



**SWOS**  
Satellite-based Wetland  
Observation Service



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 642088

# The SWOS project – tracking wetlands via EO data

*Workshop of the GEO Initiative on Earth Observation for Ecosystem Accounting (EO4EA)*

*EEA, Copenhagen, Denmark - 28 March 2017*

*Dania Abdul Malak, University of Malaga - Spain*



BROCKMANN GEOMATICS  
SWEDEN AB



universität **bonn**



# Support to policy implementation



**SWOS is an implementation tool that supports evidence-based policy on wetland ecosystems, by:**

- Promoting and underpinning the consideration of wetlands in the implementation of key policy areas,
- Providing an operational standardized monitoring mechanism,
- Delivering a service portal as “the” entry point to easily locate, access, process and connect wetland information.



# Sentinel-3



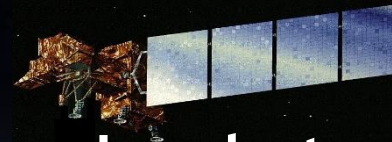
MERIS  
(Envisat)



Landsat-  
8



Landsat  
ETM+



MODIS



Landsat TM



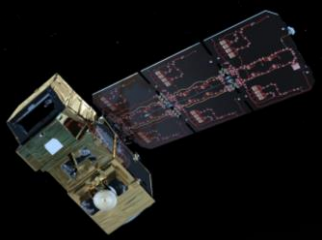
Landsat  
MMS



Sentinel-1



Sentinel-  
2



The ,satellite fleet' used  
by SWOS





# Sentinel-1

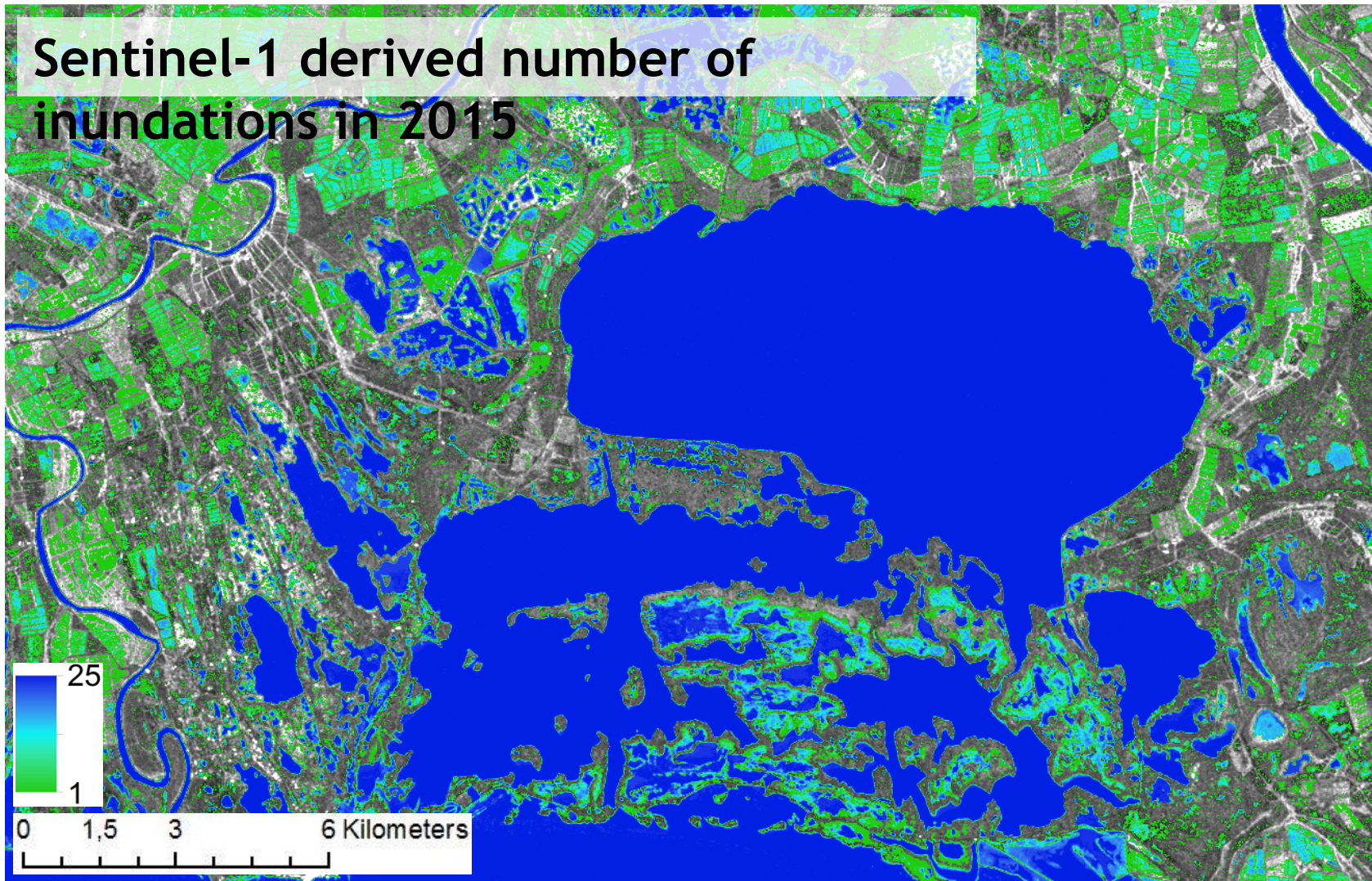
Type: SAR system

Spatial resolution: 5m - 40m

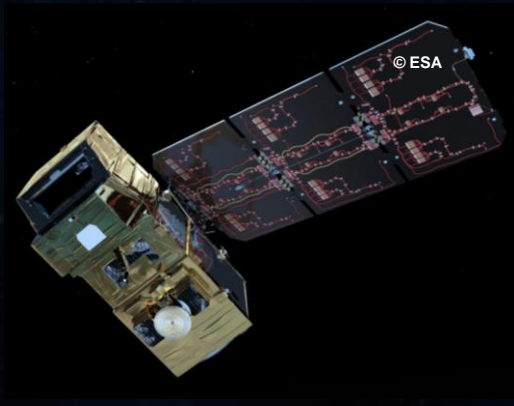
**SWOS - Wetland applications:**

- Identification of water (flooded areas)
- Information on soil moisture

## Sentinel-1 derived number of inundations in 2015







# sentinel-2

Type: Optical system  
(13 spectral bands)

