

GlobWetland II, the future and more....

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Where can EO technology play a role?



Wetlands Inventory: The collection and/or collation of **core information** for wetland management, including creation of an information base.

Wetlands Assessment: The identification of the **status** of, and **threats** to, wetlands as a basis for the collection of more specific information through monitoring activities.

Wetlands Monitoring: Regular collection of specific site information for **management purposes**.

With the ultimate goal to

- Increase **scientific knowledge**;
- Support **efficient management**, conservation, restoration and wise use of wetlands;
- Contribute to **improve the performances** (reporting obligations) of the Ramsar Contracting Parties;



Satellite-based geospatial information products for wetlands monitoring

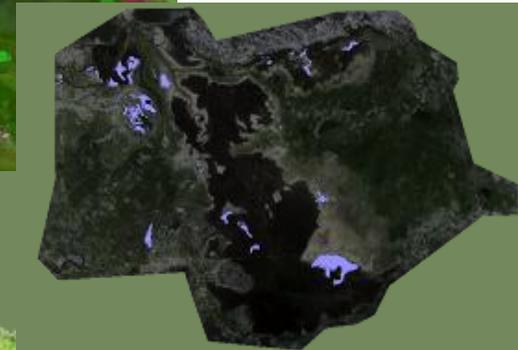


Mature products:

- **Land Use and Land Cover maps,**
(including wetlands typologies)
- **Change Detection Maps**
(on Land Use / Land Cover)
- **Water Cycle Regimes**
(seasonal and annual variations)

R&D products:

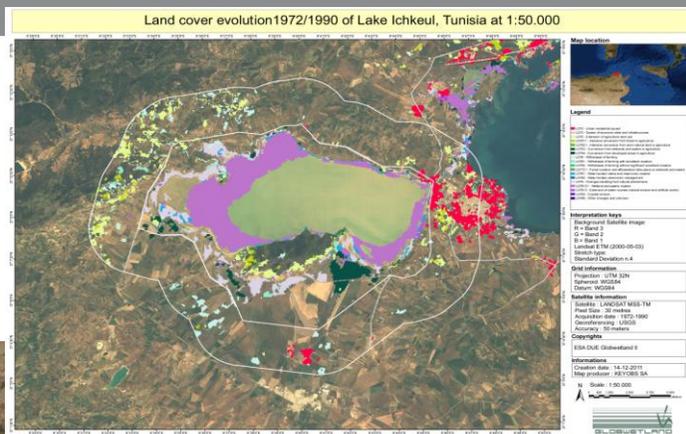
- **Wetland Identification and Delineation**
(support to wetlands inventory)
- **Water Quality**
(dissolved organic matters, suspended sediments, chlorophyll concentration)



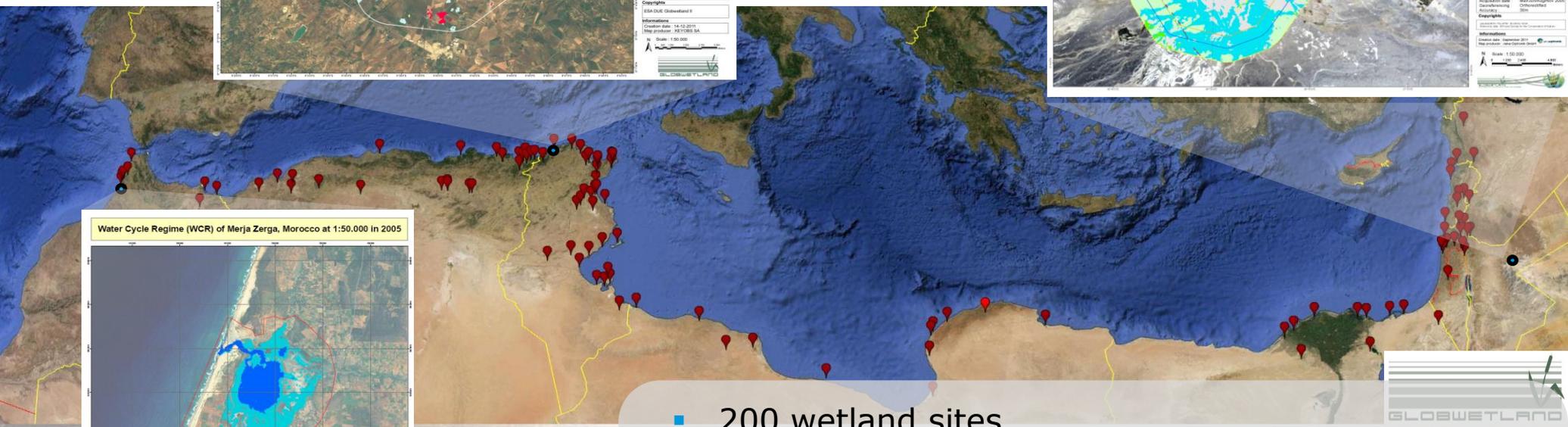
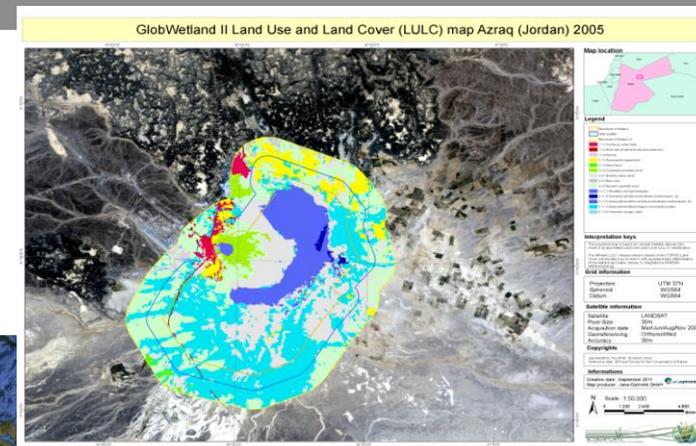
GlobWetland II, a regional pilot project of the Global Wetlands Observing System (GWOS)



