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Poster N 6.18
Session A

Satellite operational products for precipitation, soil moisture and snow: applications and case studies

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The EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management **(H SAF) provides quality checked real time products to satisfy the need of operational hydrology and water resources management.** The **H SAF portfolio includes more than twenty operational products** for snow, precipitation, and soil moisture, obtained through the use of different approaches and satellite sensors offering the users data characterized by high temporal and spatial resolution. Data format as well as the computational and storage needs sometimes could limit the use of satellite observations, especially for operational purposes and for less experienced users.

With the aim of boosting the use of the developed products and the involvement of the users within the project framework, H SAF started the last Continuous Development and Operational Phase (CDOP-4) with a dedicate cluster to "Product Usage and User Outreach" activities. **One of the main goals of this new Cluster is to provide users with support and tools for product handling and usage for specific applications.**

Recently, **the data access tools for some precipitation products,** the daily precipitation on a regular grid (at 0.25° x 0.25°), the instantaneous and accumulated precipitation on pixel based for the MSG full Disk in near real time (every 15 minutes) namely P-AC-SM2RAIN (H64), P-IN-SEVIRI-PMW (H60) and P-AC-SEVIRI-PMW (H61) respectively, have been developed and tested in real case studies.

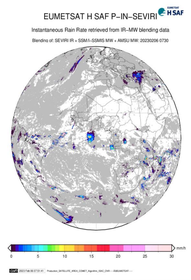
The tools allow to download and tailor the data over the study area for a specific period indicated by the user. The code allows to draw figures and to produce a netCDF file that stores the subset of data for further analysis. The proposed approach will allow the user to save coding time, storage resources and to grant easy and fast access to the data also to the practitioners with less experience in data format and programming language. It is **planned to expand and harmonize the portfolio of this type of script to also facilitate access to H SAF snow and soil moisture.**

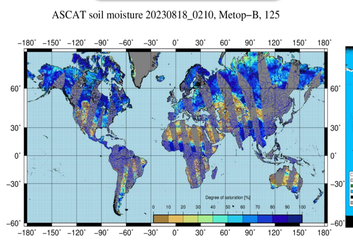
H SAF OPERATIONAL PRODUCTS

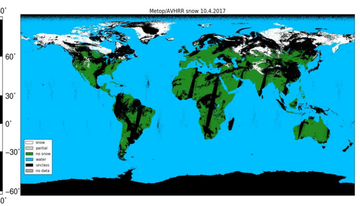
PRECIPITATION
rate and accumulated

SOIL MOISTURE
surface and root zone

SNOW
cover, melting condition, water equivalent







Near Real Time products

Coverage: Europe, Full Disk, Global

Data record

Spatial resolution: Regular grid, pixel based

Products validation: quality assessment and hydrovalidation

To find out more about the H SAF

PRODUCTS USAGE AND USERS OUTREACH

Training

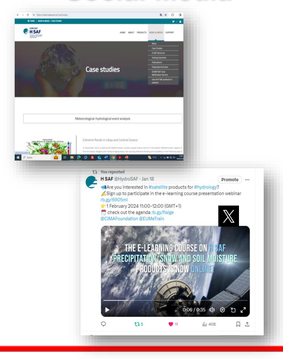
Courses on hydro-meteorological applications