Spatial resolution: 10m - 60m

## Wetland applications:

- Land monitoring (such as LULC)
- Ecosystem monitoring (such as ecosystem delimitation, habitat delineation)
- Inland water monitoring

# The "natural color" image

## Azraq, Jordan (25.12.2015)

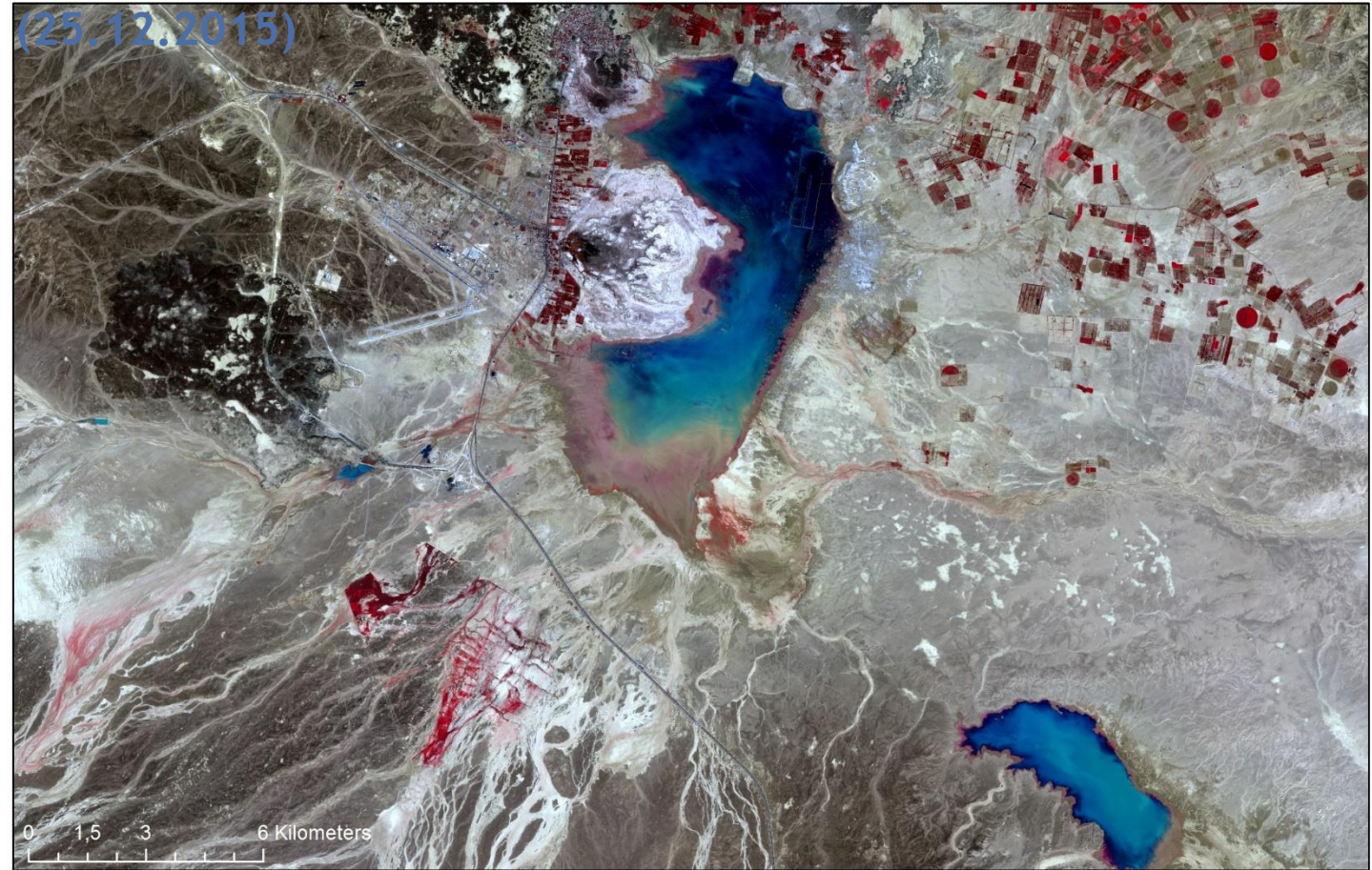
S		
W	B12	
I	B11	
R		
C		
l	B10	
o	B9	
u		
N	B8a	
I	B8	
R		
V	B7	
N	B6	
I	B5	
R		
V	B4	R
I	B3	G
	B2	B
S	B1	





# The standard "false color" composite: **Focus on vegetation**

Azraq, Jordan  
(25.12.2015)