Change detection maps



Land Use / Land Cover maps

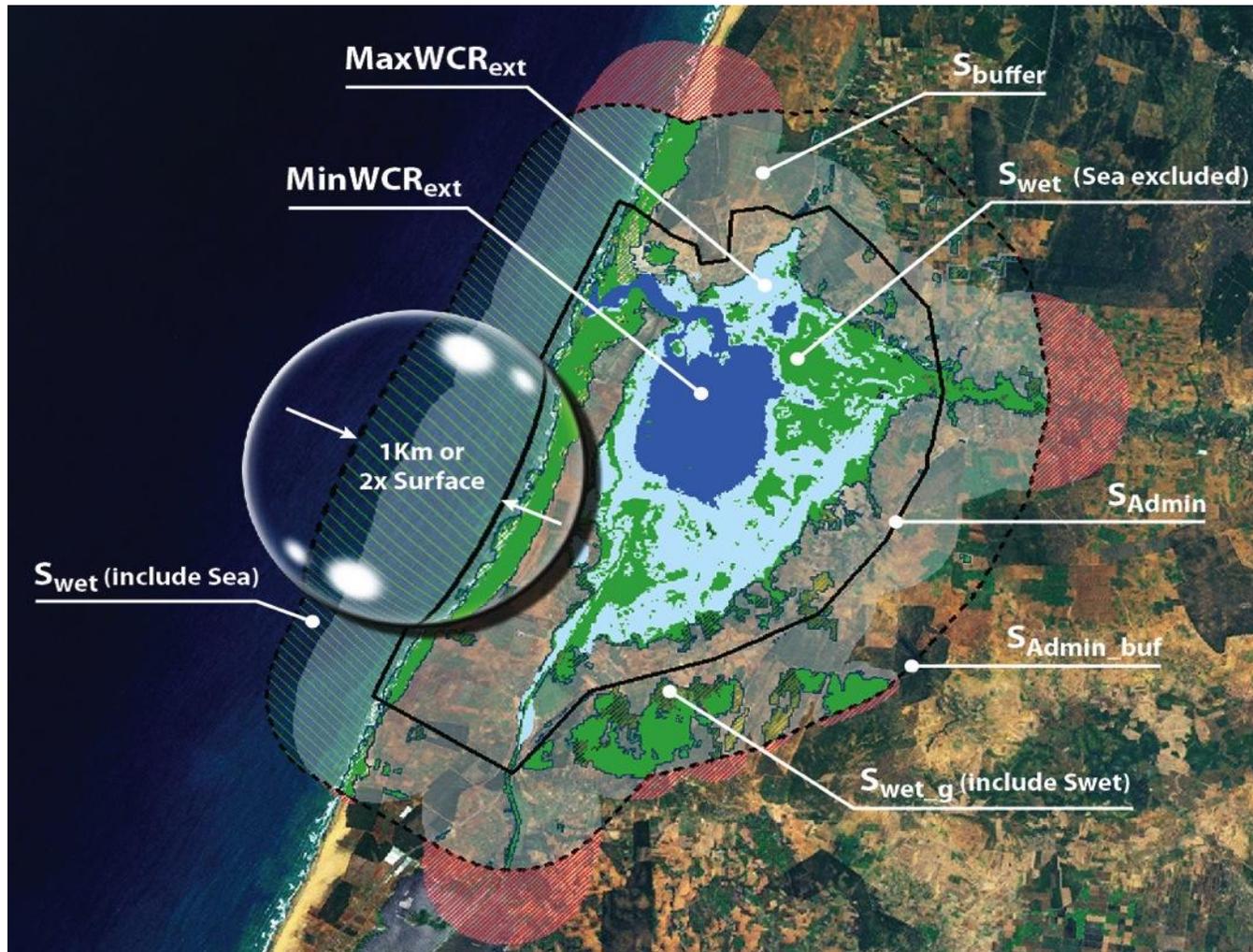


Water Cycle Regime (WCR) of Merja Zerga, Morocco at 1:50.000 in 2005



Water Cycle Regimes

