BEYOND FLOODS MONITORING

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Flood events are the world's most frequent natural disasters affecting a large number of people and assets.

Factors affecting floods

* Rainfall intensity and duration;

* Characteristics of the river and the basin (area, shape, slope, soil type and land use), antecedent conditions, extreme temperature;

* Drainage systems and river (or generally water resources) management;

* Human activities, such as agriculture, urban development, industry and tourism, but also climate change, contribute to an increase in the likelihood and adverse impacts of flood events.

European Union Floods Directive 2007/60/EC

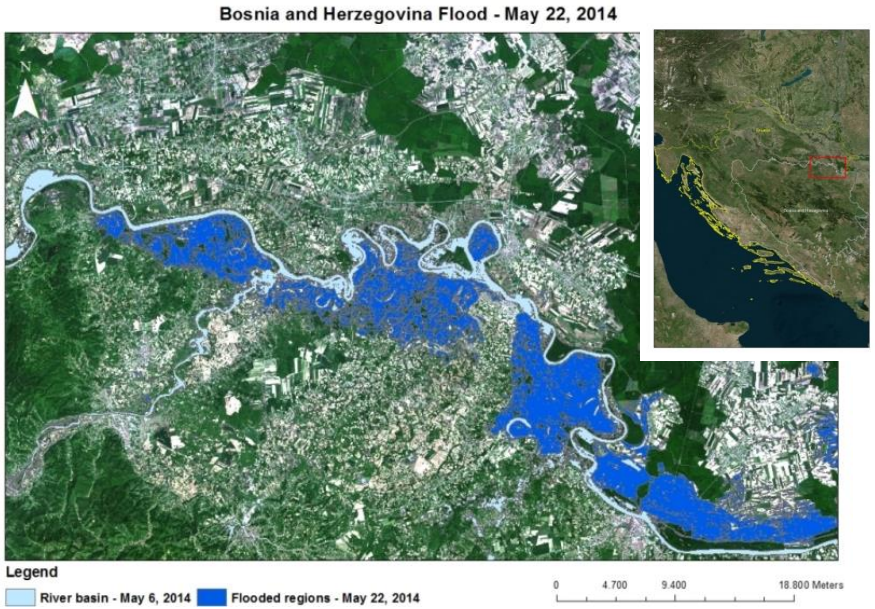
The EU Floods Directive "***on the assessment and management of flood risks***" aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage, economic activity and infrastructure.

This Directive applies to inland waters as well as all coastal waters across the whole territory of the EU, and defines flood as '***a covering by water of land not normally covered by water***'.

Member States are ultimately required to establish **flood risk management plans focused on prevention, protection and preparedness**.

BEYOND's Floods Observatory for Greece & South-Eastern Europe

We register major flood events and we publish the flood mapping results produced following the processing and photo-interpretation of satellite Optical and SAR images.



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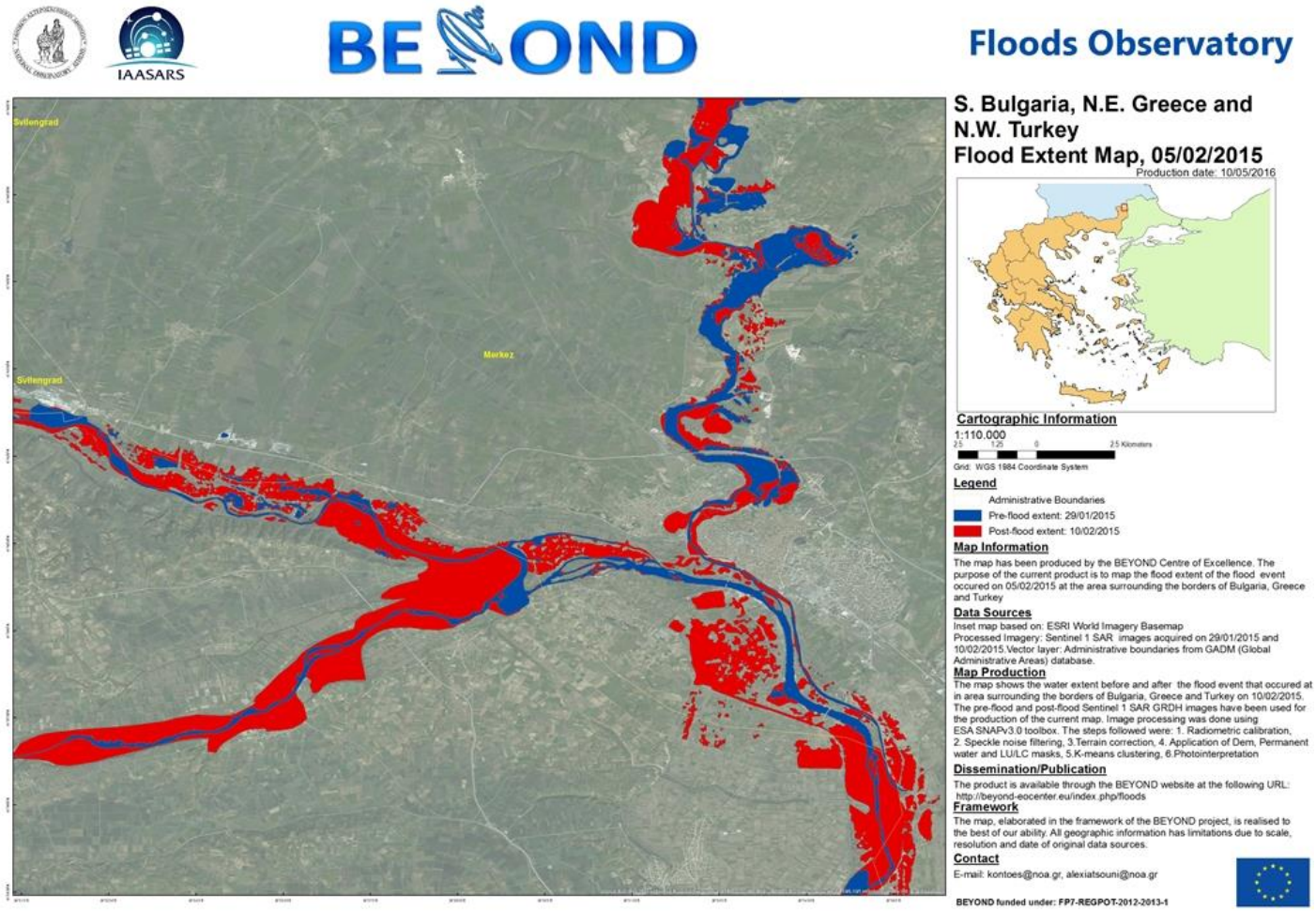
BEYOND's Floods Observatory for Greece & South-Eastern Europe Case study: Floods in Greece, Bulgaria, Turkey, Evros river, 05/02/2015