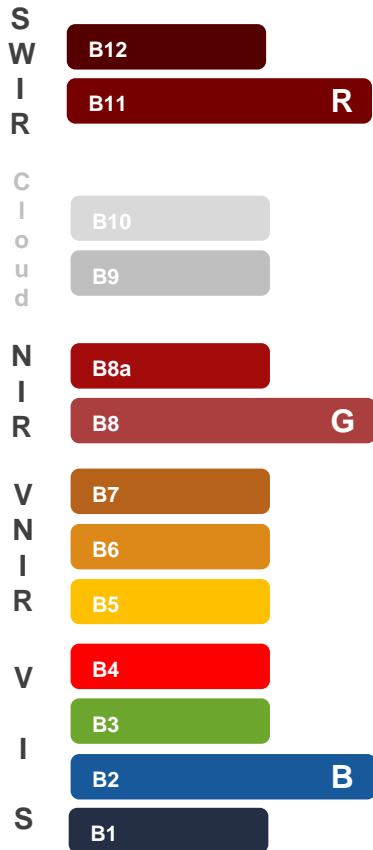


S	
W	B12
I	B11
R	
C	B10
l	B9
o	
u	
d	
N	B8a
I	B8
R	R
V	B7
N	B6
I	B5
R	
V	B4
	G
I	B3
	B
S	B2
	B1



# The “natural-like” color: Focus on green and dry vegetation and water

Azraq, Jordan  
(25.12.2015)





## The „soil false-color“:

### Focus on soil types/moisture and sparse vegetation

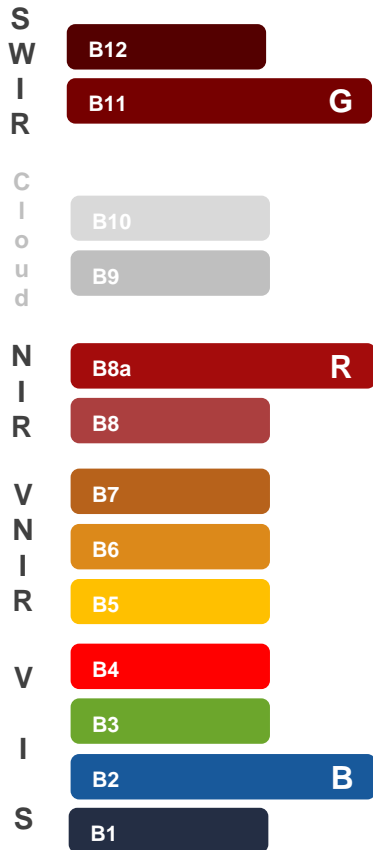
Azraq, Jordan  
(25.12.2015)



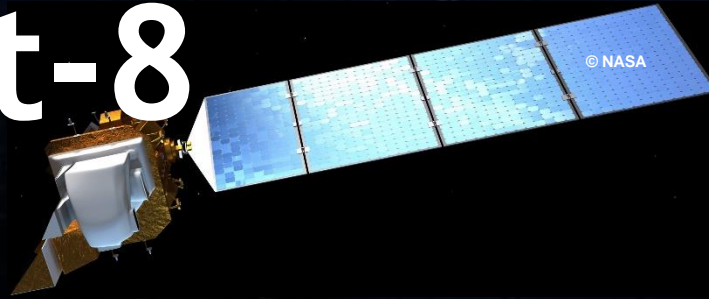


# The „wetland-composite“: Focus on water - land boundaries

Azraq, Jordan  
(25.12.2015)



# Landsat-8



Type: Optical system  
(11 spectral bands)

