

South-East European Multi-Hazard Early Warning Advisory System (SEE-MHEWS-A)

South-Caucasus EW4All Event
14-15 December 2023



WORLD
METEOROLOGICAL
ORGANIZATION



SITUATION IN SOUTH-EAST EUROPE

Hazards

The region is affected by hydrological and meteorological hazards including:

- Floods
- Extreme temperatures
- Severe storms
- Droughts
- Wildfires
- Landslides

Damages

During the last 20 years:

- Over 6000 people lost their lives
- Over 12 million people were affected
- Over 20 billion USD total estimated losses and damages.

Challenges

Societal:

- Many social, economic, and political factors in the region continue to put vulnerable groups and economic sectors at risk.

NMHSs capacities:

- NMHSs facing challenges with securing adequate financial and human resources in fulfilling their core function - to provide timely and accurate warnings.

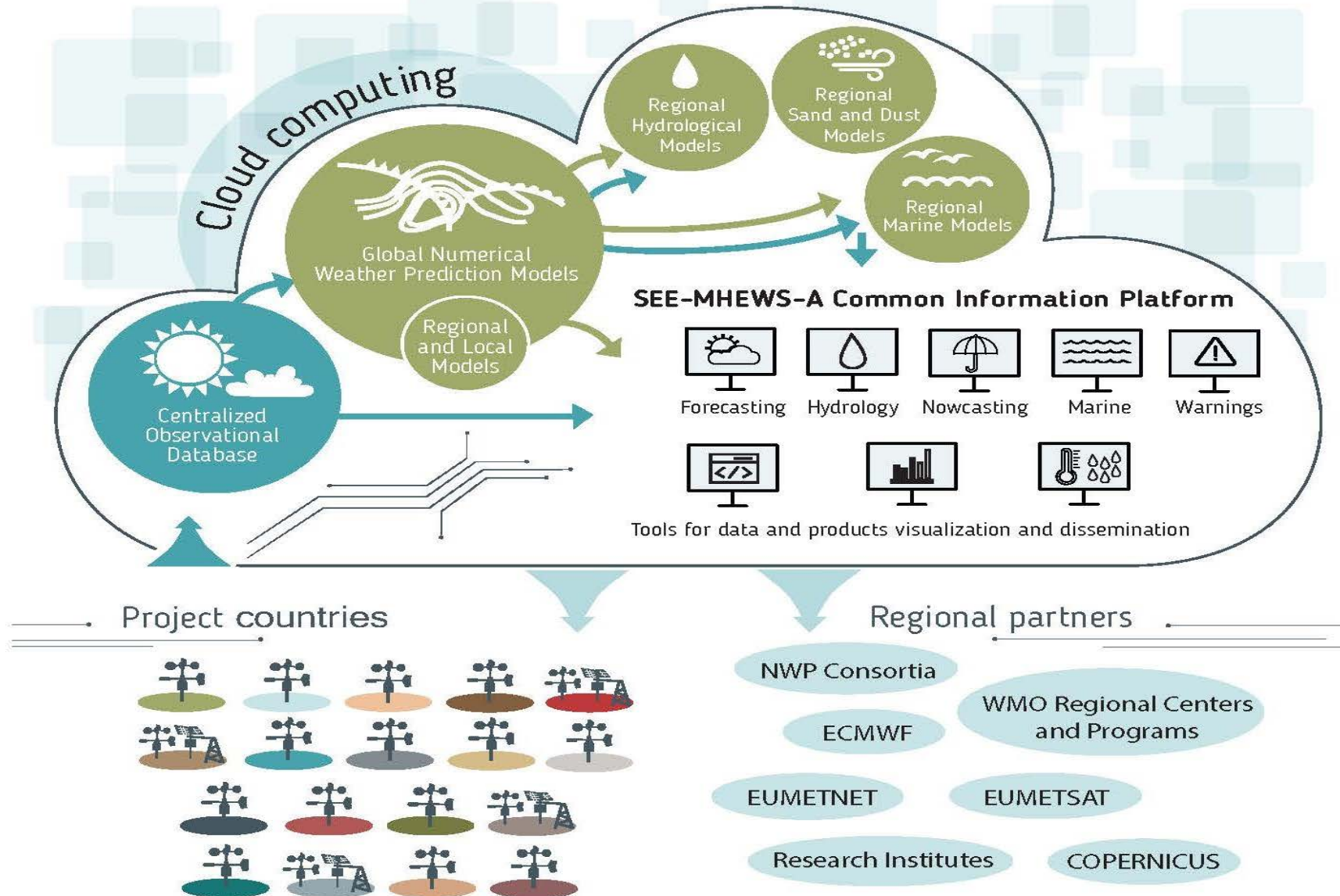
Policies:

- Advancements in policy frameworks are required to facilitate collaboration between different entities.