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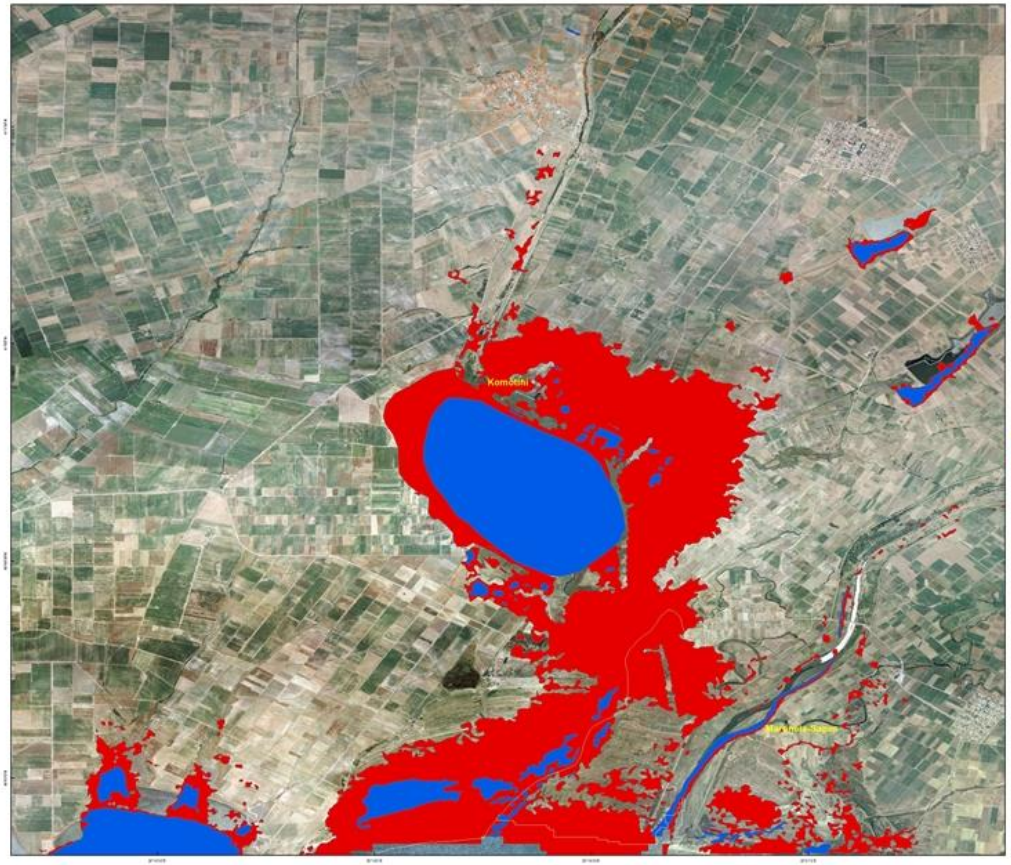
BEYOND's Floods Observatory for Greece & South-Eastern Europe

Case study: Floods in Greece 16/01/2016

BEYOND Floods Observatory

Rodopi Area - Greece
Flood Extent Map, 16/01/2016
Production date: 04/04/2016



Cartographic Information
1:40.000
1 0.5 0 1 Kilometers
Grid: WGS 1984 Coordinate System

Legend
Administrative Boundaries
Pre-flood extent: 12/01/2016
Post-flood extent: 18/01/2016

Map Information
The map has been produced by the BEYOND Centre of Excellence. The purpose of the current product is to map the flood extent of the flood event occured on 16/01/2016 in the area of Rodopi.

Data Sources
Inset map based on:High resolution LSO/VLSO Orthophotos of Ktimatologio S.A. Processed Imagery: Sentinel 1 SAR images acquired on 12/01/2016 and 18/01/2016.Vector layer: Administrative boundaries from GADM (Global Administrative Areas) database.

Map Production
The map shows the water extent before and after the flood event that occured in the area of Rodopi on 16/01/2016. The pre-flood and post-flood Sentinel 1 SAR GRDH images have been used for the production of the current map. Image processing was done using ESA SNAPv3.0 toolbox. The steps followed were: 1. Radiometric calibration, 2. Speckle noise filtering, 3.Terrain correction, 4. Application of Dem, Permanent water and LU/LC masks, 5.K-means clustering, 6.Photointerpretation

Dissemination/Publication
The product is available through the BEYOND website at the following URL: http://beyond-eocenter.eu/index.php/floods

Framework
The map, elaborated in the framework of the BEYOND project, is realised to the best of our ability. All geographic information has limitations due to scale, resolution and date of original data sources.

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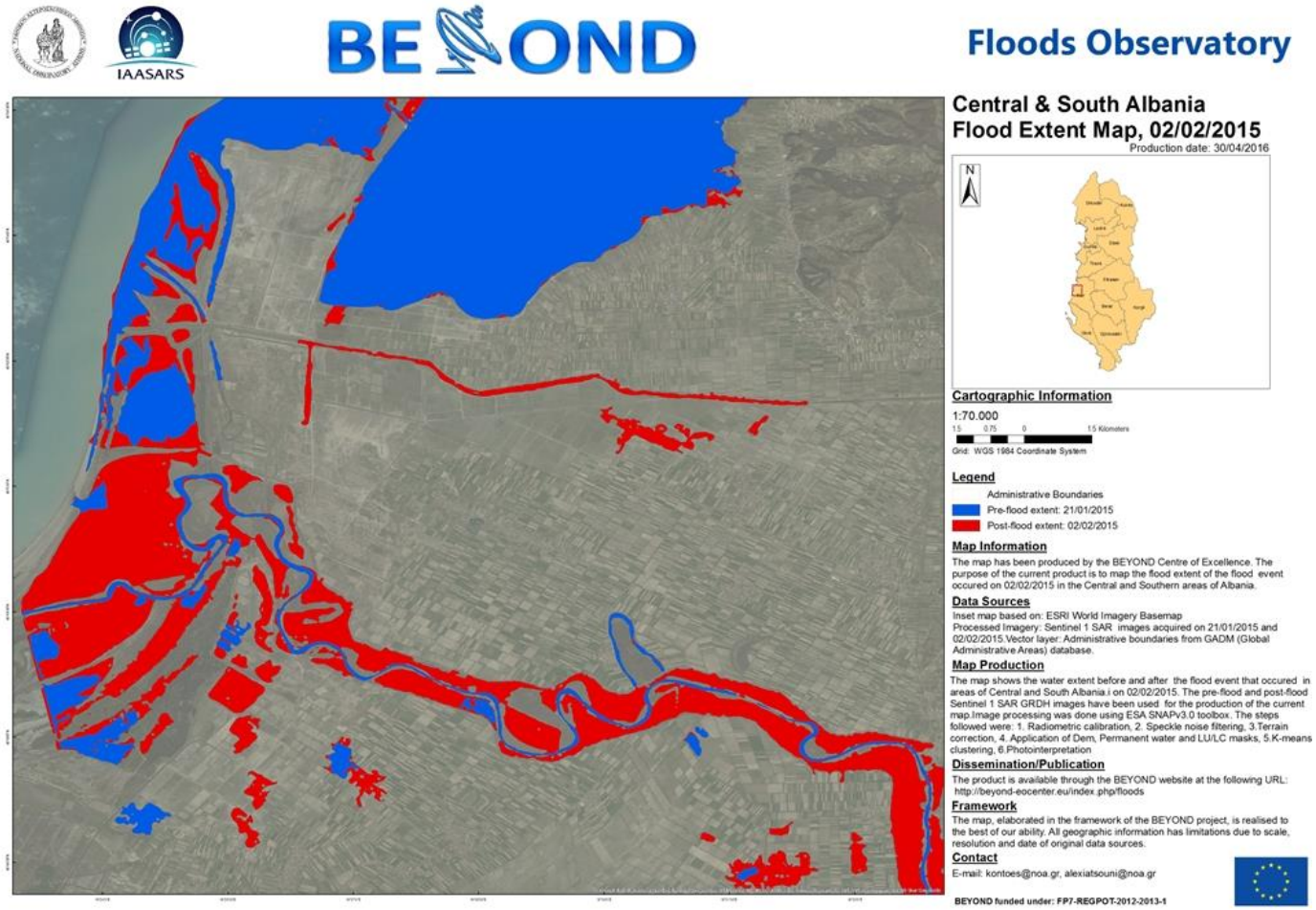
BEYOND's Floods Observatory for Greece & South-Eastern Europe