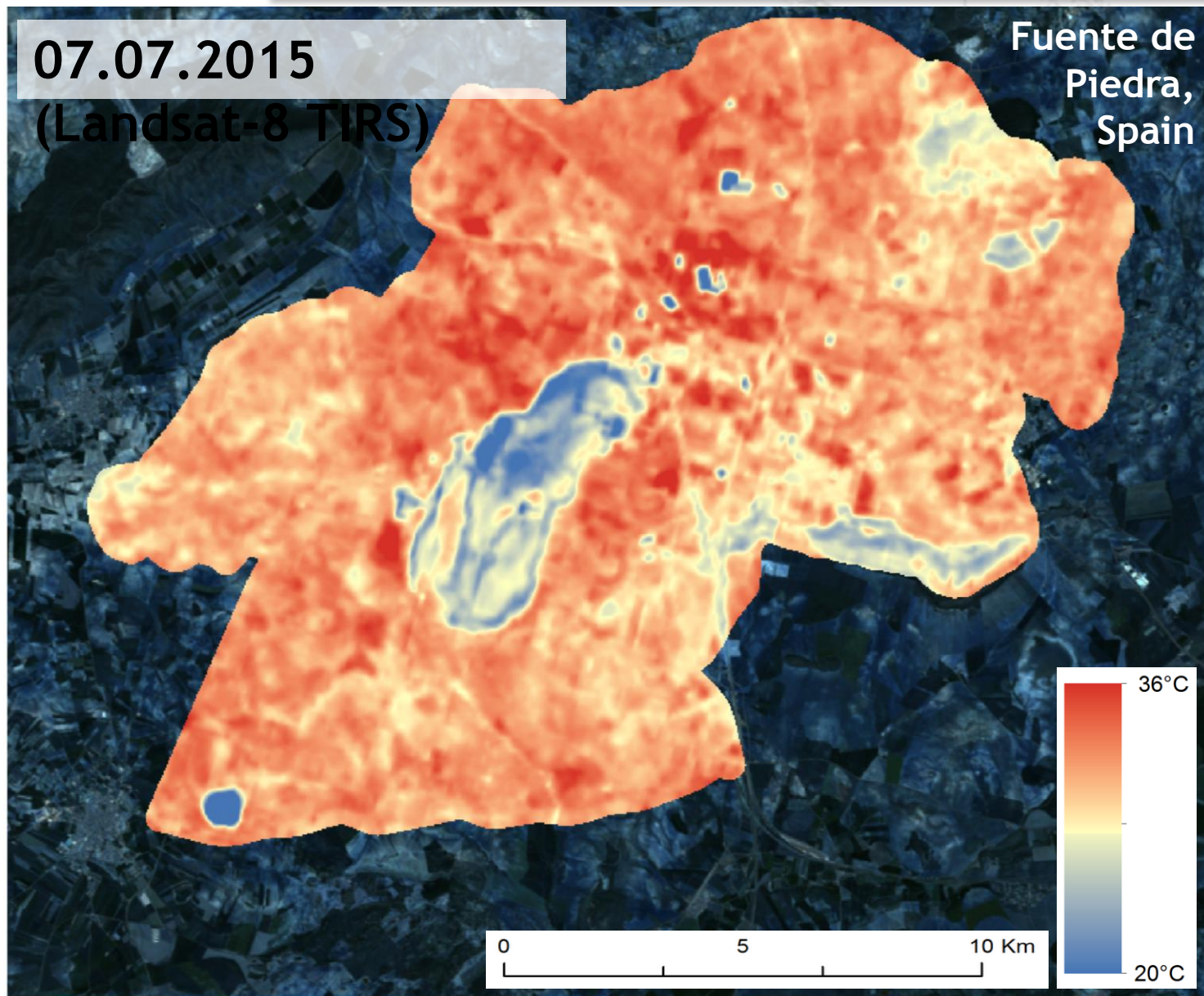
Spatial resolution: 15m - 100m

## Wetland applications:

- Land monitoring (such as LULC)
- Inland water monitoring
- Land Surface Temperature

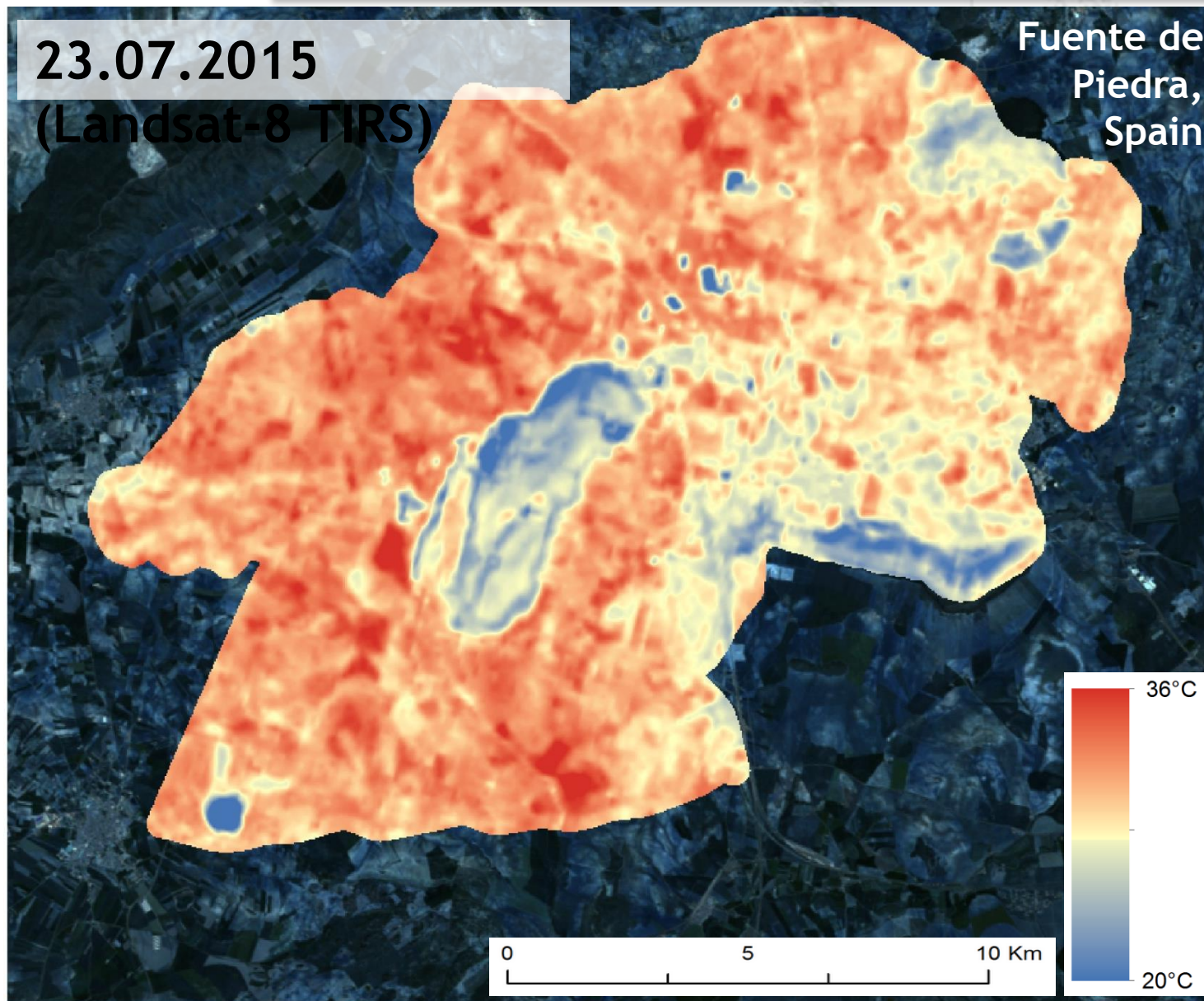


## The thermal infrared perspective



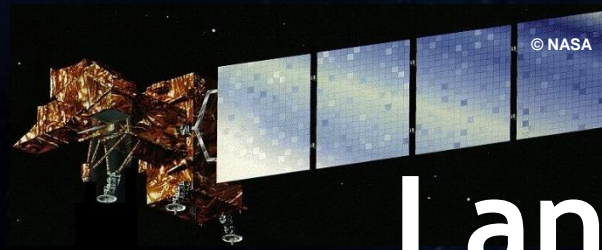
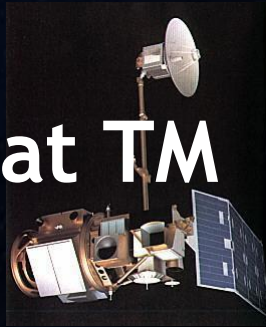


