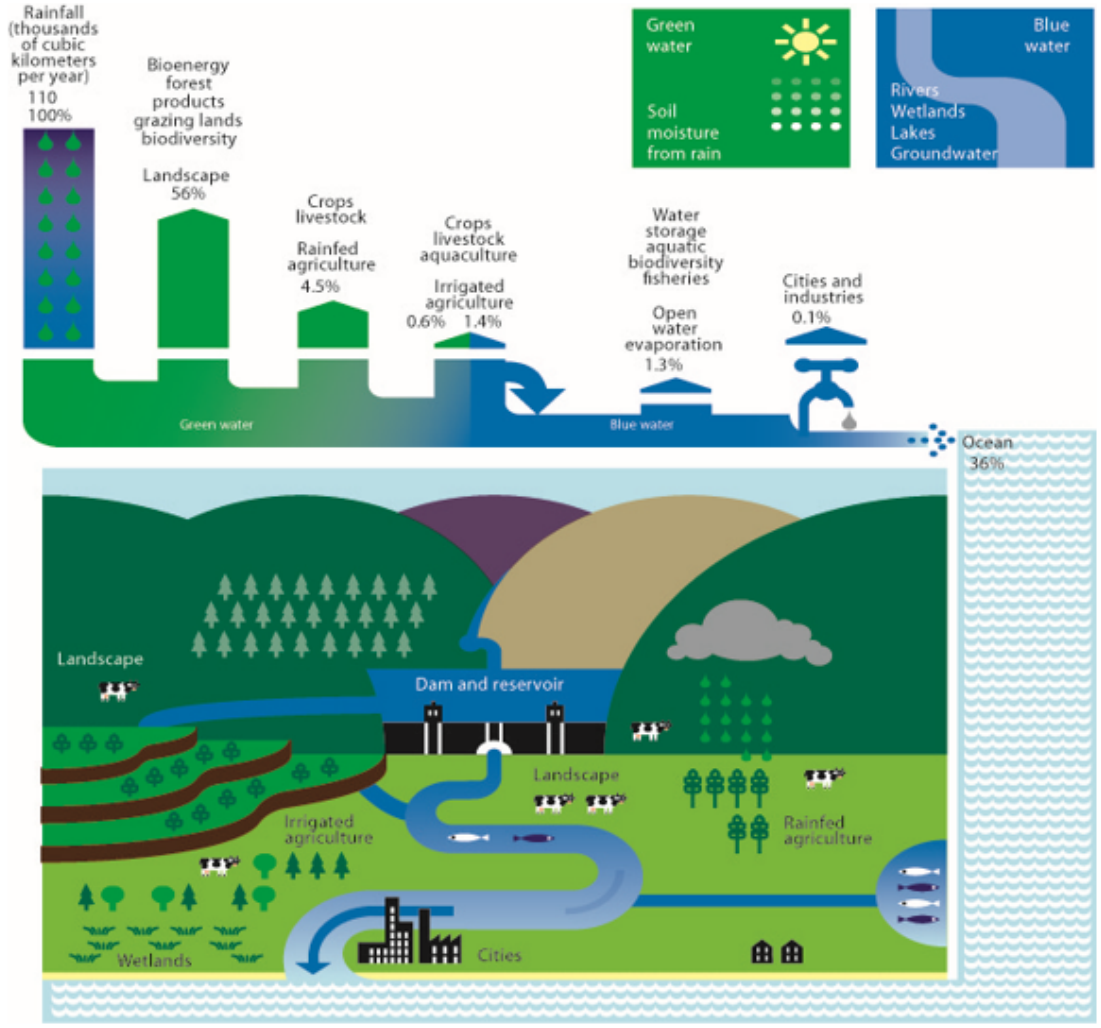
WATER ACCOUNTING +



- A new framework designed to provide explicit spatial information on water depletion and withdrawal processes
- Tracks water depletions rather than withdrawals and goes beyond flow and run-off accounting
- Provides consistent and coherent data sets that integrate hydrological processes with water management and the services and benefits from water consumption
- Provides a tool to evaluate and plan water resources management, to monitor changes in water resources and to assess the impacts of future interventions