E-learning platform to learn about H SAF products on a self-enrolment basis

Courses on specific Themes

Cooperation

Social Media



Tools

Download and read data

Import Python packages

Spatio/temporal domains definition

Data download

Data reading and extraction

Perform spatio/temporal aggregation

Analysis and pre-process

Direct use of the extracted and pre-processed data into modelling chains

Creation of output files, i.e. images, netcdf, tables…

Assess data quality against benchmark provided by the user

Applications

Hydrological models

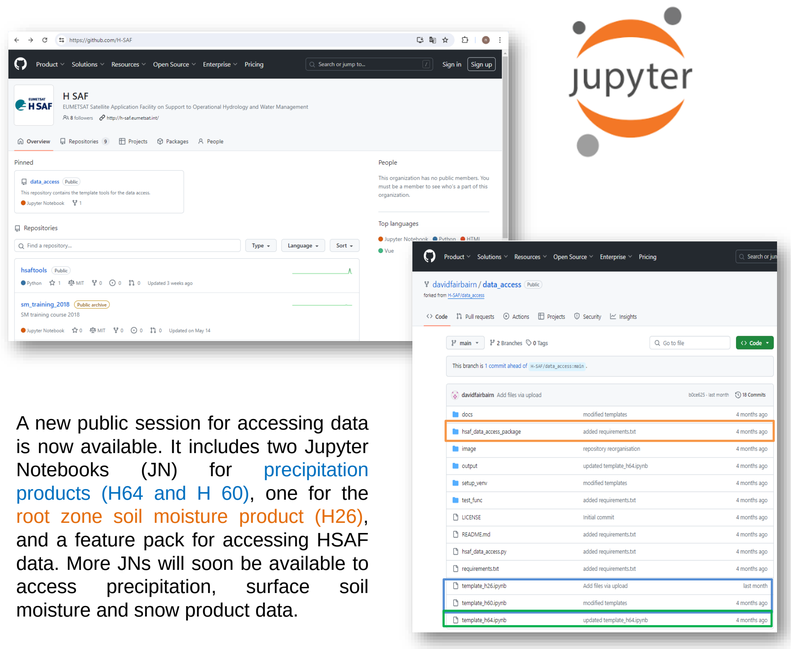
Climatological anomalies

Water resources management

Some data reading and preprocessing tools are now available. while tools for applications such as hydrological models, anomaly analysis or water resource management studies are being developed. The tools are developed in Python using Jupyter Notebooks which allow you to have text, code and figures in the same file easily accessible even to users who are not programming experts.

H SAF DATA ACCESS TOOLS

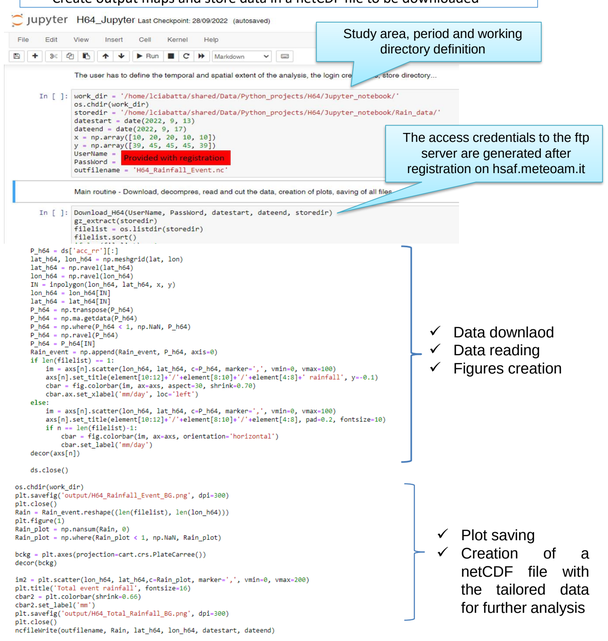
Github repository



A new public session for accessing data is now available. It includes two Jupyter Notebooks (JN) for precipitation products (H64 and H 60), one for the root zone soil moisture product (H26), and a feature pack for accessing HSAF data. More JNs will soon be available to access precipitation, surface soil moisture and snow product data.

A notebook for *Precipitation/Soil Moisture integrated product* (H64) rainfall product:

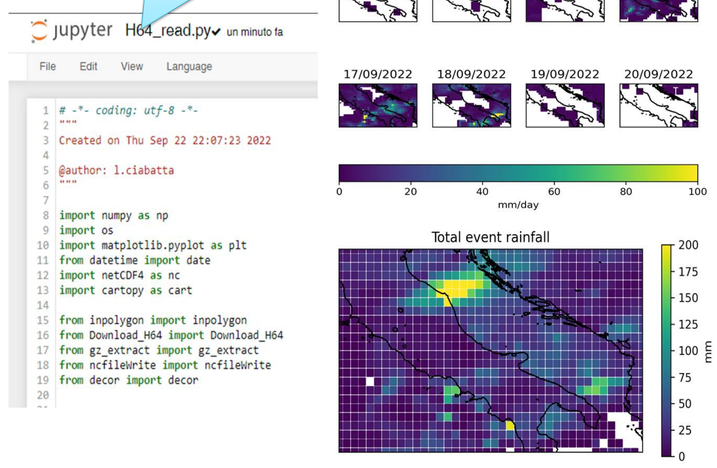
- Mainly focused on case studies;
- Download and extract data according to user requirement;
- Create output maps and store data in a netCDF file to be downloaded



- ✓ Data downlaod
- ✓ Data reading
- ✓ Figures creation
- ✓ Plot saving
- ✓ Creation of a netCDF file with the tailored data for further analysis

Precipitation Jupyter Notebooks

H64 is the gridded daily precipitation obtained by merging soil moisture-derived rainfall with Passive Microwave (PMW) rainfall estimates.