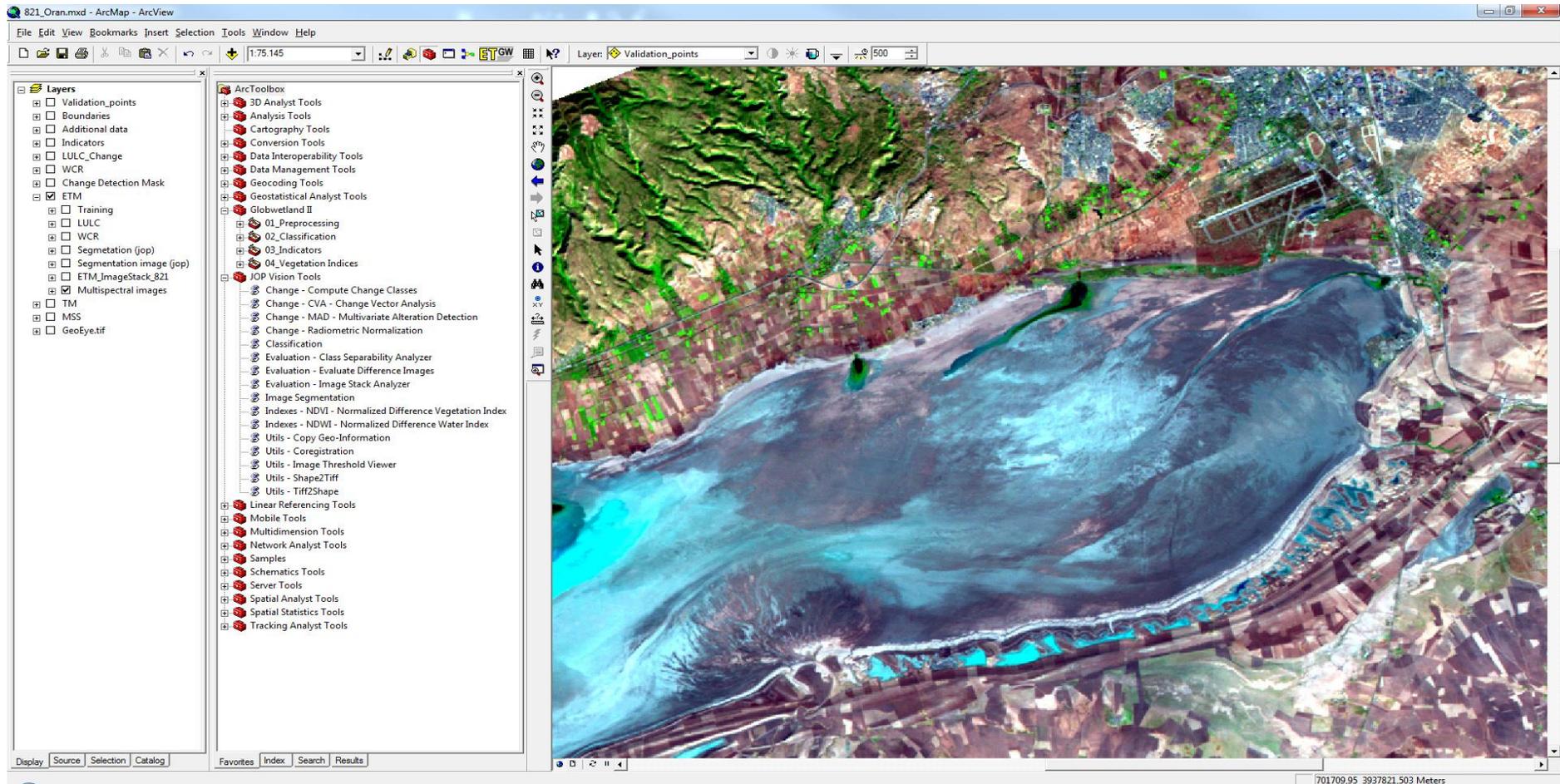
- 200 wetland sites
- 3 different points in time (1975, 1990, 2005):
- 3 types of maps (at 1:50.000 scale)
- 4 types of indicators