## The thermal infrared perspective





# Landsat TM



# Landsat ETM+



Landsat  
MSS

Type: Optical systems

MSS (from 1972): 4 spectral bands

TM (from 1982): 7 spectral bands

ETM+ (from 1999): 8 spectral bands

Spatial resolution: 30m - 120m

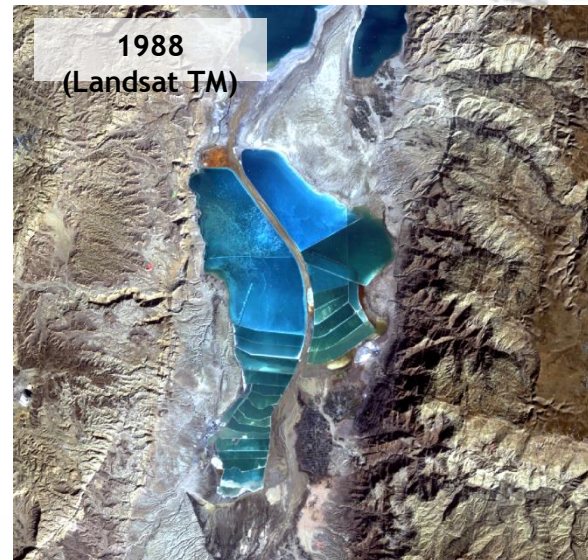
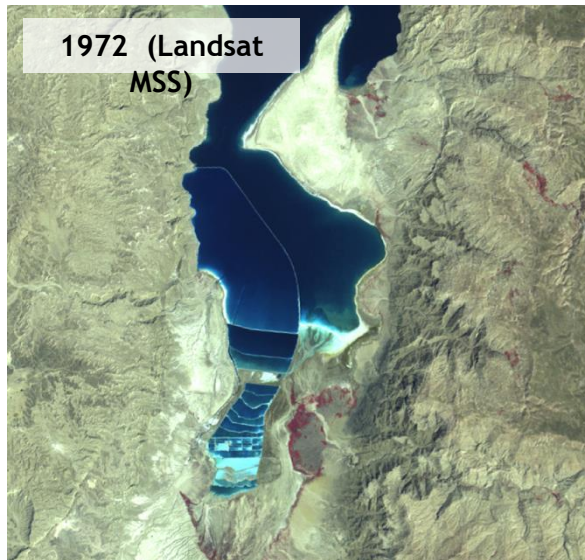
**Wetland applications:**

- Historical land and inland water monitoring back to 1970s

▪ Historical Land Surface Temperature



## The temporal perspective: Assessing wetland trends



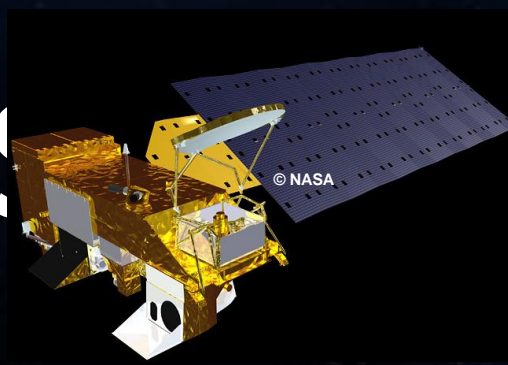
**Monitoring of long term changes / decreasing water table (Dead Sea, Jordan)**