Geographical:

- Many countries in the region are small in size - hazards often affect multiple countries.

SOUTH-EAST EUROPEAN MULTI-HAZARD EARLY WARNING ADVISORY SYSTEM



SEE-MHEWS-A BACKGROUND

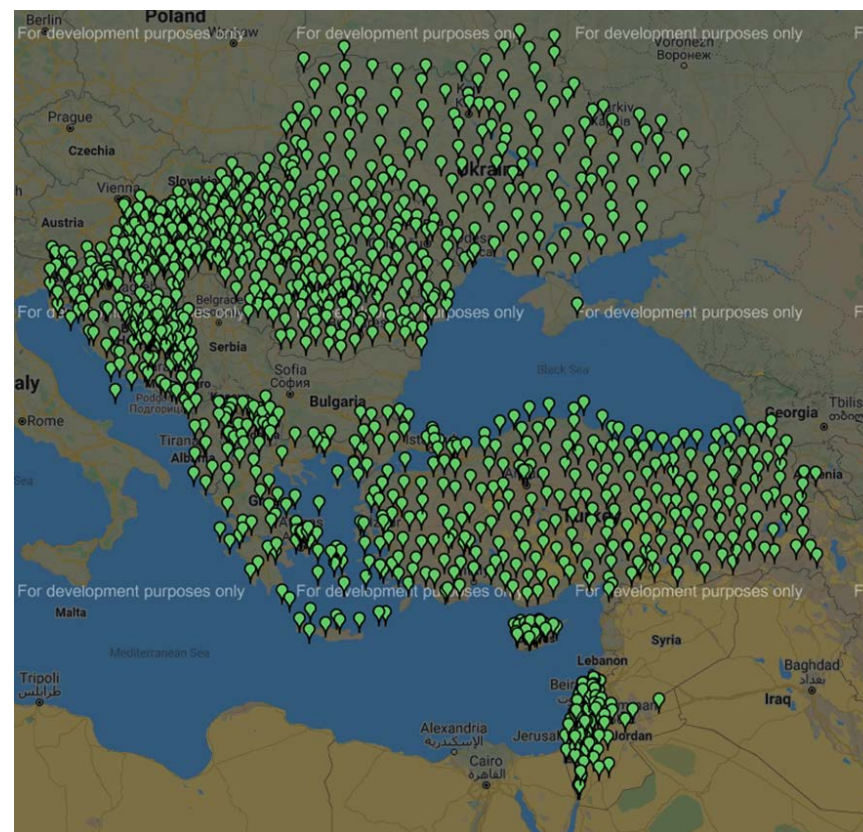
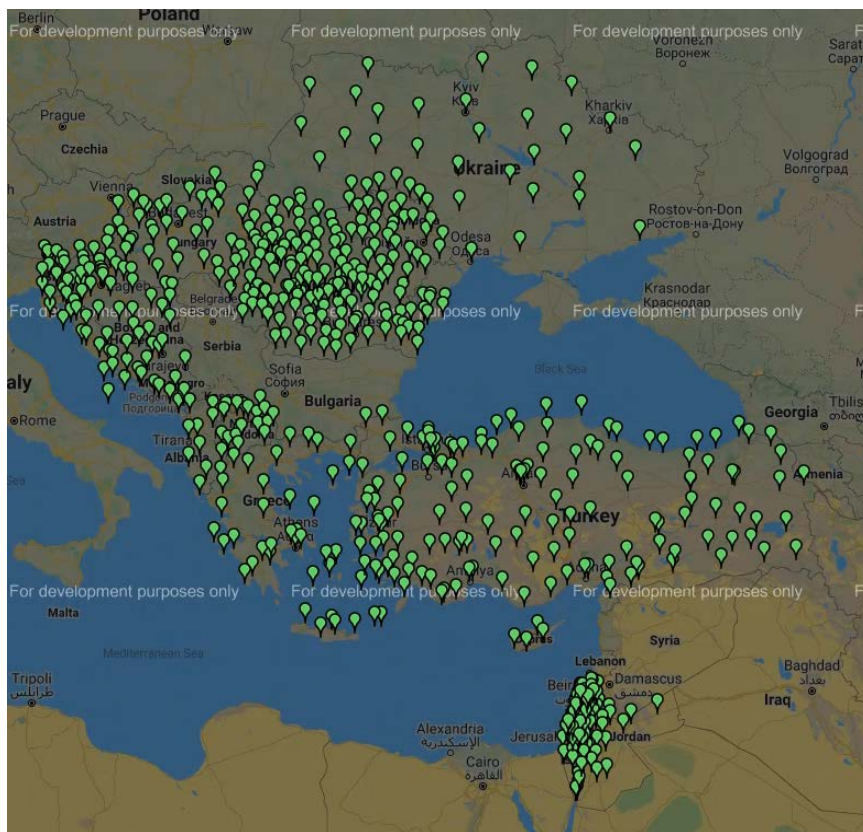
PHASE 1: Supported by USAID (580,000 USD) in 2016-2018