Case study: Floods in Albania 02/02/2015



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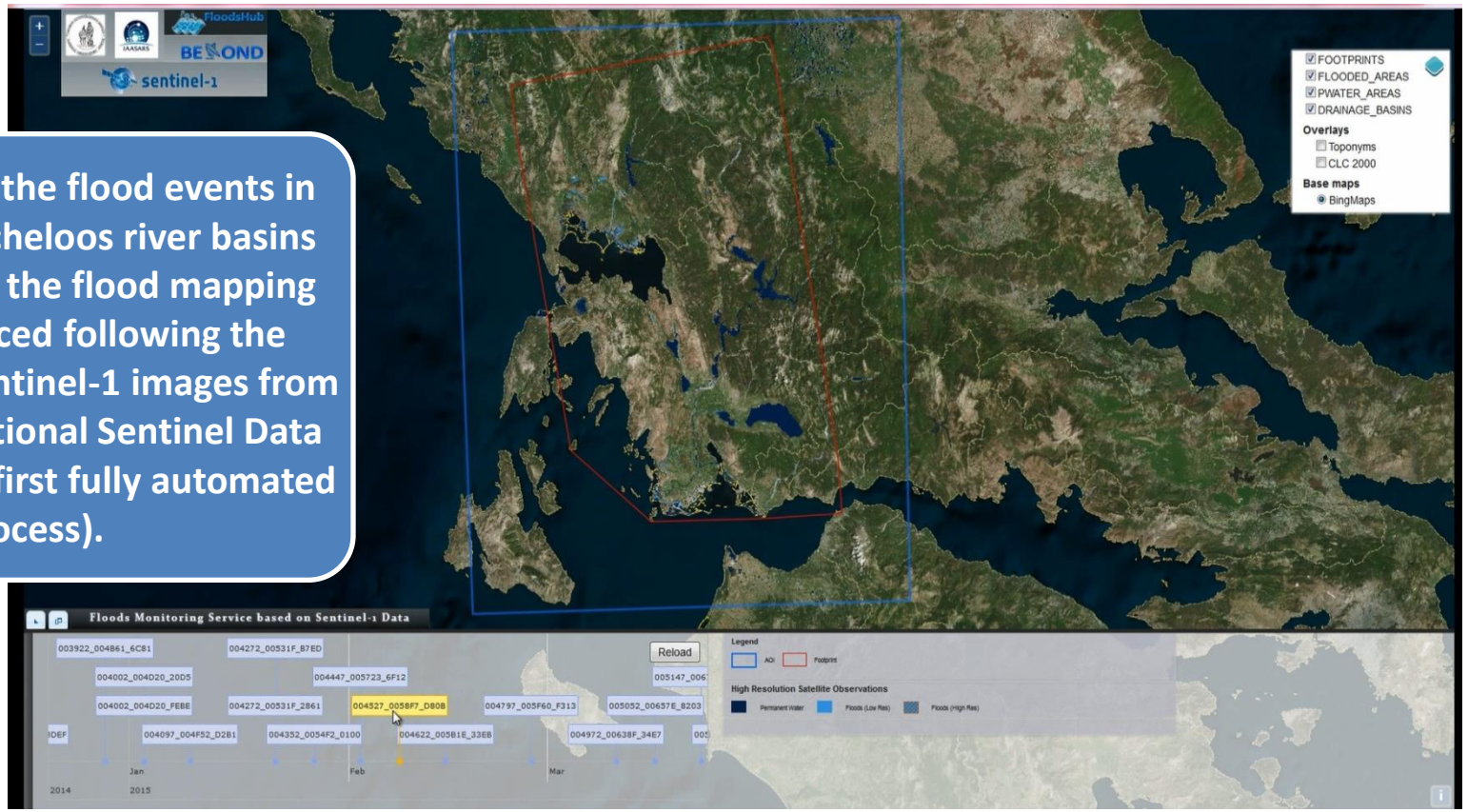
SEVENTH FRAMEWORK PROGRAMME
FP7-Regpot-2012-23-1

FloodHub: BEYOND's Floods Monitoring Service — Overview

We monitor all the flood events in Arachthos & Acheloos river basins and we publish the flood mapping results produced following the processing of Sentinel-1 images from the Hellenic National Sentinel Data Mirror Site (the first fully automated process).



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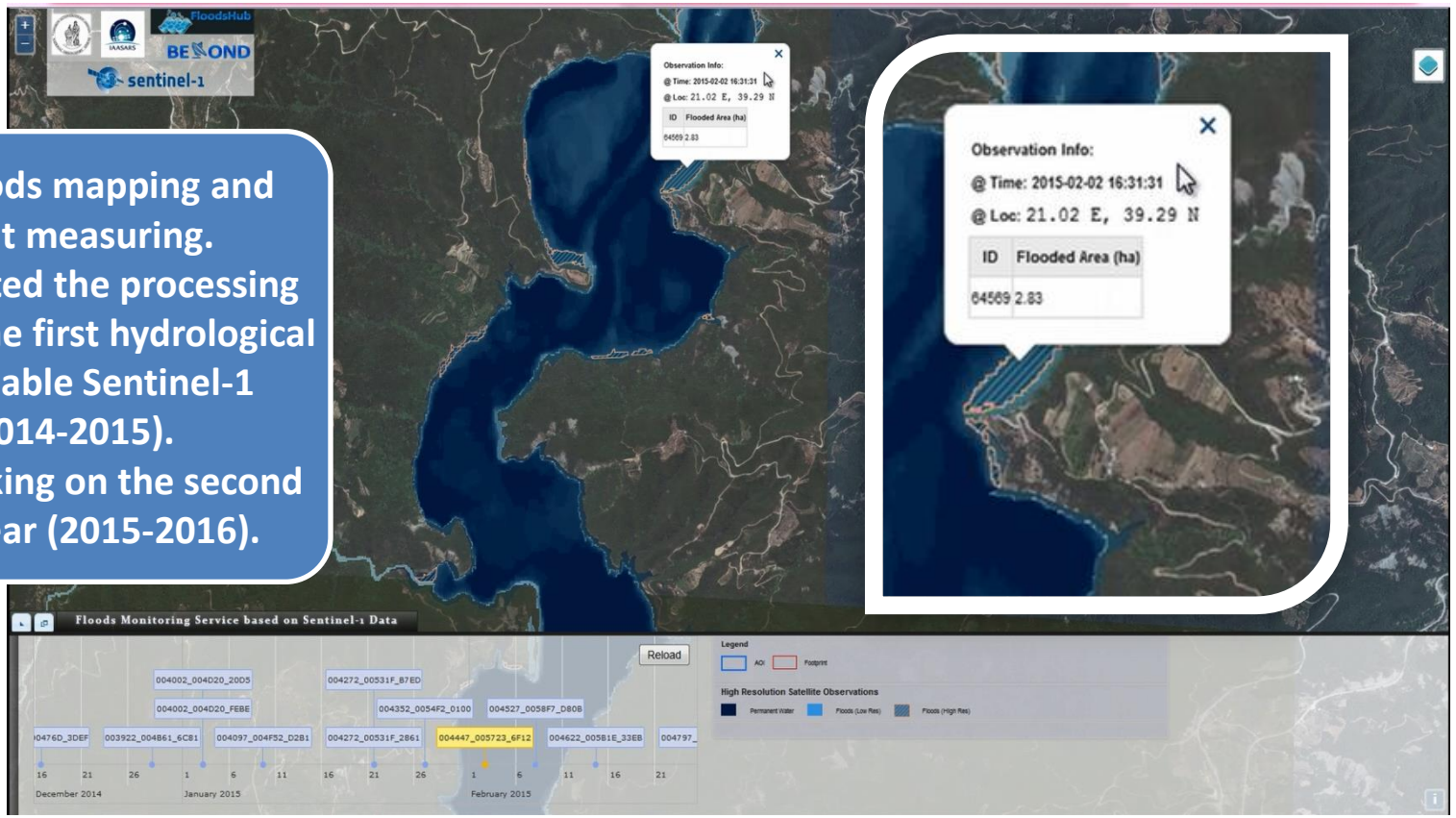
FloodHub: BEYOND's Floods Monitoring Service — Detail

We provide floods mapping and floods extent measuring.
We have completed the processing and analysis for the first hydrological year with available Sentinel-1 images (2014-2015).
We are now working on the second hydrological year (2015-2016).