IWMI International Water Management Institute

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www.iwmi.org

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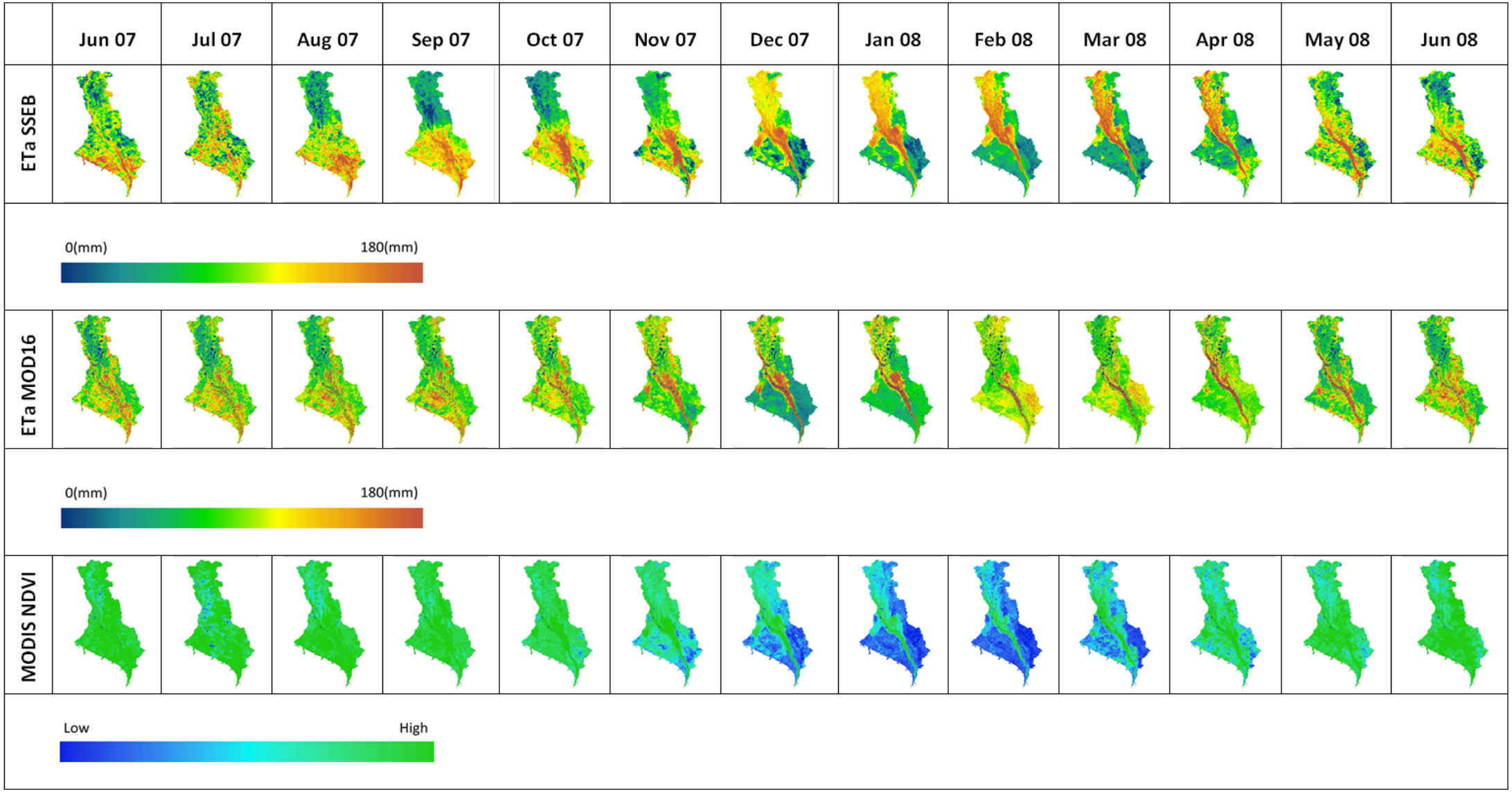