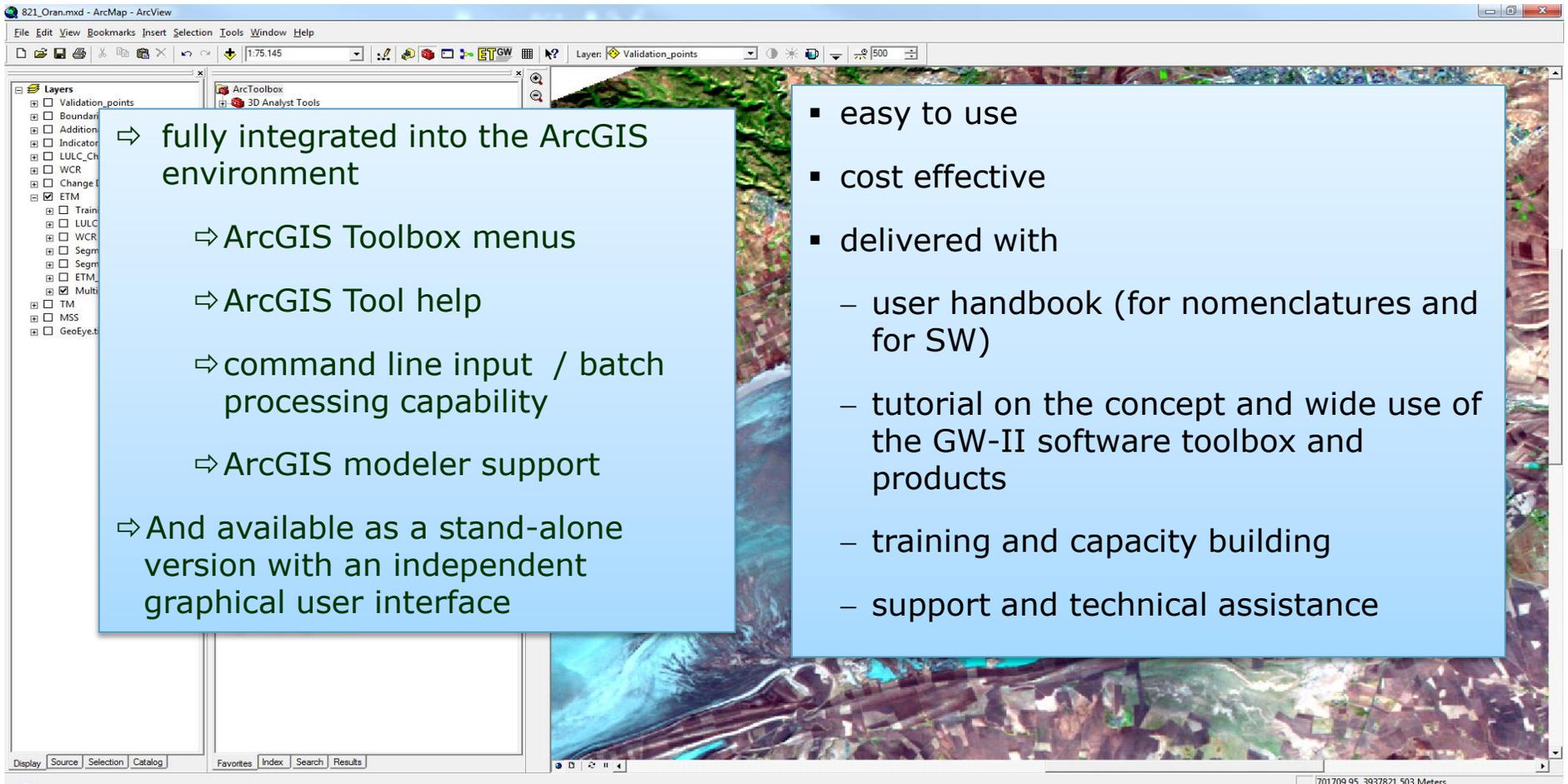
Four indicators:

- 1) changes in wetland areas
- 2) changes due to agriculture & urbanization
- 3) changes to the inundation of the ecosystem
- 4) status and trends of Wetland

The GW-II software toolbox



The GW-II software toolbox



821_Oran.mxd - ArcMap - ArcView

File Edit View Bookmarks Insert Selection Tools Window Help

1:75,145 Layer: Validation_points 500

Layers

- Validation_points
- Boundar
- Addition
- Indicator
- LULC_Ch
- WCR
- Change
- ETM
- Train
- LULC
- WCR
- Segm
- Segm
- ETM
- Multi
- TM
- MSS
- GeoEye.t

ArcToolbox

- 3D Analyst Tools

Display Source Selection Catalog Favorites Index Search Results

701709.95 3937821.503 Meters

⇒ fully integrated into the ArcGIS environment

- ⇒ ArcGIS Toolbox menus
- ⇒ ArcGIS Tool help
- ⇒ command line input / batch processing capability
- ⇒ ArcGIS modeler support

⇒ And available as a stand-alone version with an independent graphical user interface

- easy to use
- cost effective
- delivered with
 - user handbook (for nomenclatures and for SW)
 - tutorial on the concept and wide use of the GW-II software toolbox and products
 - training and capacity building
 - support and technical assistance