**Monitoring of short term changes / wetland characteristics (Azraq Oasis, Jordan)**



# MODIS



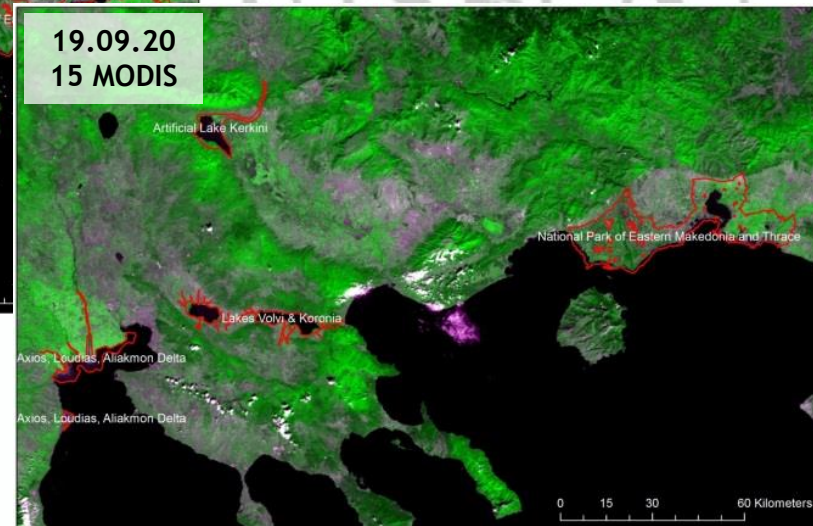
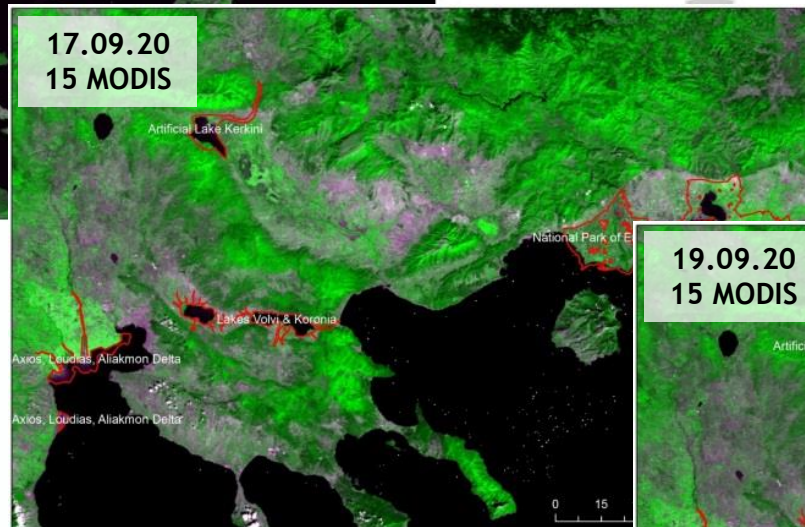
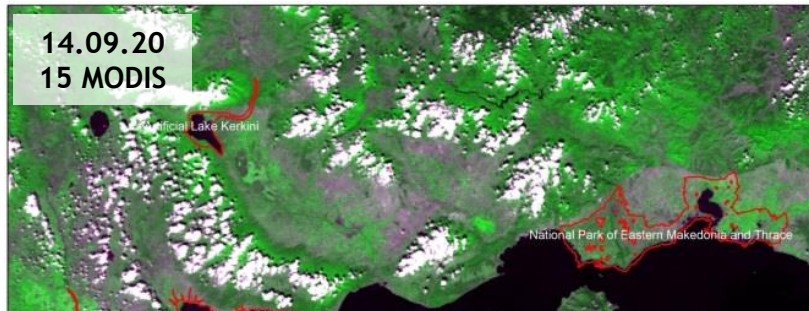
Type: Optical system  
(36 spectral bands)

Spatial resolution: 250m - 1000m

## Wetland applications:

- Land and sea surface temperature
- Water/Ocean color & Phytoplankton
- Wide swath for large-scale monitoring

## The daily large-scale perspective



Large scale monitoring of all the SWOS test sites in one country (Greece)



# MERIS (Envisat)



Type: Optical system  
(up to 15 spectral bands)

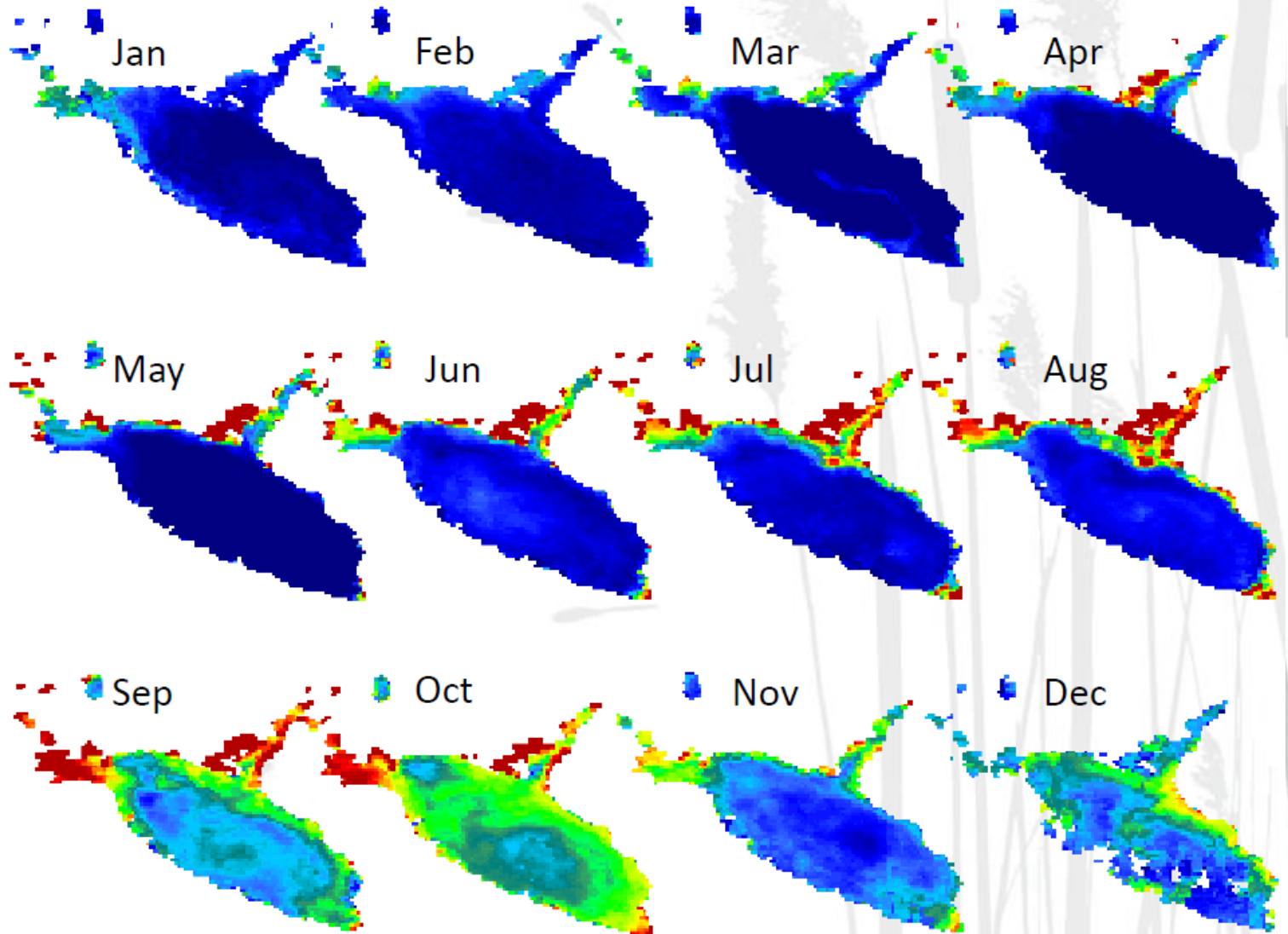
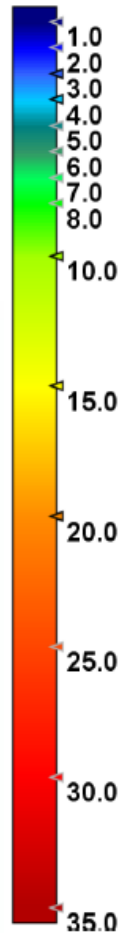
Spatial resolution: 300m