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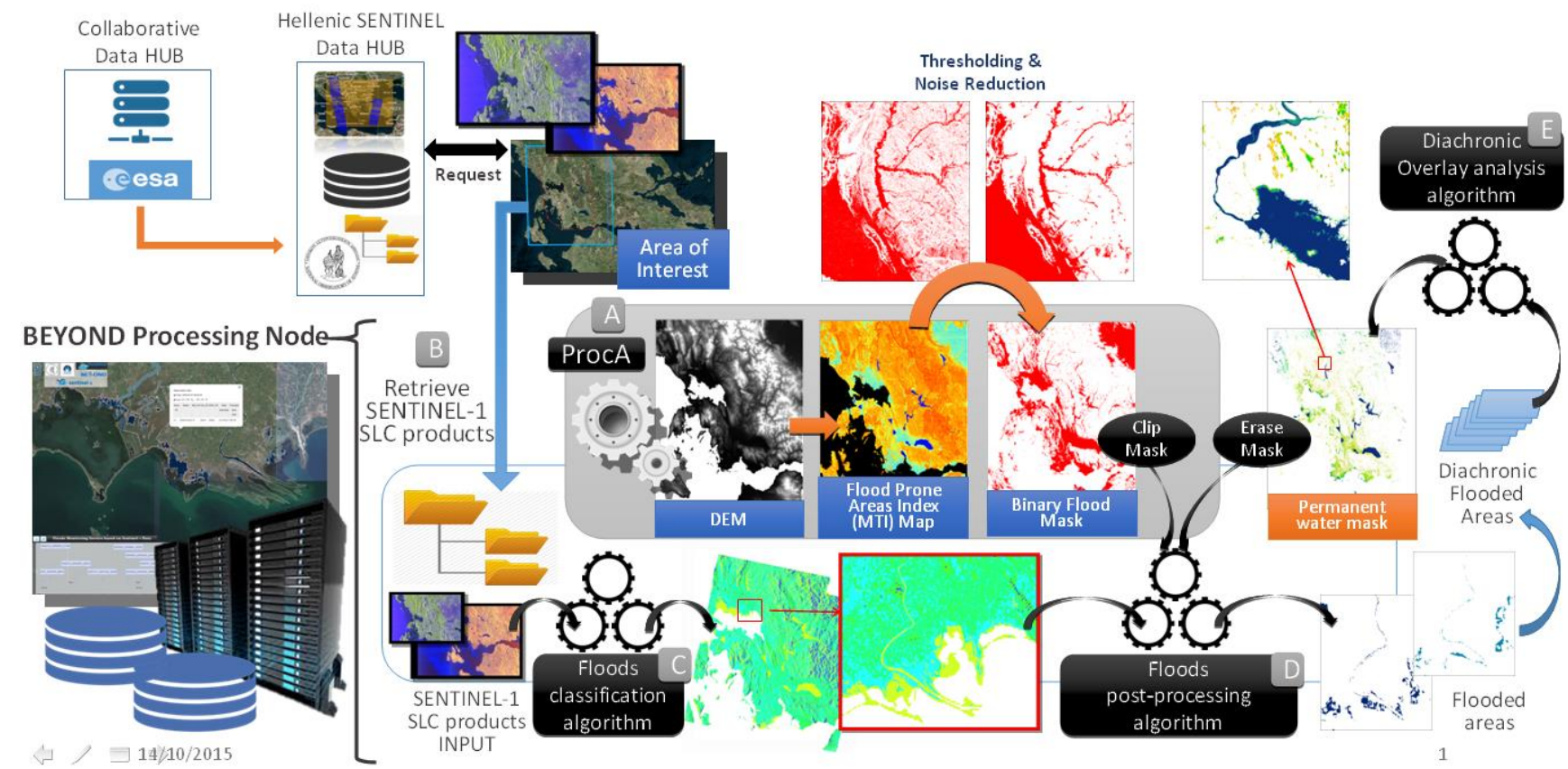
FloodHub: BEYOND's Floods Monitoring Service Architecture



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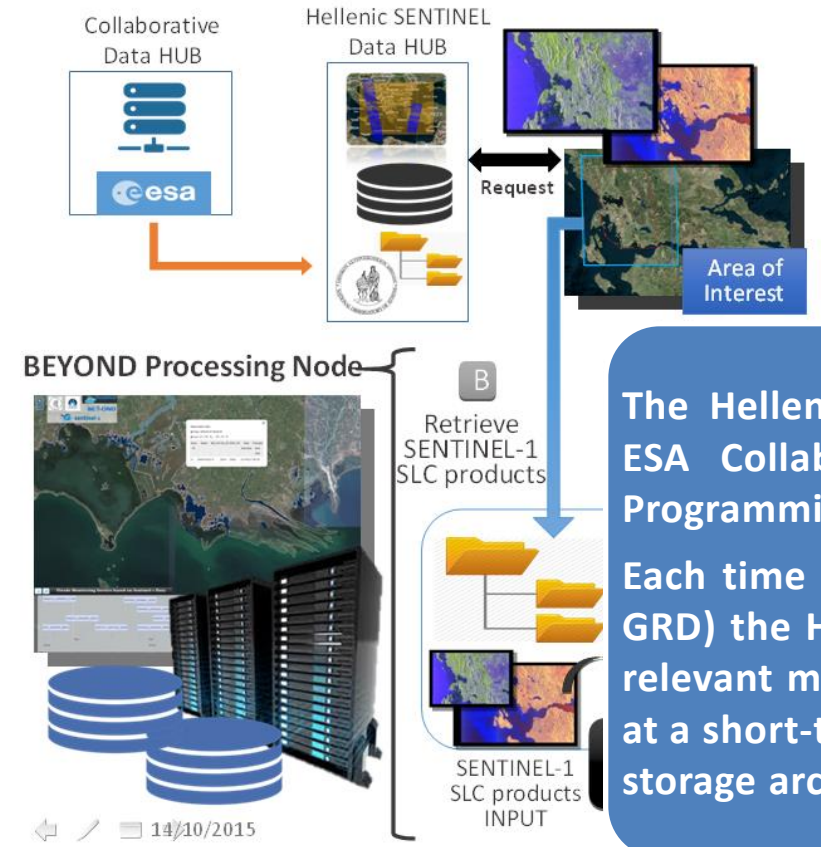
FloodHub: BEYOND's Floods Monitoring Service Architecture