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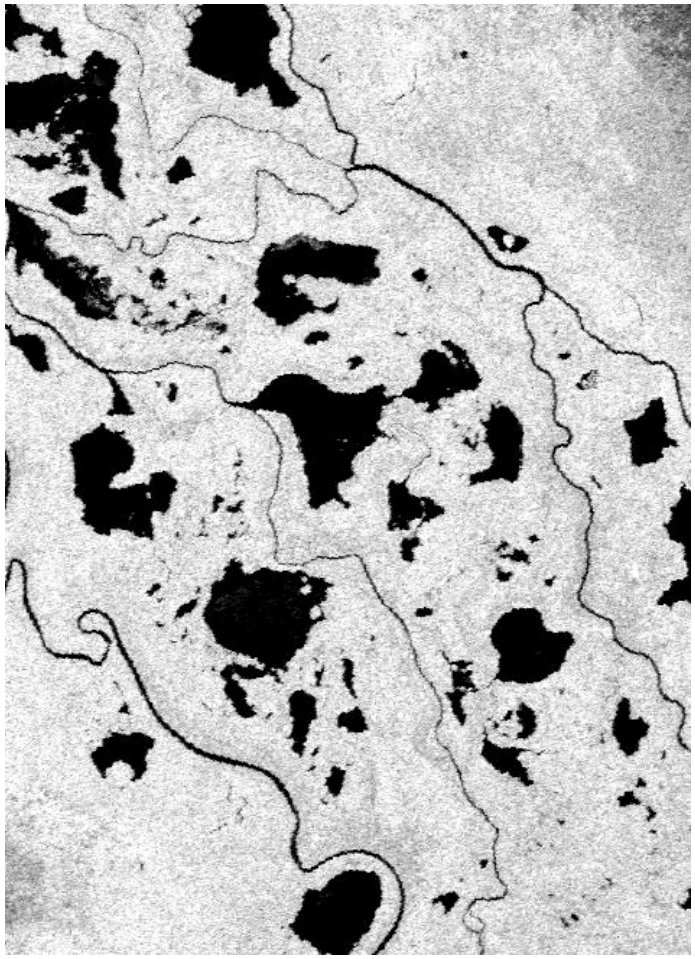
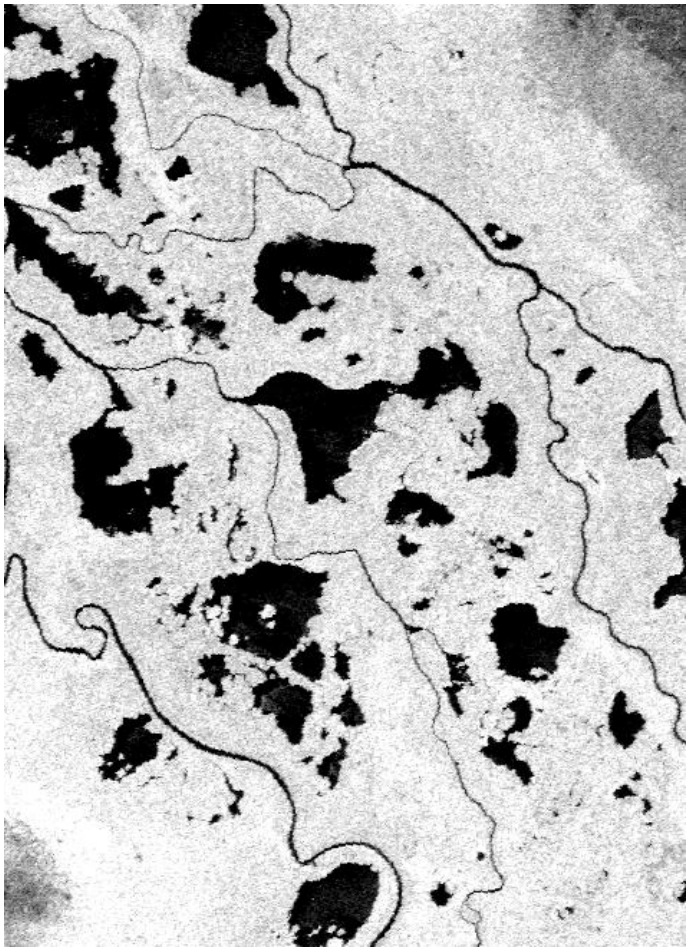


28/07/2007



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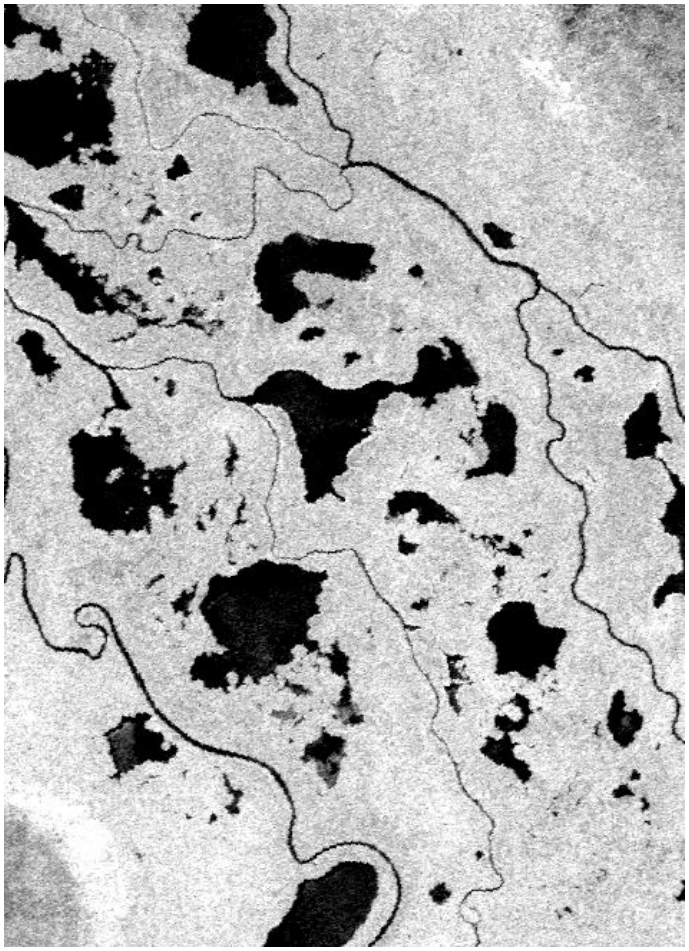