**Wetland applications in SWOS:**

- Water Quality (historical 2002 - 2011)

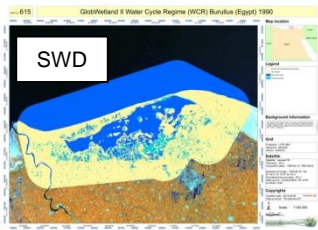
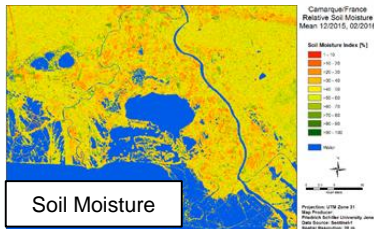
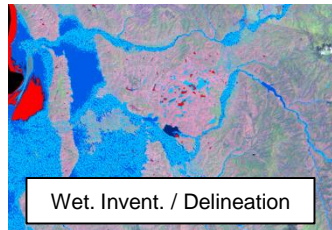
**2011**

Chl a (ug/l)





# SWOS Indicators derived from EO



Wetlands extent

Wetlands status  
and trends

Wetland threats

Ecosystem physical integrity

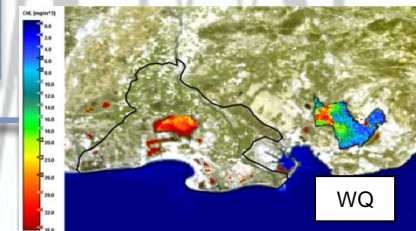
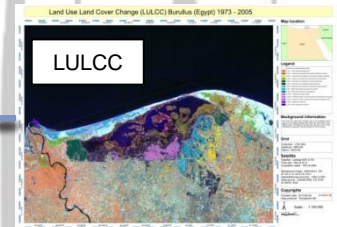
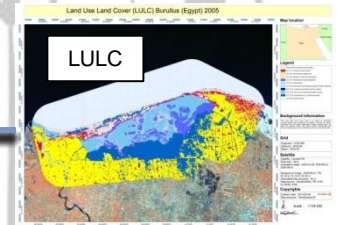
Carbon sequestration

Food provisioning

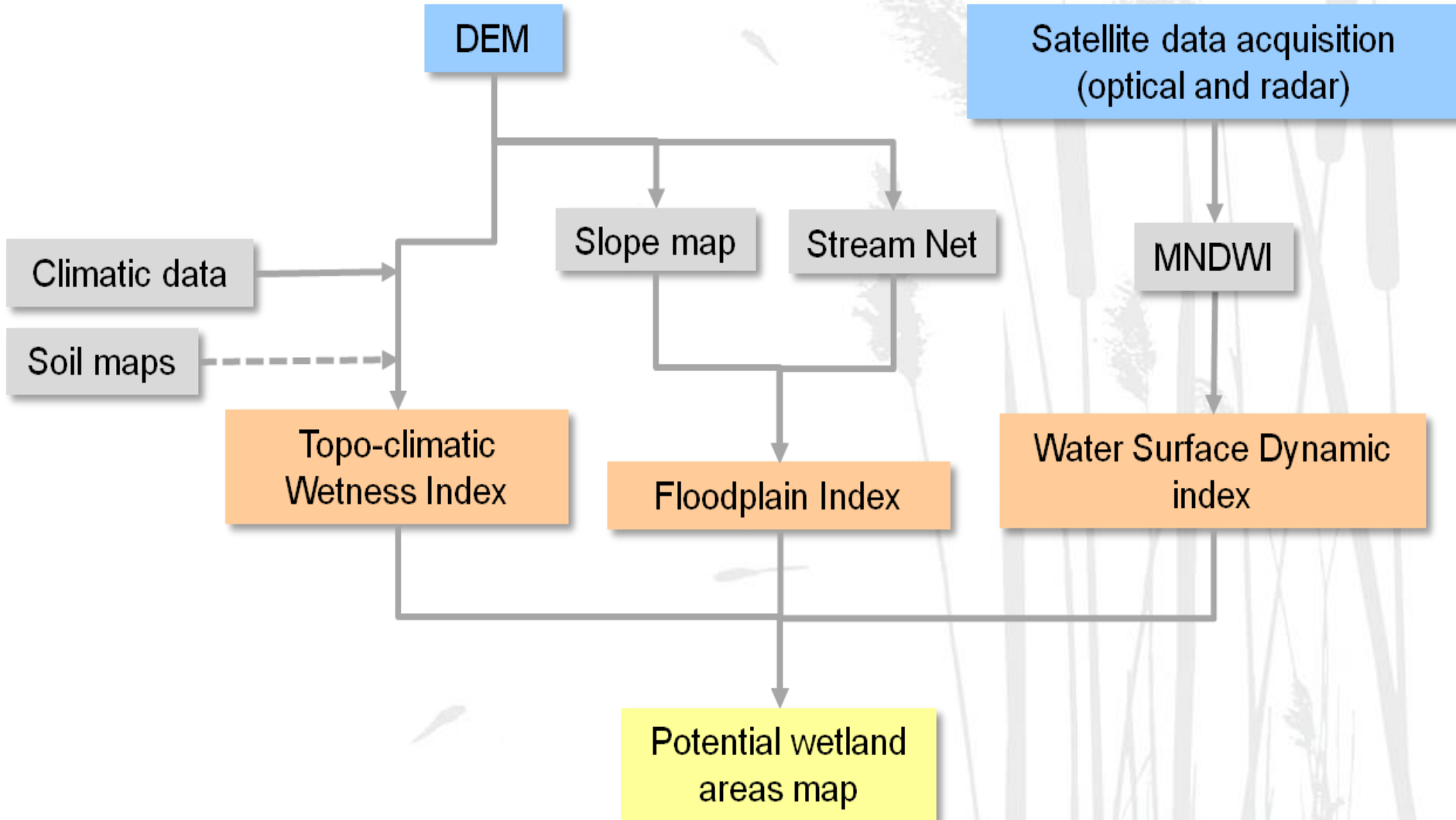
Protection against flood and  
coastal erosion