GW-II Extension to the north shore of the Mediterranean

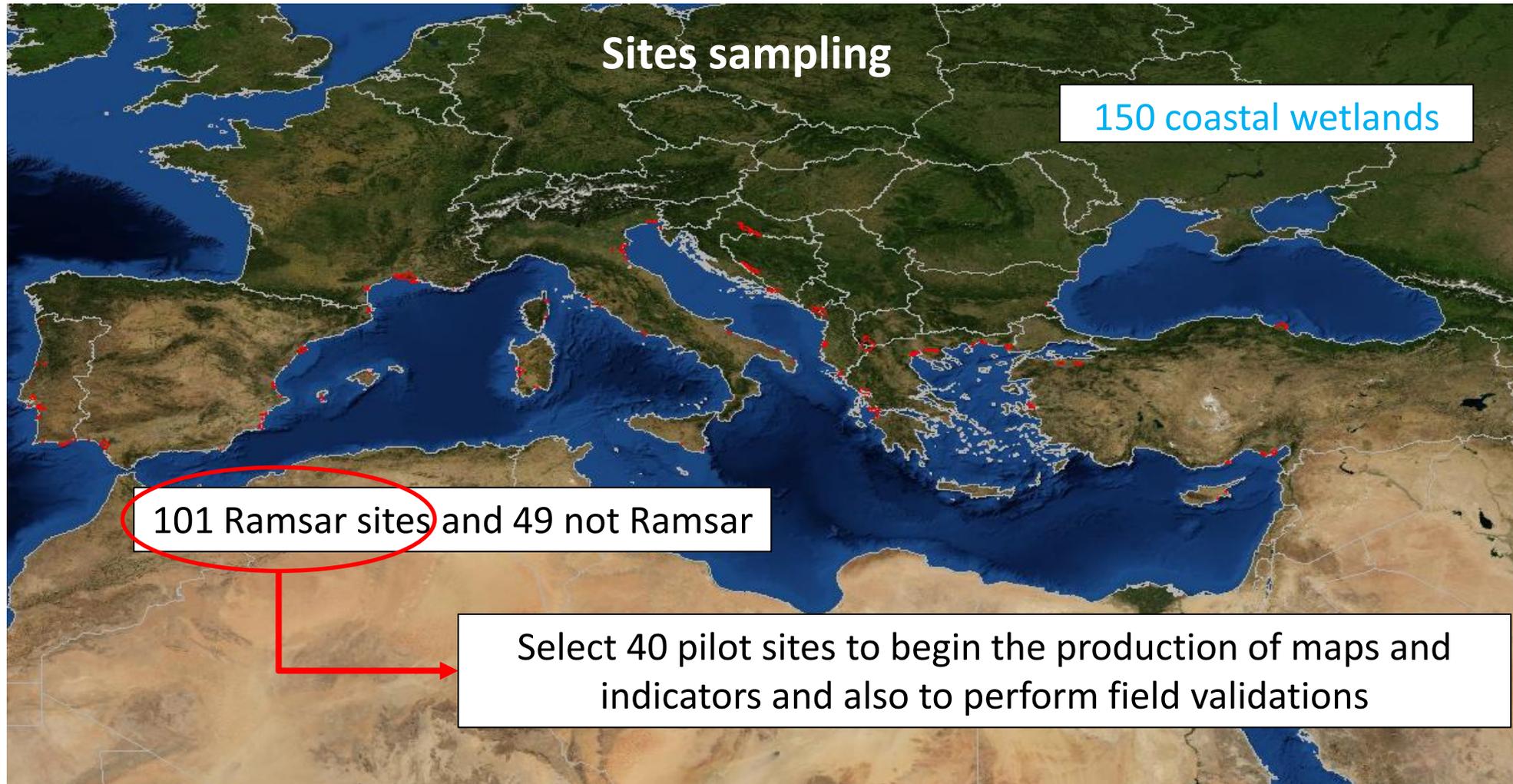


Sites sampling

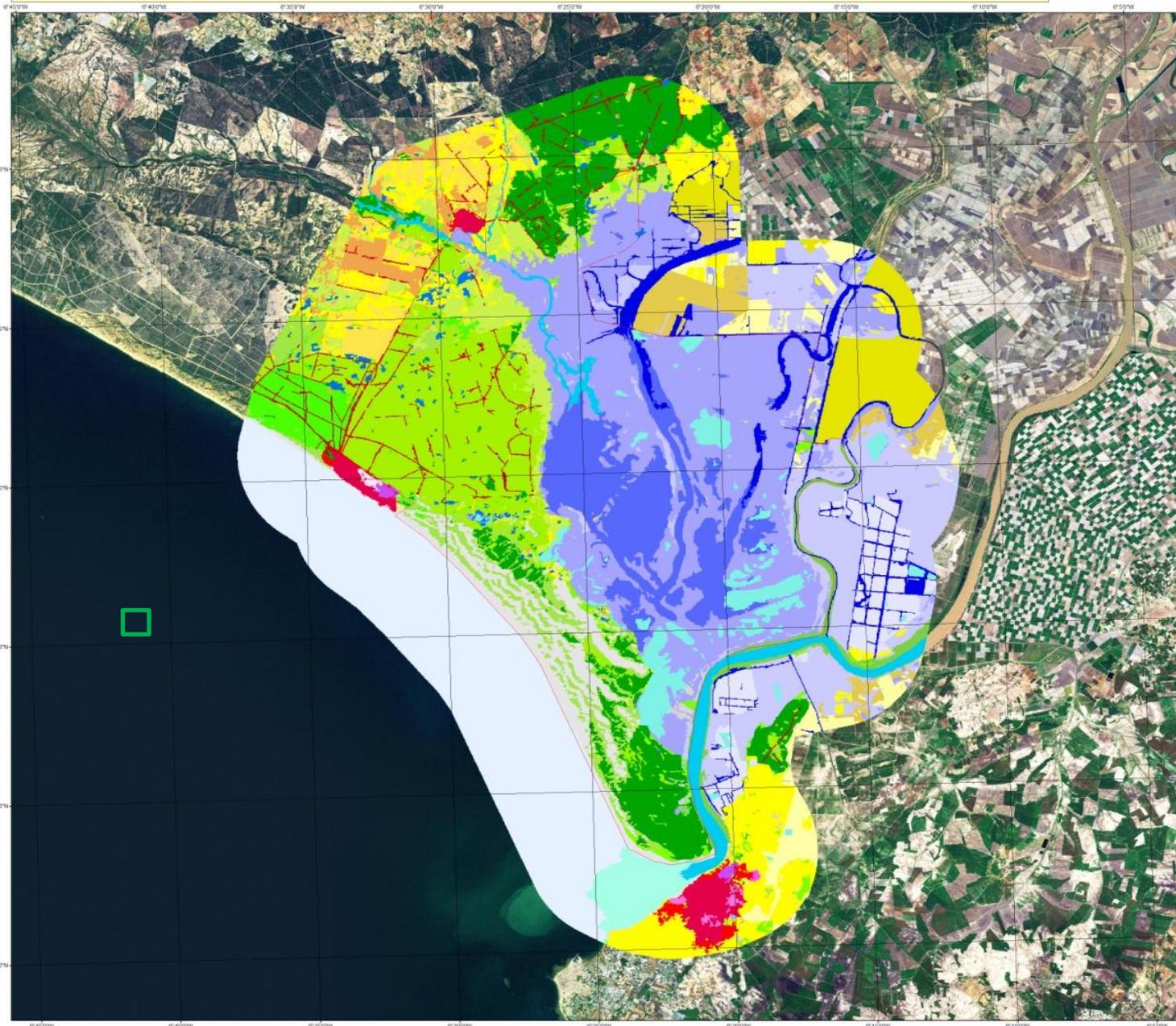
Same for the northern part => around 150 coastal wetlands will be analyzed

Around 200 sites are being analyzed for the south and the Middle-East in the GW-II project

GW-II Extension to the north shore of the Mediterranean



GlobWetland II Land Use Land Cover (LULC) map Doñana (Spain) 2005



Map Location



Legend

- Doñana Ramsar site boundaries
- C.L.C 111 Continuous urban fabric
- C.L.C 112 Discontinuous urban fabric
- C.L.C 121 Industrial or commercial units
- C.L.C 122 Road and air networks and associated land
- C.L.C 133 Construction sites
- C.L.C 14 Artificial non-agricultural vegetated areas
- C.L.C 142 Sport and leisure facilities
- C.L.C 211 Non-irrigated arable land
- C.L.C 212 Permanently irrigated land
- C.L.C 213 Rice fields
- C.L.C 222 Fruit trees and berry plantations
- C.L.C 242 Complex cultivation