10/04/2009

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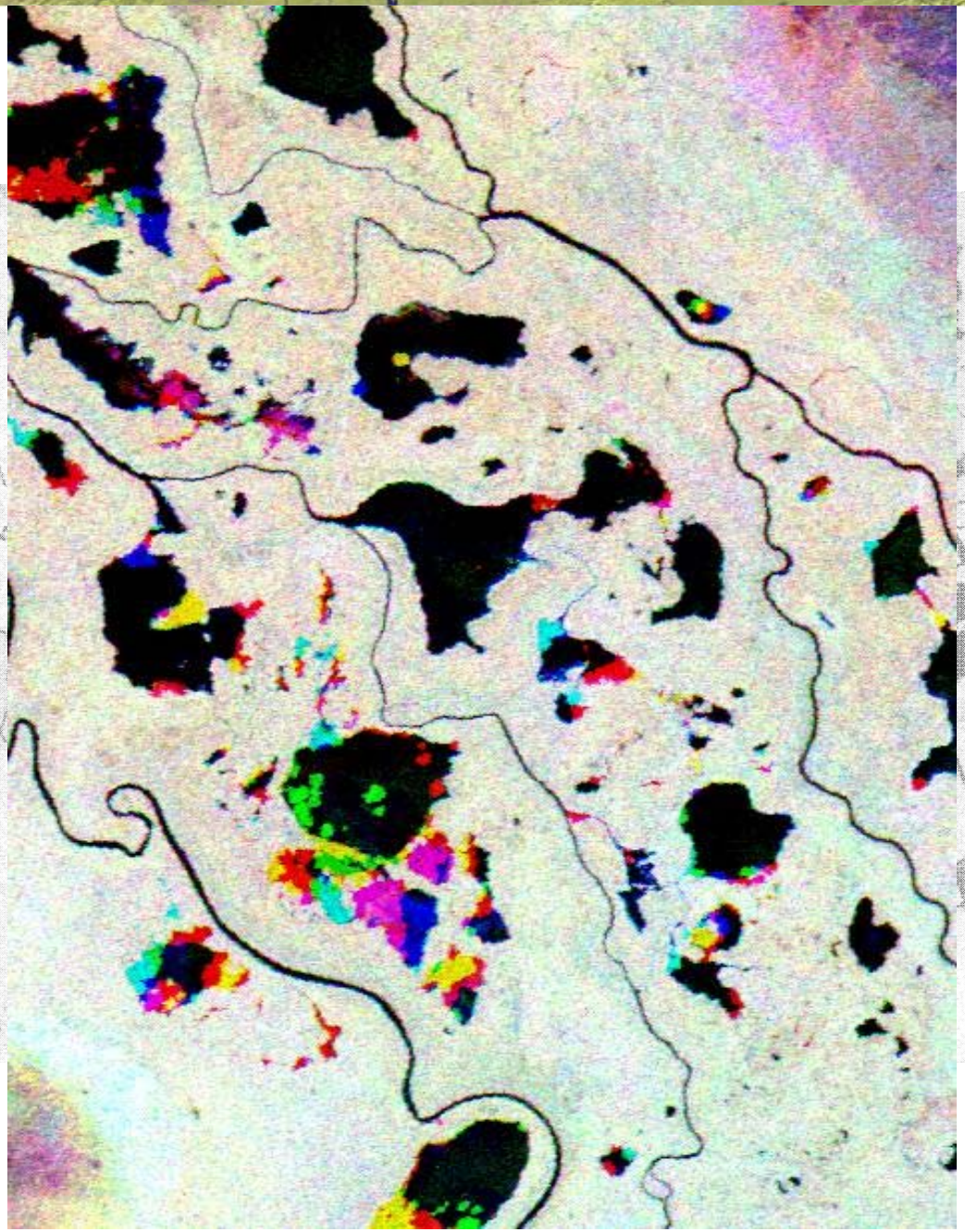

Thank you!