- Detailed [Implementation Plan](#) developed providing guidelines for development of the technical part of the system and all activities necessary to establish system operations.
- Implementation Plan developed as a joint effort between WMO, NMHSs of the region, and numerous collaborators, including WMO Regional Specialized Meteorological Centers, research institutions, numerical weather prediction consortia, and European and US meteorological and/or hydrological services.

PHASE 2: Supported by World Bank (1 500 000 USD (GFDRR) and European Union 320 000 USD (IPA)) in 2018-2022

- Development of a pilot operational hydrological modelling system for a selected transboundary river catchments.
- Agreeing on [SEE-MHEWS-A Data Policy](#) and commencing data exchange.
- Setting up quasi-operational running of limited area NWP models covering whole region, including verification.
- Setting up nowcasting system for pilot area.
- Development of the pilot version of [Common Information Platform](#).

SEE-MHEWS-A DATA EXCHANGE



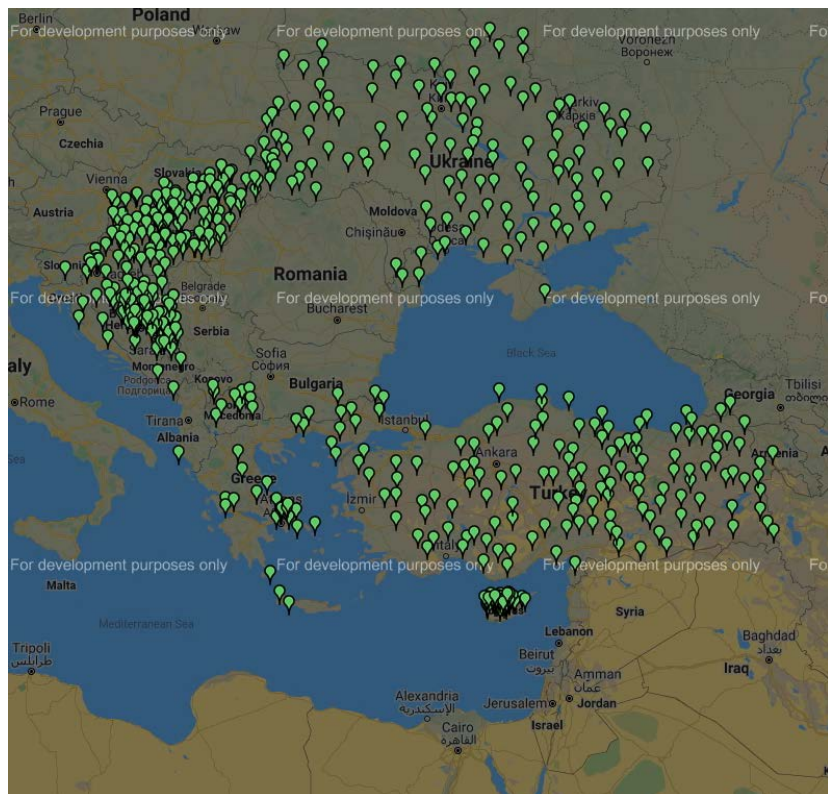
GTS (WMO Global telecommunication system)

Stations shown are only from participants that either signed the [SEE-MHEWS-A Data Policy](#) or started the NRT submission.