- C.L.C 243 Land principally occupied by agriculture, with significant areas of natural vegetation
- C.L.C 311 Broad-leaved forest
- C.L.C 312 Wet forests including riparian
- C.L.C 313 Coniferous forest
- C.L.C 315 Mixed forest
- C.L.C 321 Natural grassland
- C.L.C 323 Sclerophyllous vegetation
- C.L.C 324 Transitional woodland/shrub
- C.L.C 331 Beaches, dunes, and sand plants
- C.L.C 3311 Sand storage or pebble shores, includes sandbars, spits and sandy spits, includes dune systems and hatted dune stacks
- C.L.C 411 Inland marshes
- C.L.C 4111 Reedbeds and high helophytes
- C.L.C 4117 Seasonal/intermittent freshwater marshes/pools on inorganic soils, includes sloughs, peatlands, seasonally flooded meadows, sedge marshes
- C.L.C 421 Salt marshes
- C.L.C 422 Salines
- C.L.C 511 Inland water courses
- C.L.C 5114 Canals and drainage channels/ditches
- C.L.C 512 Inland water bodies
- C.L.C 522 Estuaries
- C.L.C 523 Sea and ocean
- C.L.C 5231 Permanent shallow marine waters in most cases less than six metres deep at low tide, includes sea bays and straits