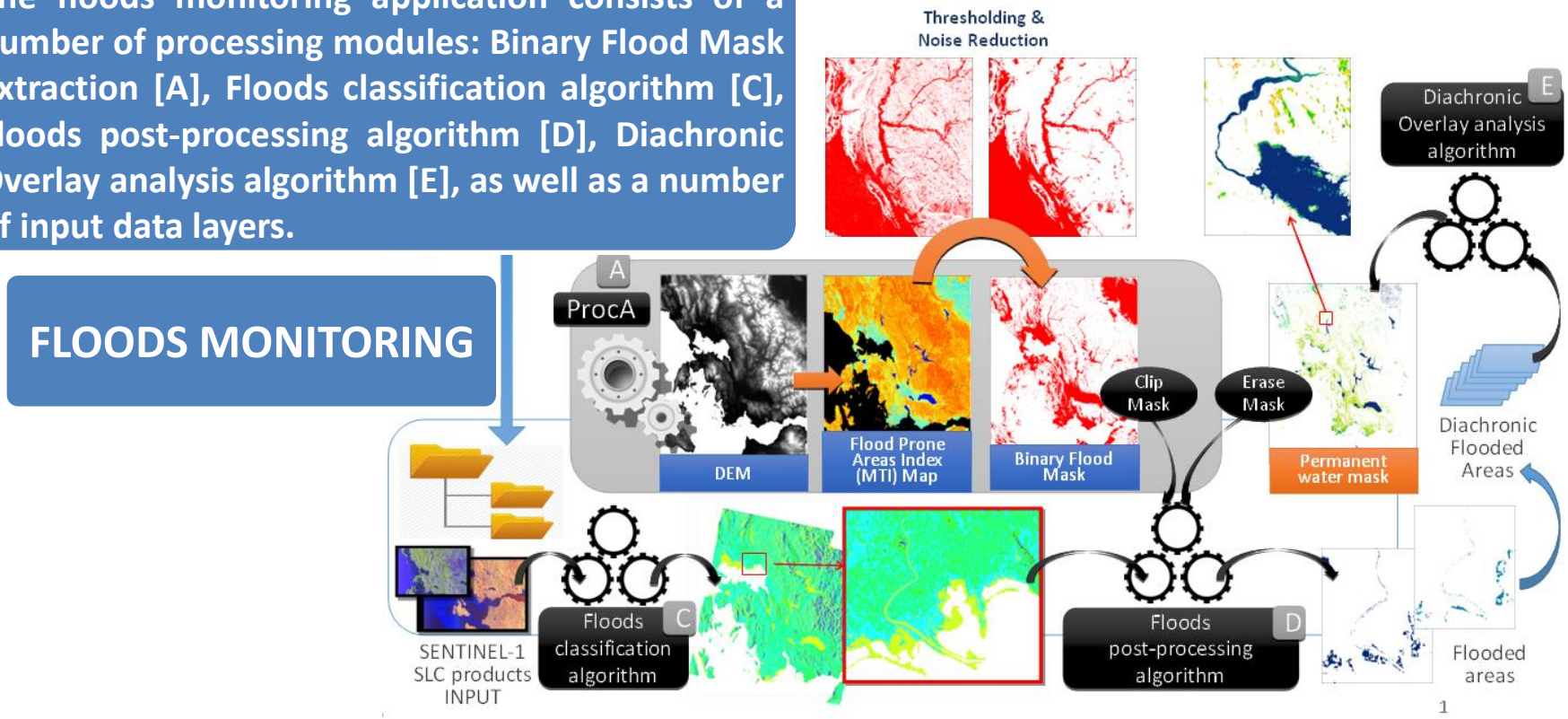
DATA RETRIEVAL

The Hellenic SENTINEL Data HUB continuously monitors the ESA Collaborative Data HUB via a dedicated Application Programming Interface (API).

Each time a SENTINEL acquisition is available (Level-1, SLC or GRD) the Hellenic SENTINEL Data HUB extracts and stores the relevant metadata as well as the original acquisition data first at a short-term and finally at a local (NOA premises) long-term storage archive (100 TB volume).

FloodHub: BEYOND's Floods Monitoring Service Architecture

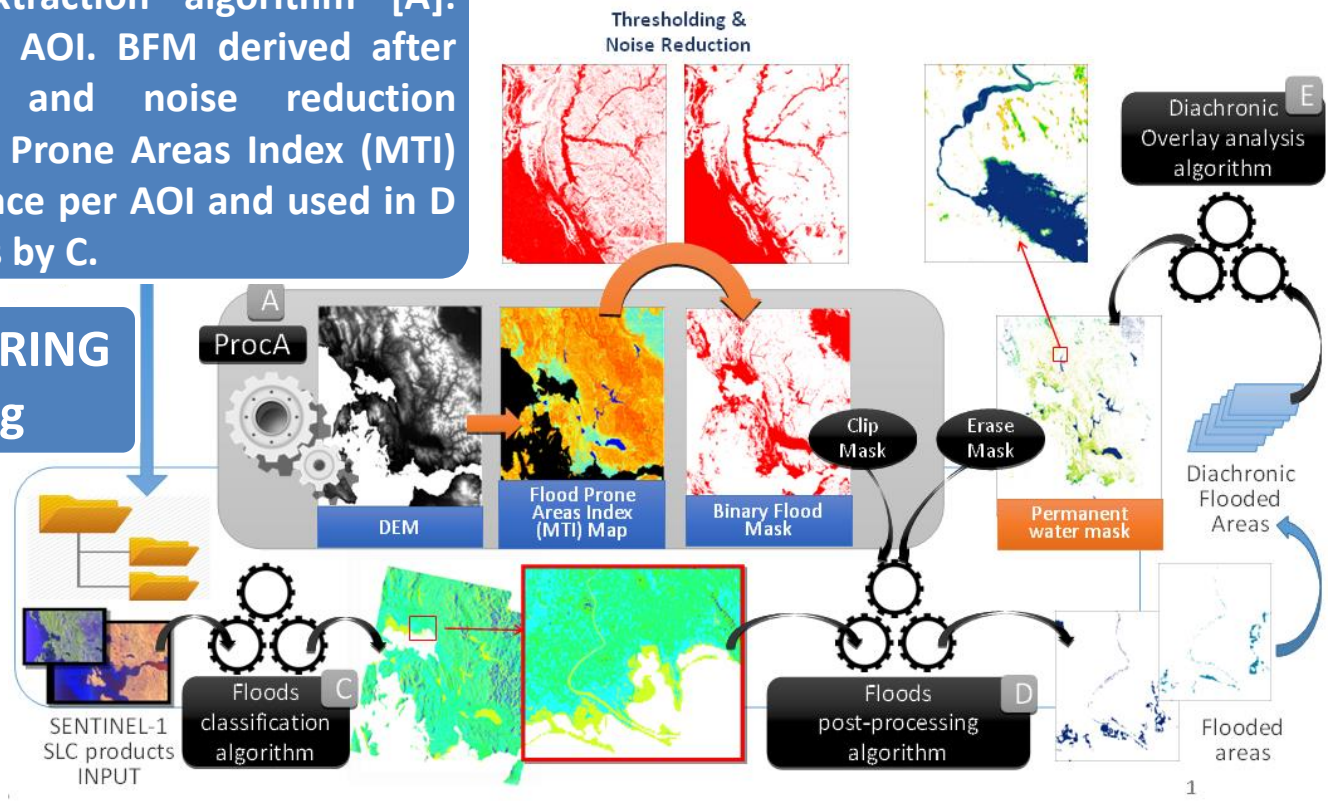
The floods monitoring application consists of a number of processing modules: Binary Flood Mask extraction [A], Floods classification algorithm [C], Floods post-processing algorithm [D], Diachronic Overlay analysis algorithm [E], as well as a number of input data layers.



FloodHub: BEYOND's Floods Monitoring Service Architecture

Binary Flood Mask extraction algorithm [A]: HR DEM input for each AOI. BFM derived after applying thresholding and noise reduction techniques to the Flood Prone Areas Index (MTI) Map. BFM calculated once per AOI and used in D to validate flooded pixels by C.

