H-SAF Soil Moisture Week 2019

4 – 8 November 2019

Monday, 4th November 2019:

13:00 – 13:30 UTC: Silvia Puca (DPC): **Introduction to the H-SAF project**

H SAF started in 2005 and aims to provide remote sensing estimates of relevant hydrological parameters: instantaneous rain rate and cumulated rainfall, soil moisture at surface and in the root zone, snow cover and water equivalent. The project involves experts from 12 national meteorological and hydrological European Institutes of Austria, Belgium, Bulgaria, Finland, France, Germany, Hungary, Italy, Poland, Romania, Slovakia and Turkey, and from ECMWF.

The H SAF main objectives are: to provide new satellite-derived products (precipitation, snow parameters and soil moisture) from existing and future satellites with sufficient time and space resolution to satisfy the needs of operational hydrology, and to perform independent validation in order to assess the usefulness of the new products for fighting against floods, landslides, avalanches, and evaluating water resources.

13:30 – 14:00 UTC: Jean Christophe Calvet (Meteo France): **Introduction on Soil Moisture and how products can be integrated into models**

In situ and satellite-derived soil moisture observations are needed to better understand and simulate land surface processes. This has been the subject of active research for more than two decades. The transfer to operations in weather forecast, hydrometeorological, and drought monitoring applications also implies the integration of satellite-derived observations into models. Examples of the use of soil moisture observations, simulations, and data assimilation are presented.

Register for the afternoon session

Tuesday, 5th November 2019:

09:00 – 09:30 UTC: Sebastian Hahn (TU Wien): **Surface Soil Moisture (SSM) products and algorithm description**

H SAF Surface Soil Moisture (SSM) products are derived from the Advanced Scatterometer (ASCAT) on-board the series of Metop satellites operating in space since more than 14 years. The SSM retrieval is based on a semi-empirical change detection method developed by TU Wien, which exploits the multi-incidence angle measurement capability of the fan-beam scatterometer ASCAT. While ASCAT Near Real-Time SSM products are most current and well suited for Near Weather Prediction (NWP), ASCAT Climate Data Record (CDR) products ensure long-term consistency and stability. This presentation will discuss the algorithmic background of the ASCAT SSM retrieval and describe the properties and characteristics of currently available ASCAT SSM products.

09:30 – 10:00 UTC: Apostolos Giannakos (ZAMG): **How to work with SSM products: From download to visualization**

H SAF Surface Soil Moisture (SSM) products that are comprised of Near Real-Time (NRT) SSM products and Climate Data Record (CDR) products are freely available at the H SAF data portal. Examples of downloading, reading and displaying SSM data in Python are presented. Ascat python software package that reads and converts data derived from the Advanced Scatterometer (ASCAT) on-board the series of Metop satellites and pytesmo python library that can be used for reading, comparison and validation of geospatial time series soil moisture datasets are introduced.

Register for the morning session

13:00 – 13:30 UTC: David Fairbairn (ECMWF): **Root zone soil moisture (RZSM) products based on scatterometer data assimilation**

ECMWF provides the core root-zone soil moisture (SM) products for H SAF through an Extended Kalman filter assimilation system, running independently of the NWP system. Space borne scatterometer-derived surface SM observations are assimilated into the root-zone (0-1 m) SM of the H-TESSEL land surface model. In this presentation, the theory behind the near-real-time and data record products is discussed.

13.30 – 14.00 UTC: David Fairbairn (ECMWF): **How to work with RZSM products: From download to visualization**

H SAF root-zone soil moisture products are freely available online. They are currently stored in daily files on a reduced Gaussian grid in GRIB binary format, which increases storage efficiency. Examples of downloading, converting the format to regular netCDF files and visualizing the data in Python are presented. The new metview-python package is also introduced, allowing direct applications in GRIB format.

Register for the afternoon session

Wednesday, 6th November 2019:

09:00 – 10:00 UTC: S. Gabellani, F. Delogu (CIMA): **Analysis of Soil Moisture time series and spatial patterns**

Soil Moisture is a crucial variable in hydrological applications. It can be measured and estimates in different way and along different spatial and temporal scale. The presentation describes how soil moisture estimated trough satellite can be compared and validated with other sources of information; theoretical basis and practical example will be showed.

Register for the morning session

13:00 – 14:00 UTC: S. Camica, L. Brocca and S. Modanesi (IRPI CNR): **Soil Moisture products for agricultural drought monitoring**

Satellite soil moisture (SM) products are highly suitable for monitoring agricultural drought. As satellite SM products cover long time periods and are available for large regions, the spatial and temporal analysis of drought conditions can be performed. The presentation will describe the theoretical background for performing drought analysis with satellite SM data, and will show some examples for the actual use of the data in identifying drought conditions in some regions worldwide.

Register for the afternoon session

Thursday, 7th November 2019:

09:00 – 10:00 UTC: S. Gabellani, F. Delogu (CIMA): **Soil Moisture data assimilation for flood prediction**

The reliable estimation of hydrological variables in space and time is of fundamental importance in hydrology to improve the flood predictions and hydrological cycle description. Nowadays remotely sensed data can offer a chance to improve hydrological models especially in environments with scarce ground-based data. The presentation describes how satellite soil moisture can be used in hydrological modelling trough data assimilation.

Register for the morning session

13:00 – 14:00 UTC: L. Brocca, S. Camici (IRPI CNR): **Flood prediction through soil moisture product**

Satellite soil moisture (SM) products have been largely used for flood prediction. The knowledge of initial soil moisture conditions before a rainfall event is critical to determine the magnitude of a flood event. The presentation will describe the theoretical background for using satellite SM products in flood prediction, and will show examples for understanding the critical role of initial soil moisture for predicting floods.

Register for the afternoon session

Friday, 8th November 2019:

09:00 – 09:30 UTC: Silvia Puca (DPC): **Hazard Assessment using Soil Moisture products**

Many severe meteorological events occurred in Europe during the last decade and caused casualties and damages to the historical heritage and natural environment. Protection of civilians and safeguard of the territory are the kay mandates of a civil Protection (CP) agency. This is achieved through activities that mitigate hydro-meteorological risks, such as flooding and droughts. European CP agencies, supported by meteorological and hydrological institutes, aim to assess risk scenarios, to monitor and supervise events and risk levels, providing early warning to National and local authorities.

Near real time accurate estimations of hydrological variables such as precipitation and soil moisture are invaluable to the CP agencies, enable them to issue early warnings and plan for disaster relief at the local level.

Besides measurements of key hydrological variables by ground-based instruments, often affected by a limited spatial coverage, advanced satellite-based precipitation and soil moisture products developed within different international programs as H SAF, are available and accessible to users in near-real time.

In this study, recent severe meteorological events are selected in order to understand how the main satellite product characteristics, i.e. accuracy, spatial pattern and resolution, update frequency and latency, impact the efficiency of a hydro-meteorological early warning system at a local level in an operational framework.

09:00 – 09:30 UTC: Nicola Berni (CRPC): **Soil moisture estimation from satellite data: the operative experience of the Umbria Region Civil Protection Early Warning Center (Central Italy)**

Umbria Region Civil Protection Early Warning center (Central Italy) is in charge of alerting and monitoring critical events for Civil Protection purposes (mainly landslides and floods). In last ten years the office has used, in cooperation with national research institutes, satellite data to improve modeling/forecasting tools performances, monitoring activities about possible impacts of severe rainfall events able to trigger floods and landslides at regional scale. In fact, the estimation of the soil water content has proved to be a key parameter for better forecast models implementation both for landslide than for flood risk issues.

Register for the morning session