GTS + SEE-MHEWS-A

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SYNOP OBSERVATIONS – NRT ADDITIONAL



Map shows both non-GTS and more frequent GTS available stations.

	Number of stations - GTS	Number of station - additional	Total # of reports/ day - GTS	Total # of reports/ day - additional
Bosnia and Herzegovina	14	63	222	9072
Croatia	40	21	683	2632
Cyprus	4	37	43	5328
Greece	44	11	282	82
Hungary*	30	90	496	2160
Montenegro	6	4	120	80
North Macedonia	17	14	113	2016
Türkiye	122	144	1640	3456
Ukraine	32	123	256	984
Romania	160	3840	26	3744
	469	4347	3881	29554

* Hungary started to exchange all data via GTS after initial exchange under the SEE-MHEWS-A

Table summarizes GTS vs. non-GTS (SEE-MHEWS-A only) stations

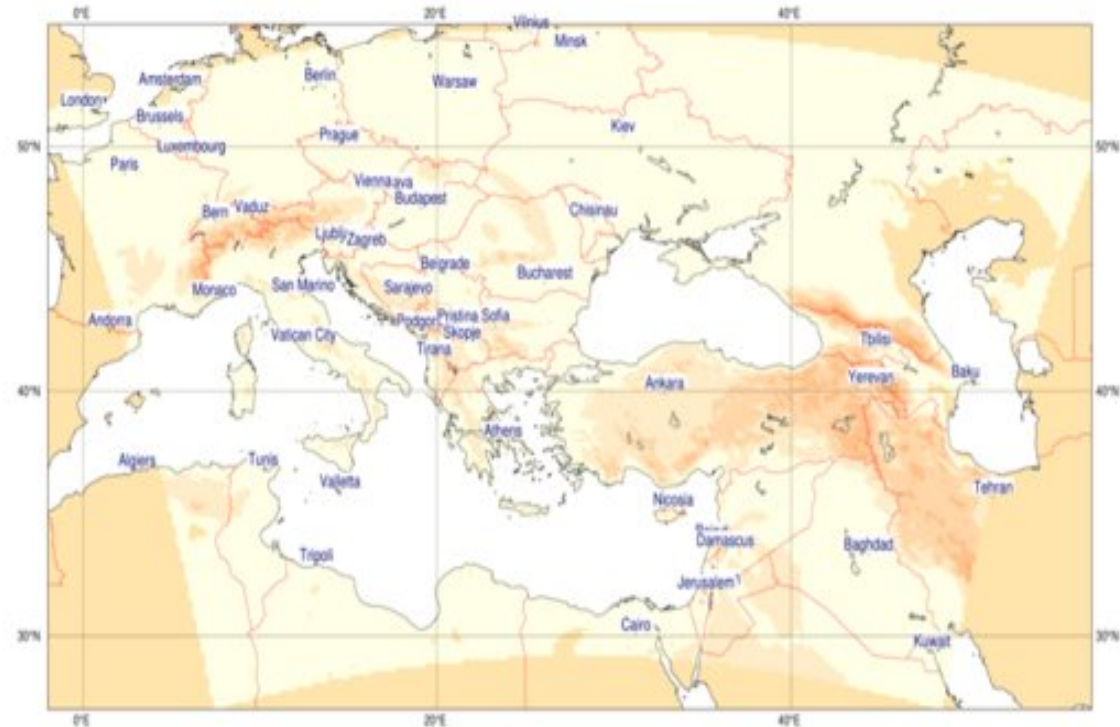
- ✓ Some countries are already sharing all their data via GTS. The SEE-MHEWS-A Data Policy facilitated some countries to go for open data policy e.g. Slovenia and Hungary

SEE-MHEWS-A NUMERICAL WEATHER PREDICTION MODELS

LAM models implemented under SEE-MHEWS-A

Model	Country	Institute
ALADIN	Slovenia	ARSO
ICON	Israel	IMS
COSMO	Greece	HNMS
NMM-B	Serbia	University of Belgrade

Verification by DHMZ (Croatia)



Common NWP domain for SEE-MHEWS-A

Slovenia and Israel currently provide computing allocations for running the NWP models at ECMWF. MeteoSwiss donated computing allocations in 2020 and 2021, and UK Met Office in 2022 to support the system development

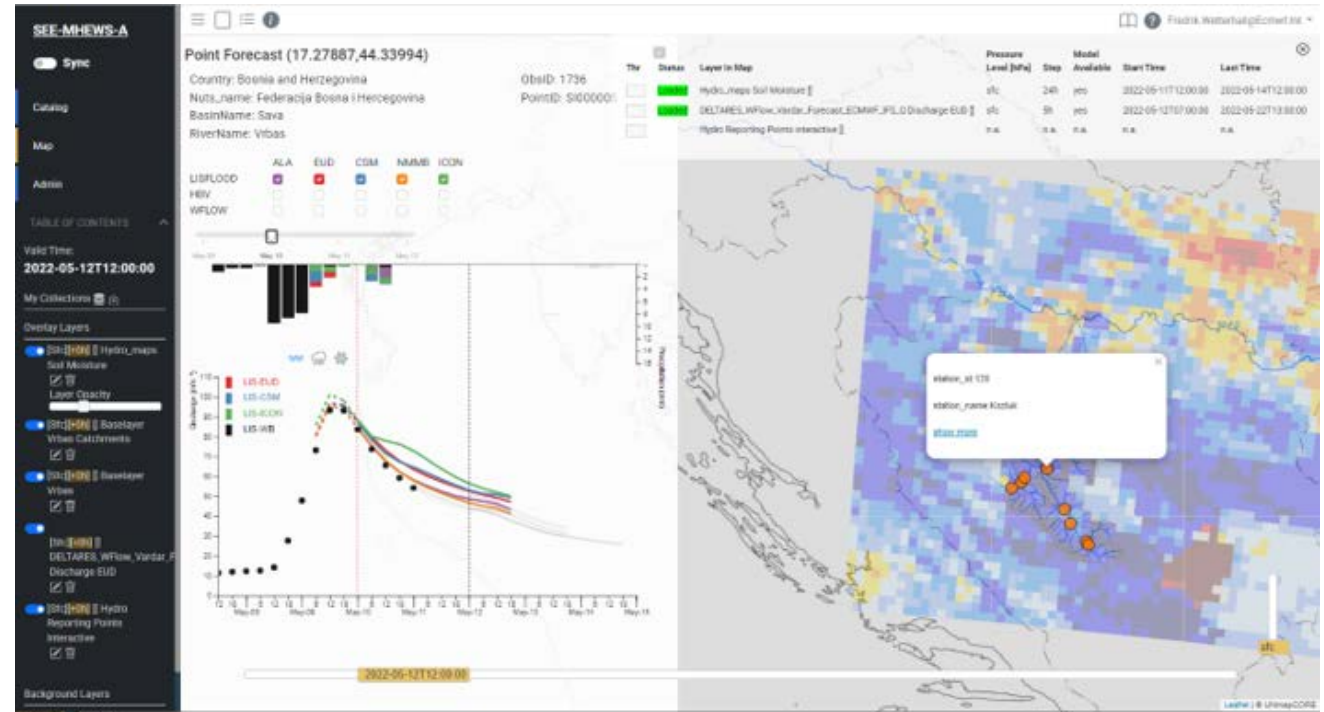
SEE-MHEWS-A HYDROLOGICAL MODELLING

Vrbas river in Bosnia and Herzegovina

- **LISFLOOD** hydrological model (CEMS-Flood) implemented by ECMWF
- The suite uses observational data and outputs from the NWP models.
- **HBV** model implemented by external expert
- Uses observations from SAPP and the project NWP outputs