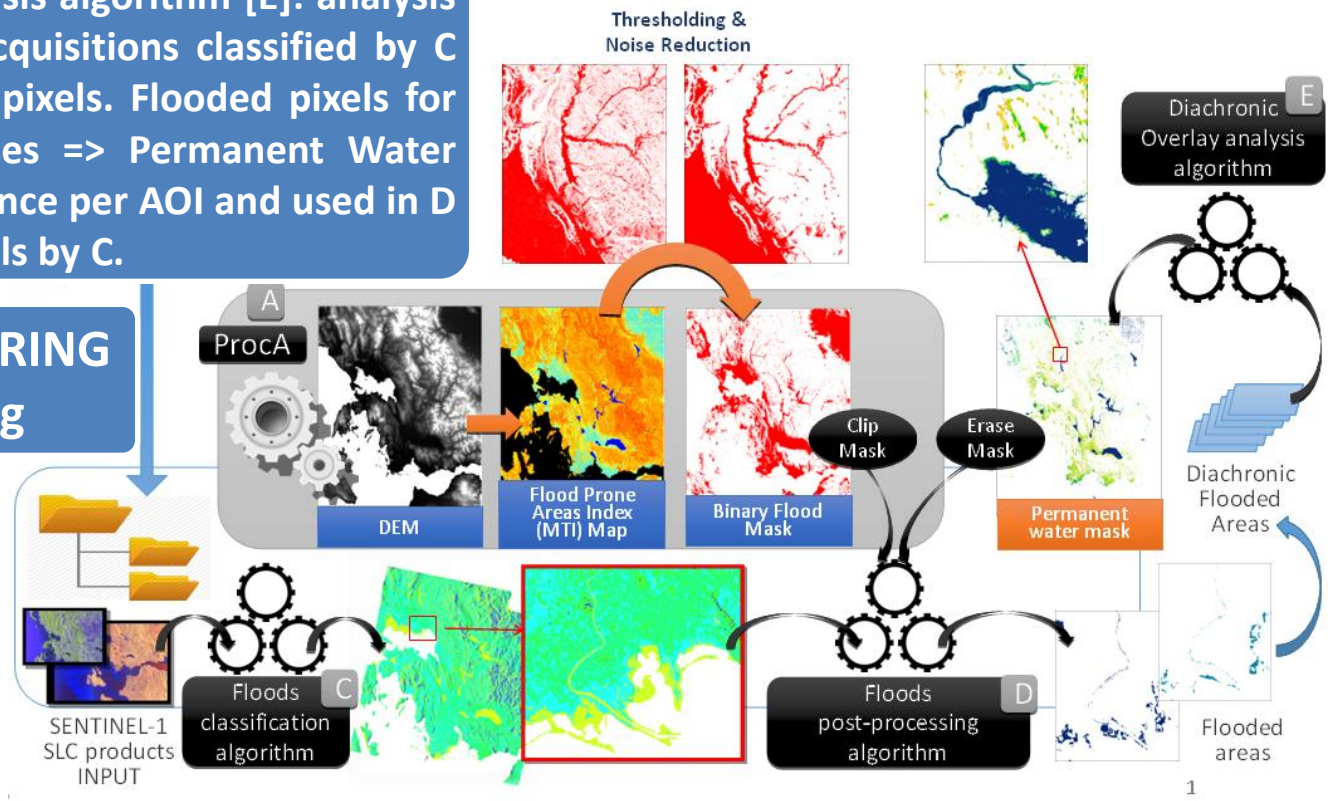
FLOODS MONITORING Pre-Processing



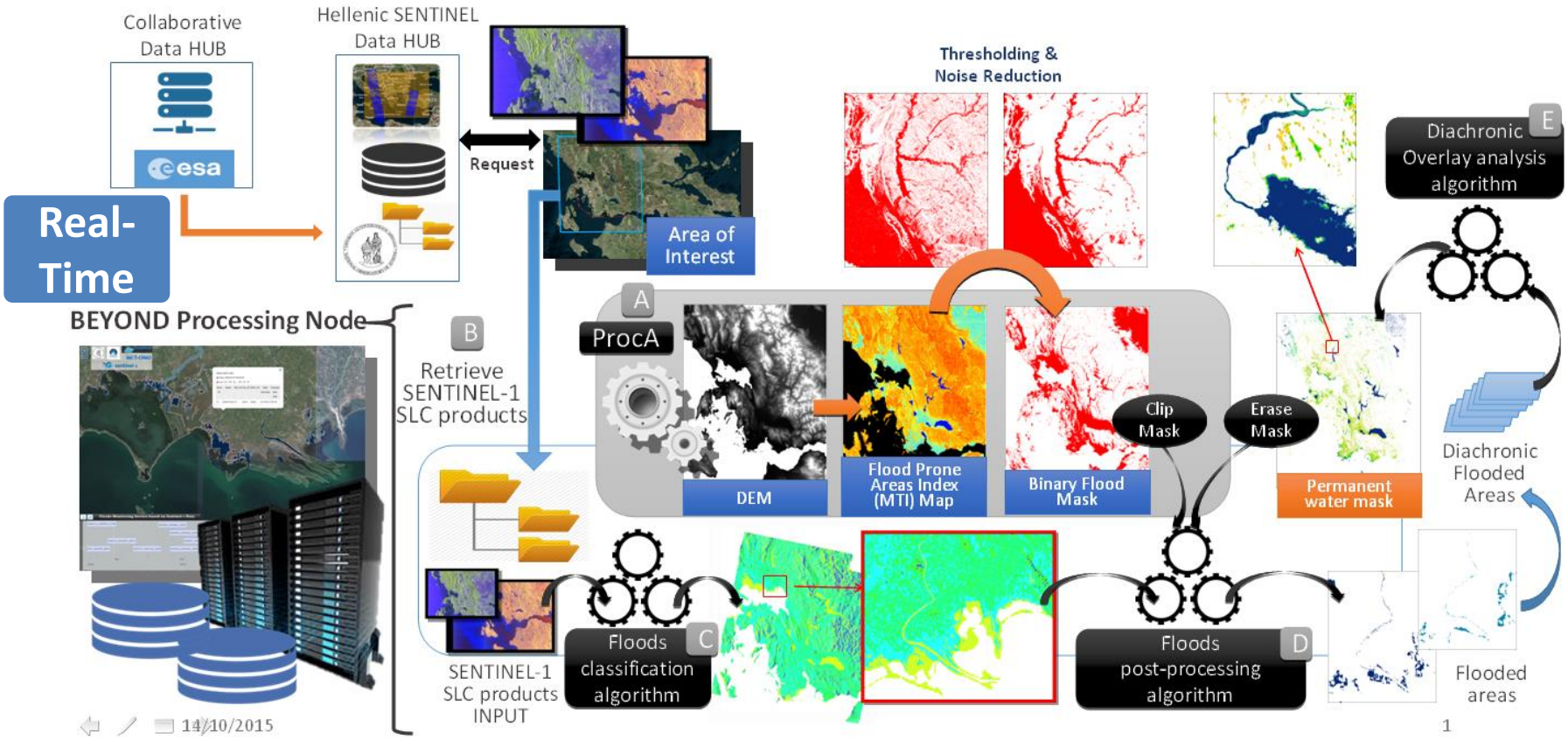
FloodHub: BEYOND's Floods Monitoring Service Architecture

Diachronic Overlay analysis algorithm [E]: analysis over many SENTINEL acquisitions classified by C as flooded/non-flooded pixels. Flooded pixels for at least 85% of all cases => Permanent Water Mask. PWM calculated once per AOI and used in D to eliminate flooded pixels by C.

FLOODS MONITORING Pre-Processing



FloodHub: BEYOND's Floods Monitoring Service Architecture



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FloodHub: BEYOND's Floods Monitoring Service VIDEO

VIDEO

MoU with the Public Power Corporation S.A. Hellas (PPC S.A.)

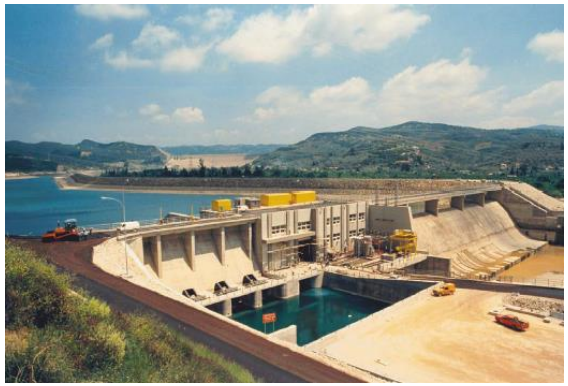
We have established cooperation with the Public Power Corporation S.A. Hellas (PPC S.A.), as there is a mutual interest in the field of studying floods and developing a methodology for monitoring and management of flood risks.