Grid

Projection : UTM 29 N
Spheroid : WGS 84
Datum : WGS 84

Satellite

Satellite : TM - ETM
Pixel Size : 30m
Acquisition date : 1999/08/27 - 2001/04/10
- 2005/01/31 - 2011/02/25
Georeferencing : USGS

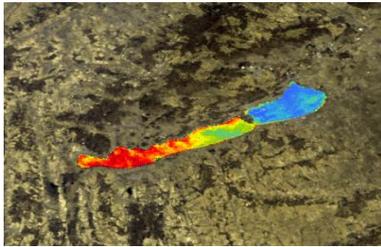
Copyrights

Creation date : 28/12/2012
Producer : Tour du Valat



- Provision of key observations for the **period 2002-2012** on **300 large perennial inland waters**:
 - Most large ($> 500 \text{ km}^2$) natural lakes and water reservoirs;
 - some natural lakes ($> 100 \text{ km}^2$) of specific biodiversity importance.
- **availability of freshwater**: surface water extent and lake surface height.
- **quality of freshwater**: concentrations of chlorophyll-a and total suspended matter, absorption coefficient of dissolved organic matter, water transparency/turbidity metrics,
- Lake surface temperature
- **Status maps, change maps, trend indicators aggregated at different spatial and temporal levels.**

Water Quality



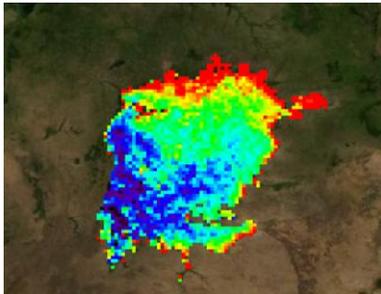
Water Constituents

Data source: MERIS Full Resolution

Parameters: Turbidity, Secchi Disk depth, chlorophyll-a concentration, suspended sediment concentration, yellow substance absorption; quality indicator; variance of parameter during averaging interval

Spatial resolution: 300m

Temporal averaging: daily / monthly / yearly (currently under discussion with users)



Lake Surface Water Temperature

Data source: AATSR (ARC Lake dataset)

Parameters: Lake Surface Water Temperature (LSWT), Uncertainty estimate for lake surface temperature, Chi-squared (goodness of fit measure for OE retrieval); Variance of LSWT over averaging period/area over averaging period/area

Spatial resolution: 0.05 degree grid / Lake-mean

Temporal averaging: None / Climatology / Timeseries

Water Quantity



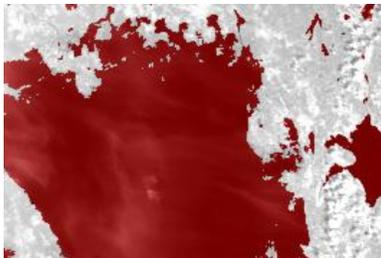
Water Level

Data source: Radar Altimeter (River and Lakes database)

Parameters: Water height difference to reference level, water volume difference

Spatial resolution: one or more points per lake (crossing points of altimeter tracks)