Water Quality

Water provisioning



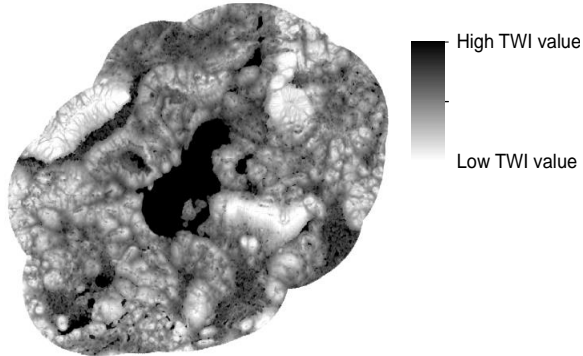
## Mapping potential wetland ecosystem extent





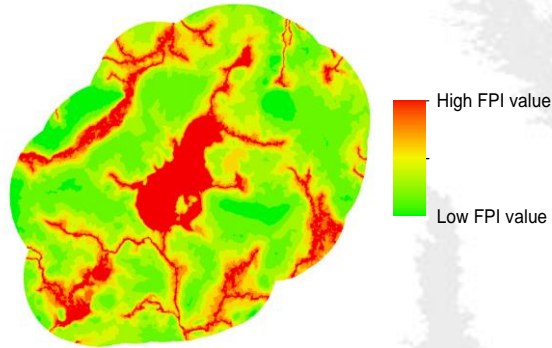
## Results (example of FdP)

### Topographic Wetness Index (TWI)



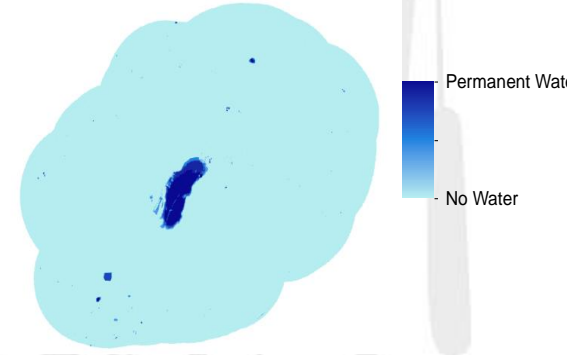
capacity to hold water on the  
surface

### The Floodplain Index

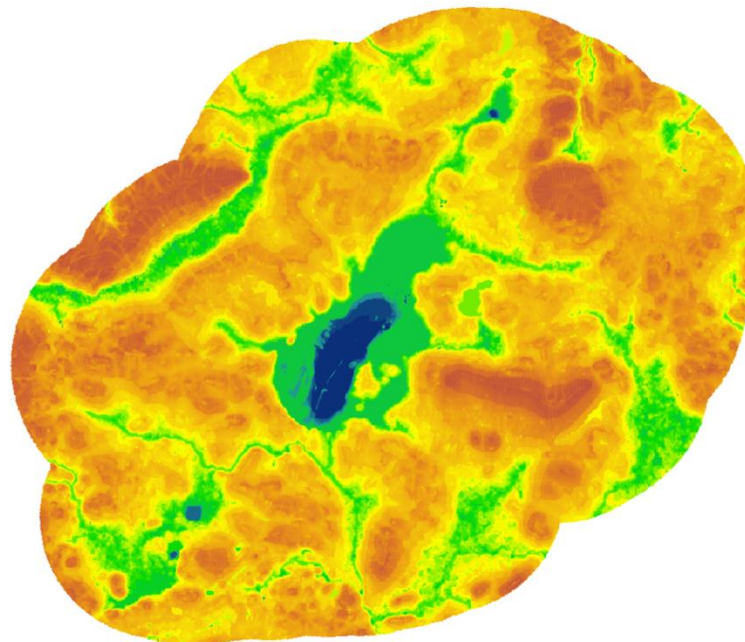


floodplain areas along  
rivers and streams

### The Surface Water Dynamics index



level of surface inundation



Potential Wetland Areas (Probability)

1  
0



# Thank you...



UNIVERSIDAD DE MÁLAGA



**Contact:** Dania Abdul Malak  
[daniaabdulmalak@uma.es](mailto:daniaabdulmalak@uma.es)