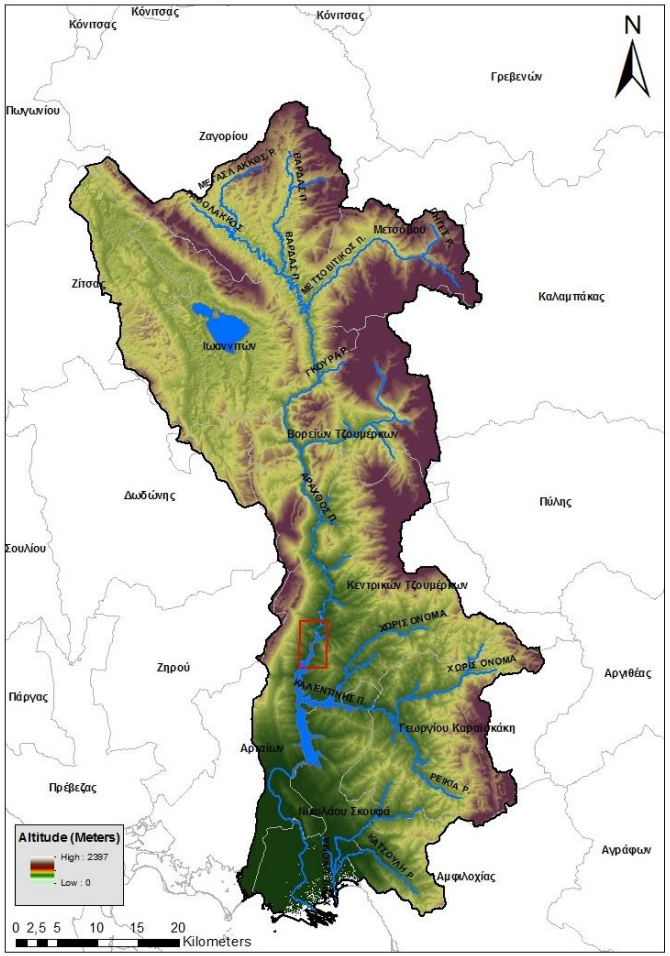
The contribution of PPC S.A. covers the provision of relevant expertise and information derived from the processing of the in-situ collected data of the hydrometeorological network operated by PPC S.A., and data relating to the management of the hydrological basins under study.

CASE STUDY:

The first case study is the river basin of Arachthos (2.209 km^2), a river with several flood events, just upstream of the city of Arta, where PPC S.A. is operating two hydroelectric plants:

1) a large one known as Pournari I (effective capacity of reservoir 303 million m^3)
2) a smaller one known as Pournari II (effective capacity of reservoir 4 million m^3).





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BEYOND Twinning with CIMA Research Foundation, Italy

1st training: 9-13 February 2015
2nd training: 11-15 April 2016

www.cimafoundation.org

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BEYOND Twinning with CIMA Research Foundation, Italy

CIMA has developed the **DEWETRA platform**, a real-time integrated system for hydro-meteorological and wildfire risk forecasting, monitoring and prevention which is fully operational at the Italian Prime Minister Office – National Department for Civil Protection – "Centro Funzionale Centrale".

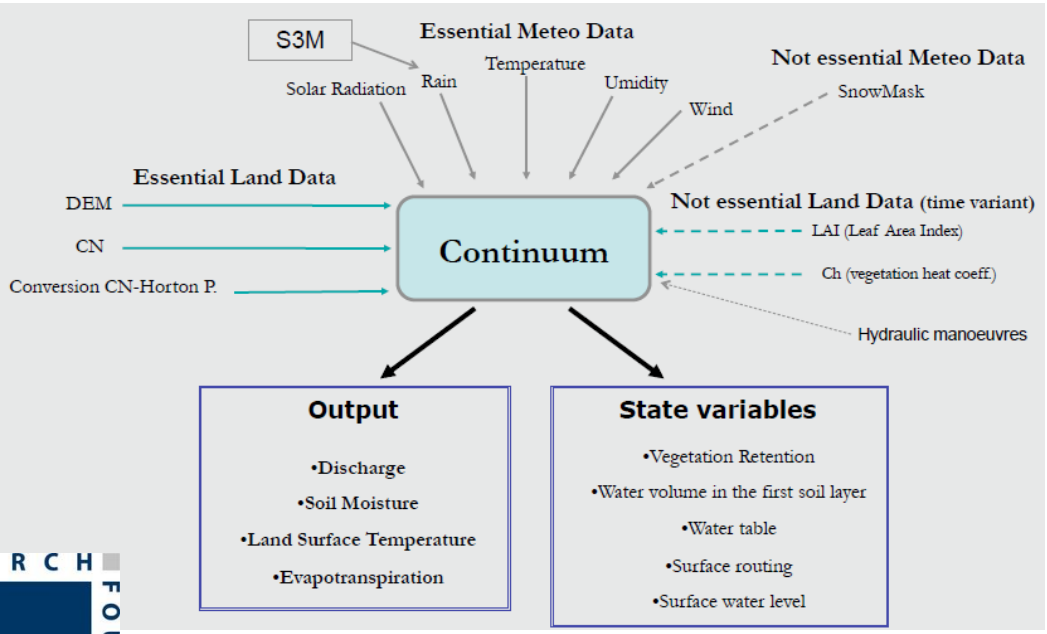
In the field of floods CIMA has developed the **Flood-PROOFS** (Flood-PRObabilistic Operational Forecasting System), a system which is operative in real time since 2008, designed to assist decision makers during the operational phases of flood forecasting, nowcasting, mitigation and monitoring in small and medium catchments (areas of the order of some 103 km^2), typical of Mediterranean environment.

Flood-PROOFS includes the **Continuum model**, a continuous distributed hydrological model that strongly relies on a morphological approach, based on a novel way for the drainage network components identification.

Continuum distributed hydrological model

A complete and distributed model that allows to simulate the main hydrological processes.
Designed with simple but robust processes schematization and with the possibility to exploit remote sensing data. It can be implemented also in scarce data environments

- Simple but complete description of Hydrological Cycle
- Fully Distributed
- Complete Mass Balance
- Energy Balance
- Based on simple terrain data
- Possibility of using satellite data
- Aptitude to data assimilation



RESEARCH FOUNDATION
cima
OBSERVE TO PREDICT,
PREDICT TO PREVENT.

1st training: Introduction to Flood-PROOFS system, focusing on the Continuum hydrological model, including theoretical background & Orba case study in NW Italy.

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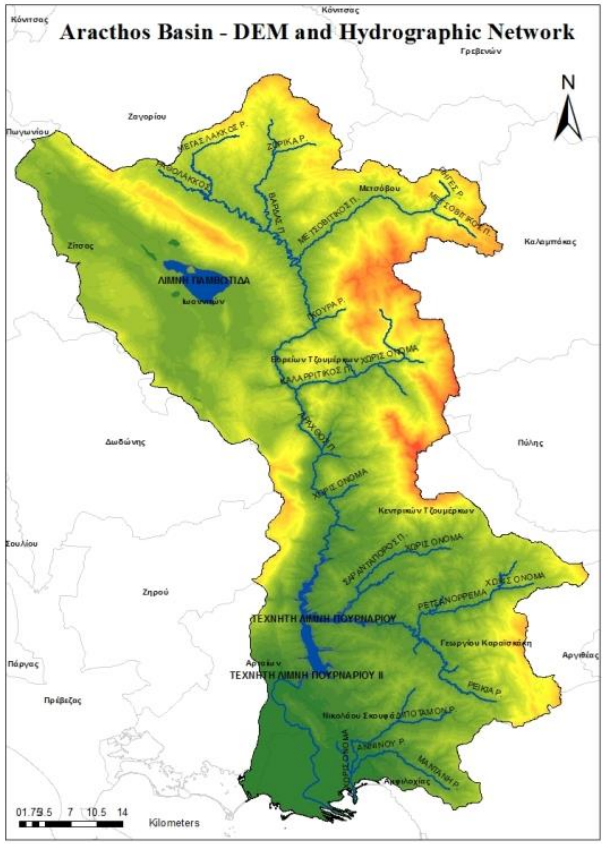
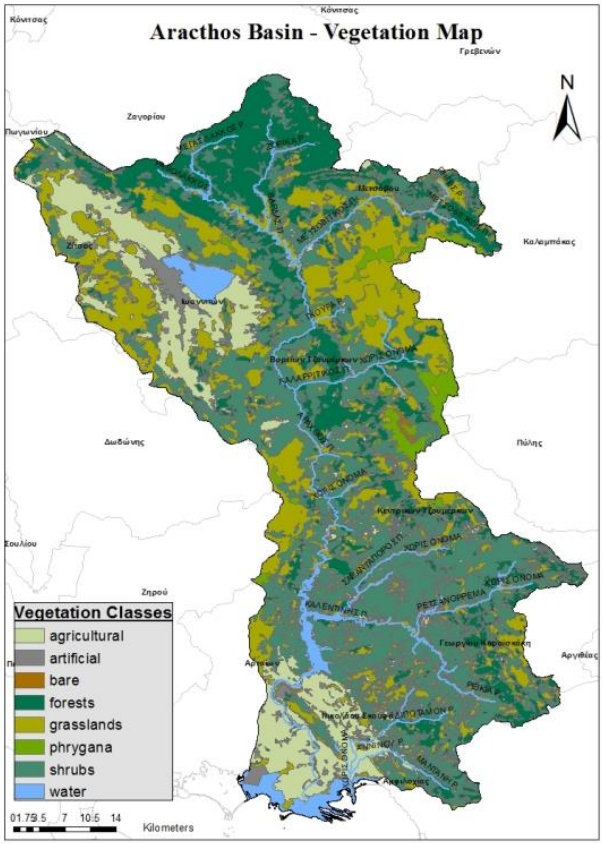
Continuum distributed hydrological model

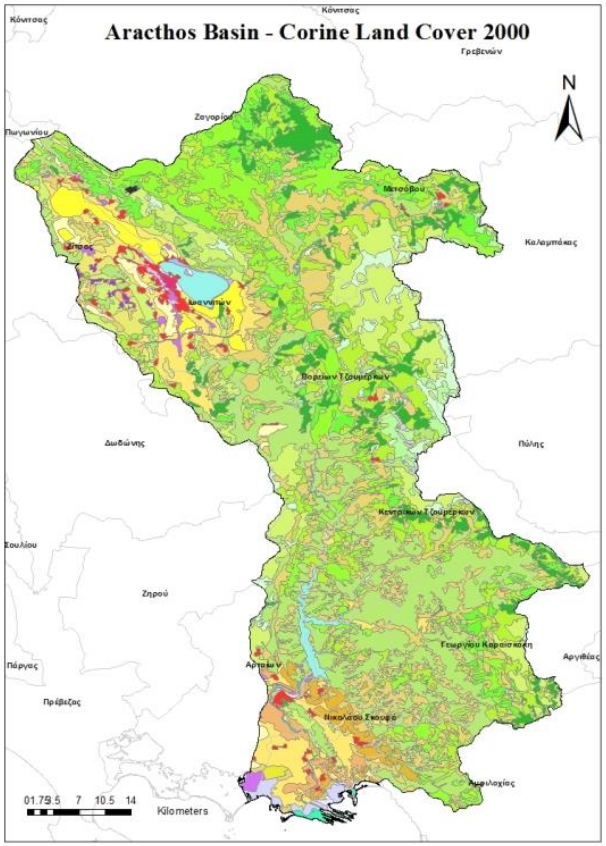
2nd training: Set up of the Continuum model for Arachthos river case study in West Greece:

- Preparation of the input static data;
- Adaptation of scripts and generation of the static data for the model;
- Preparation of a sample of meteorological timeseries for the model;
- Interpolation of the meteorological variables;
- Preparation of the configuration file and the calibration of the model.

Continuum distributed hydrological model - Arachthos river basin







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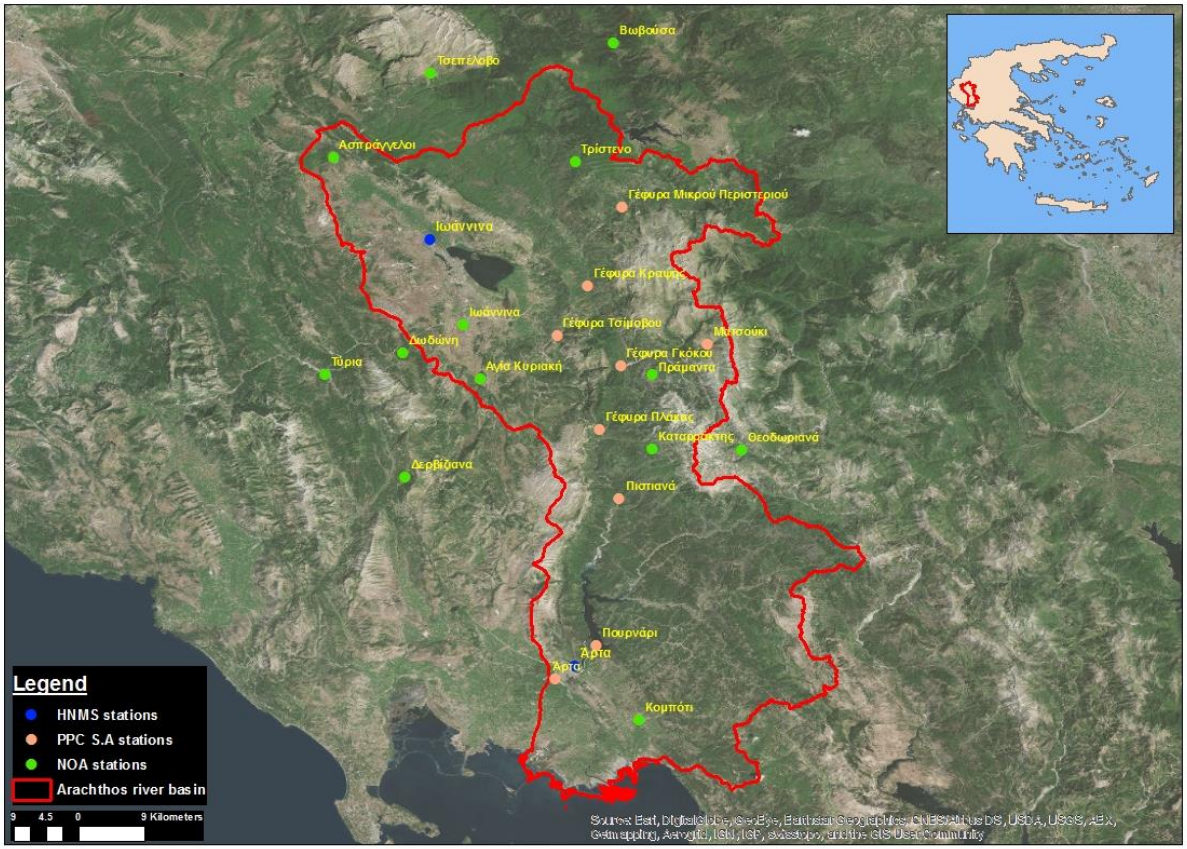
Continuum distributed hydrological model - Arachthos river basin

Collection of all the available meteorological and hydrometric timeseries of the last 5 years for the running of the model in Arachthos river basin.

Stations:

- PPC S.A.
- HNMS
- NOA



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