Temporal averaging: time series



Water Extent

Data source: ASAR WS (LC-CCI processing) + MERIS Full Resolution

Parameters: land-water mask

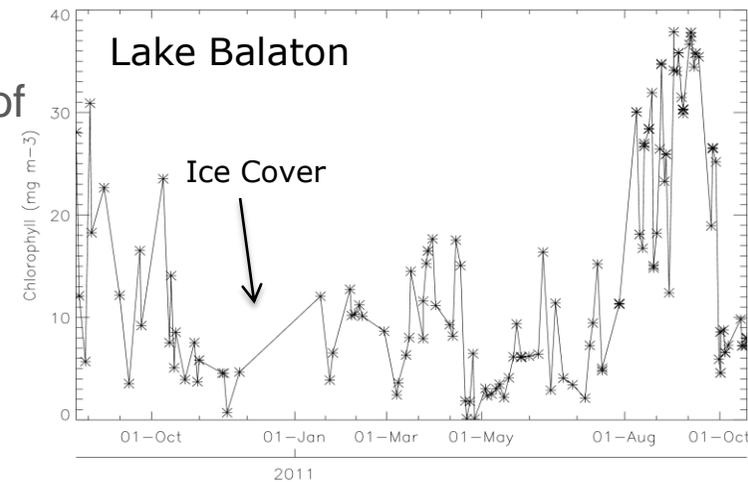
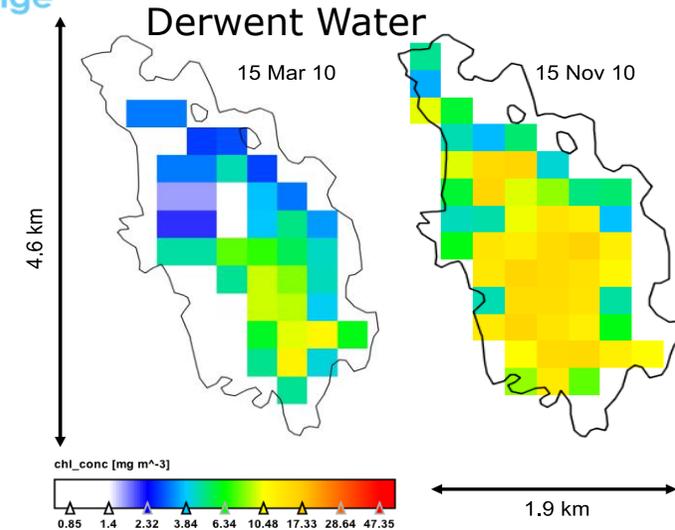
Spatial resolution: 300m

Temporal averaging: 1 map derived from 10 year time series; for some areas a seasonal climatology is available; temporal variability from combination with optical data



Investigate the state of lakes & their response to environmental change drivers:

- Near real time processing satellite based observatory
- Processing archived data for up to 20-year time series
- Including: (i) LSWT; (ii) TSM; (iii) CDOM; (iv) Chl a; (v) PC
- Detect spatial & temporal trends & attribute causes of change for 1000 lakes worldwide (1/3 of inland water, 2/3 of all inland water > 1km²)
- Forecast lake sensitivity to environmental change
- Apply findings into lake management
- Tied PhD – Primary Productivity



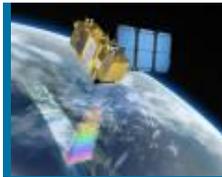
The GMES/Copernicus Sentinel missions, Satellite data access on the long term



Sentinel 1 – SAR imaging

All weather, day/night applications, interferometry

2013 / 2015



Sentinel 2 – Multi-spectral imaging

Land applications: urban, forest, agriculture,...
Continuity of Landsat, SPOT

2014 / 2016



Sentinel 3 – Ocean and global land monitoring

Wide-swath ocean color, vegetation, sea/land
surface temperature, altimetry

2014 / 2016



Sentinel 4 – Geostationary atmospheric

Atmospheric composition monitoring, trans-
boundary pollution

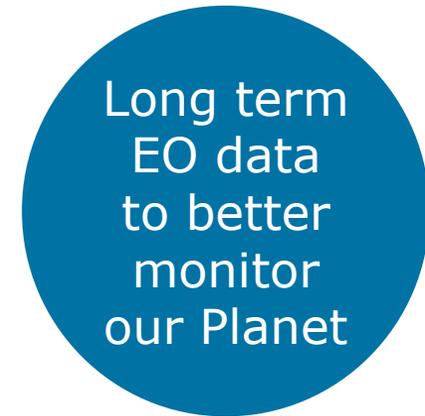
2019



Sentinel 5 – Low-orbit atmospheric

Atmospheric composition monitoring
(S5 Precursor launch in 2015)

2019



Sentinel-2



Multispectral High Resolution Optical Imager

- Routine operations starting in 2014
- A unique spatial resolution/large swath combination (10m/290km)
- A high revisit frequency (5 days periodicity @ equator with 2 satellites)
- Systematic acquisition of all land surfaces and coastal waters
- Thirteen spectral bands (10m / 20m / 60m in VIS, NIR & SWIR domains)

A satellite-style map of the Mediterranean region and Africa. The map shows the Mediterranean Sea, the Red Sea, and the Gulf of Aden. The landmasses are colored in shades of green, brown, and tan, representing different terrain types. The text is overlaid on a semi-transparent white and blue background.

**GlobWetland III,
a strong African focus**

User consultation
12-14 June 2013, ESRIN

- EO capabilities in **LULC mapping, detection of LC changes and water table (including floods) mapping** are **already well developed**.
- The good results available from full scale applications demonstrate that EO technology is already **moving beyond experimental to a full operational system**.
- One of the highest-value applications for EO techniques is in back-casting **time series (30 years)** for areas with no data or gauging networks.
- A number of **promising applications** that requires still further work to be operational: **water levels, water quality, wetland forecasting (through hydrological models)**.
- **From 2014, Sentinel 2 in combination with LDCM and C/L band radar systems** will offer **unprecedented observation opportunities** for mapping and monitoring Wetlands worldwide.
- **GW-III**, moving **from regional to continental GWOS**.



Thanks for your attention



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With the contribution of:

