The Global Mangrove Watch (GMW) Update for STRP-20 (Feb 13-17, 2017)

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Global Mangrove Watch

- An international collaborative project established as part of the Japan Aerospace Exploration Agency (JAXA) Kyoto & Carbon (K&C) Initiative science programme. Technical leads: Aberystwyth Univ. (U.K.) & UNSW (Australia)

- Aim to provide geospatial (map) information about mangrove extents and changes at national to global scales for Ramsar Contracting Parties, NGO’s and the public

- GMW part of STRP WP Task 1.1 (Earth observation as a “best practice” tool for inventorying, mapping and monitoring wetlands, including Ramsar Sites) and the GEO-Wetlands Initiative plan to develop a Global Wetlands Observation System (GWOS)
Objectives:

• Overall: Mapping of **extent and changes in global mangrove** areas using satellite radar at 25m spatial resolution

• Generation of updated **baseline maps** of the global mangrove extent for the years 2010 and 2015

• Generation of **maps of annual changes** in the global mangrove areas.
Existing global mangrove datasets

- **World Forest Watch** (Hansen et al): does not distinguish mangrove from other types of forest
GMW input data:

Fine resolution (25 m) L-band SAR global mosaic data.

Datasets used

- 1996: JERS-1 SAR
- 1998/2000: USGS (Giri et al)
- World Mangrove Atlas (Spalding et al)
- 2007: ALOS PALSAR
- 2008: ALOS PALSAR
- 2009: ALOS PALSAR
- 2010: ALOS PALSAR
- 2015 & annually: ALOS-2 PALSAR
Methodology

**Input:** Radar image(s):
- Date X  
- Date X & Date Y

**Output:** Mangrove map:
- Extent (X)  
- Extent (X) & Changes (X-Y)

1. Thematic validation/training
2. Classification
Challenge – many different types of changes

**Losses**
- Acquaculture
- Oil and gas exploration
- Urbanisation and infrastructure
- Logging for firewood and other uses
- Degradation
- Climate change...

**Gains**
- Natural migration
- Seaward expansion (natural / anthropogenic)
- Inland expansion (e.g. due to sea level rise and flooding)
- Large-scale replanting projects
Anthropogenic changes:
Aquaculture and infrastructure

**Input**: Multi-temporal radar image tiles

**Output**: Mangrove extent and change map
Human-induced gains in mangrove extents:
Upstream deforestation causing increased sedimentation
2016: Sudden substantive dieback of mangroves in northern Australia, from Darwin to Cape York (>1000’s km coastline!)
Natural processes: Gains and losses through erosion and sedimentation transport
Methodology (2/2)

Analysis undertaken in the RSGISLib software (www.rsgislib.org) and associated python modules.
2010 global baseline (v1.0) completed
Status & Next steps

• Global products (version 1.0) for 1996, 2010 and 2015 generated
  – First round of validation of extent and change using airborne and VHR spaceborne (RapidEye) data undertaken across the globe
  – Subsequent refinement of algorithms.

• Further refinements planned throughout 2017 to improve mapping accuracy.

• Potential for integrating ESA Sentinel-1 (SAR) and Sentinel-2 (optical) data
  – Better discrimination of mangroves and proximal forest.
  – Additional and more frequent detection of change.
Status & Next steps

• Preparation for public release of baseline and change maps (2017/Q1)

• Maps to be made available through
  – JAXA www
  – World Resources Inst, Global Forest Watch server
  – UNEP-WCMC Ocean Data Viewer
Global 2010 baseline: Sneak peek...
2010 global mangrove baseline

Guayaquil, Ecuador
2010 global mangrove baseline

Guayaquil, Ecuador
2010 global mangrove baseline
Sundarbans, India & Banlgadesh
2010 global mangrove baseline

Sundarbans, India & Bangladesh
2010 global mangrove baseline

Gulf of Carpenteria, Australia
2010 global mangrove baseline

Gulf of Carpenteria, Australia
2010 global mangrove baseline

Niger river delta, Nigeria
2010 global mangrove baseline

Niger river delta, Nigeria
Transparency and open data

All satellite data, classification algorithms and software and mangrove maps utilised in GMW is open and free of charge.

- Mangrove maps
- 25m satellite radar image tiles
- Classification software (open source: RSGISLib.org)
- Classification algorithm specifications
- GIS interface

Users are able to use the maps “as generated by GMW”, or access the original satellite data, classification software to replicate, validate, or improve the mangrove classifications.
Funding

- GMW has to a large extent been undertaken on a non-funded voluntary basis

- **Mangrove Capital Africa**
  - New WI project funded by DOB Ecology (NL)
  - Start 2017/Q1. Duration 2 (+8) years
  - Objectives: sustainable management and rehabilitation of mangroves on a continental scale – Africa
  - “Africa Mangrove Watch” component – limited but sustained funding for GMW map generation over Africa

- **Others**
  - New funding opportunities on the horizon.
  - To maintain global-scale focus
  - Integration of new sensors (Sentinels, SAOCOM, drones, …)
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