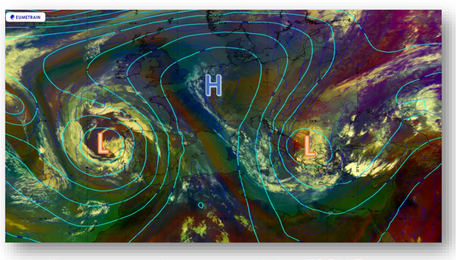


The JN for the precipitation product (daily cumulative) obtained from the soil moisture on the regular grid. It downloads the data and displays the daily maps for the chosen period. The figure shows the flash flood in the Marche region hat occurred in September 2022 .

PRODUCT APPLICATION

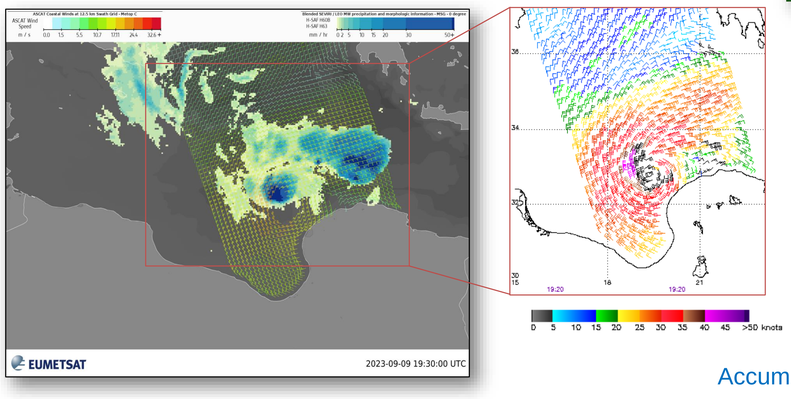
Mediterranean cyclone – Daniel 2023

In September 2023, a very intense Mediterranean cyclone caused severe floodings in the eastern Mediterranean regions. It first hit Greece, Bulgaria and Turkey bringing heavy rain and causing extensive flooding and casualties. In the following days it intensified over the Ionian Sea, moving towards the Libyan coast with very intense precipitation. In the coastal city of Derna two dams collapsed causing over 11,000 victims.



Air mass and geopotential at 500 hPa

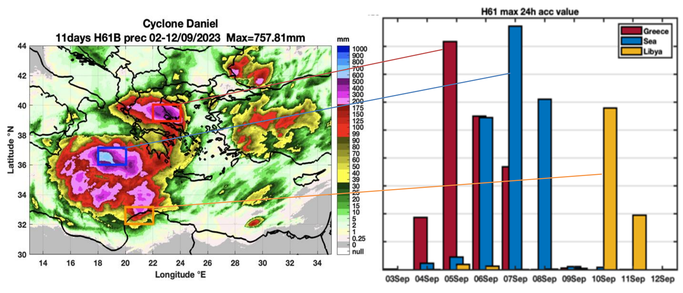
Costal wind and Instantaneous precipitation



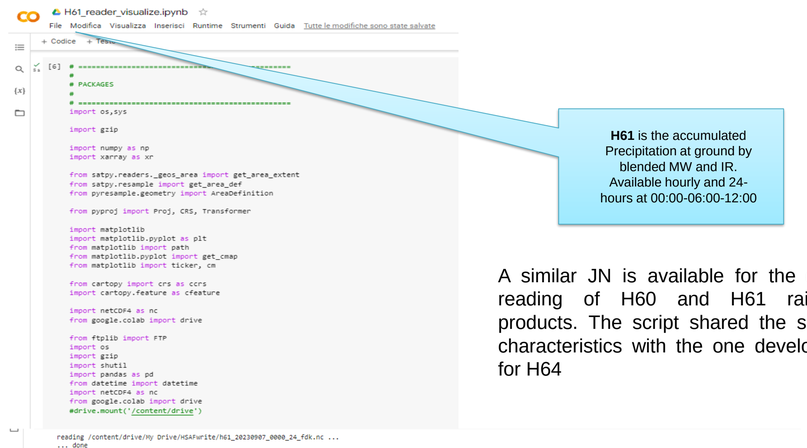
Exceeding the 34 kt threshold, Daniel has intensified to Storm category, due to the strong diabatic forcing over the very warm weathers of the southern Mediterranean

3-5 September
Accumulated precipitation estimated by satellites was mainly located in the Peloponnesus area, exceeding 500 mm.
6-8 September
Precipitation fell in the Ionian Sea, reaching the maximum for the entire event (over 730mm).
9-11 September
The cyclone affected the Libyan coast: an anomalous amount of rainfall with a daily peak of 294 mm.

Accumulated precipitation



07 September 2023 Daniel Cyclone: 24-h of accumulated precipitation estimated by H61



A similar JN is available for the data reading of H60 and H61 rainfall products. The script shared the same characteristics with the one developed for H64