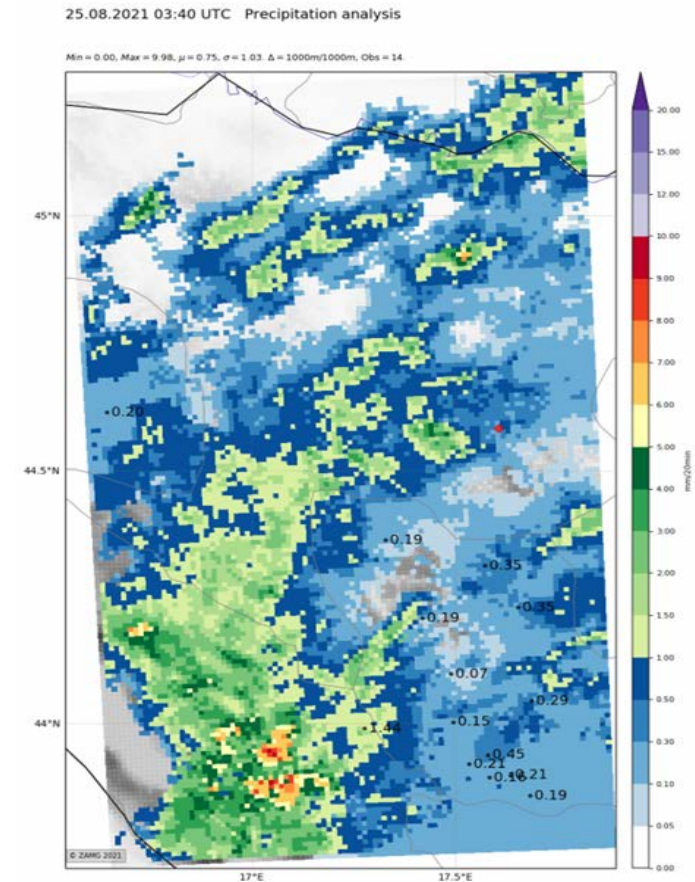
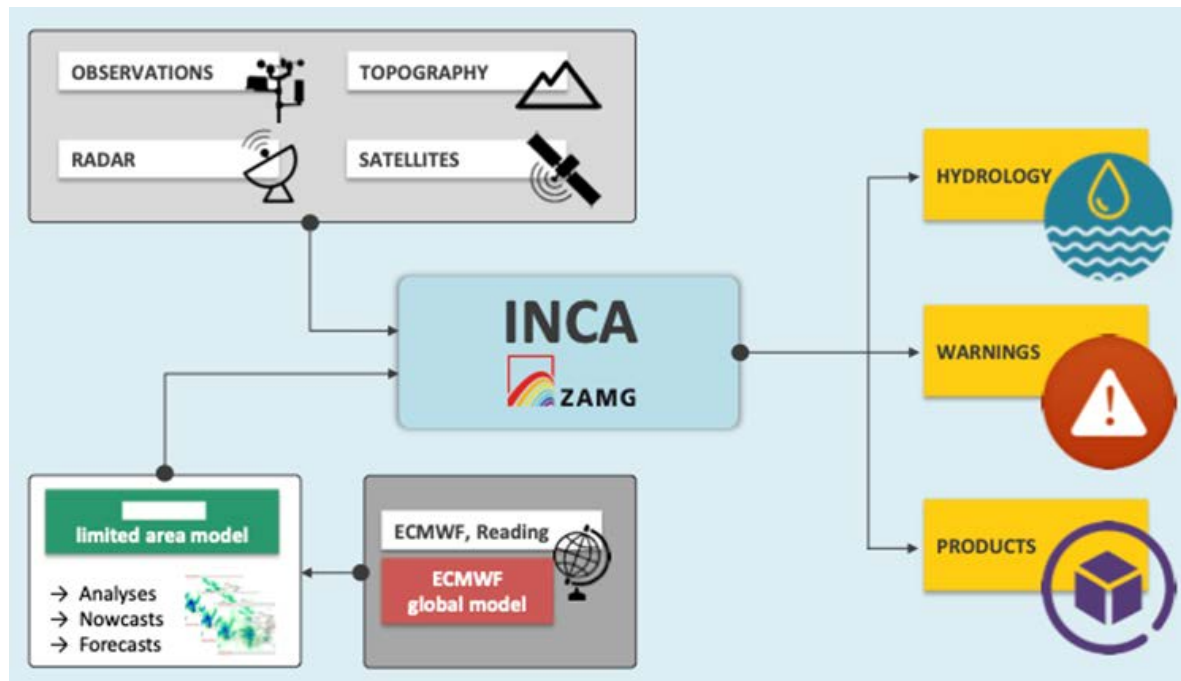
Vardar river in North Macedonia

- **WFLOW** model to be implemented at EWC by Deltares
- Use S3 for access to observations and NWP forcing



NOWCASTING

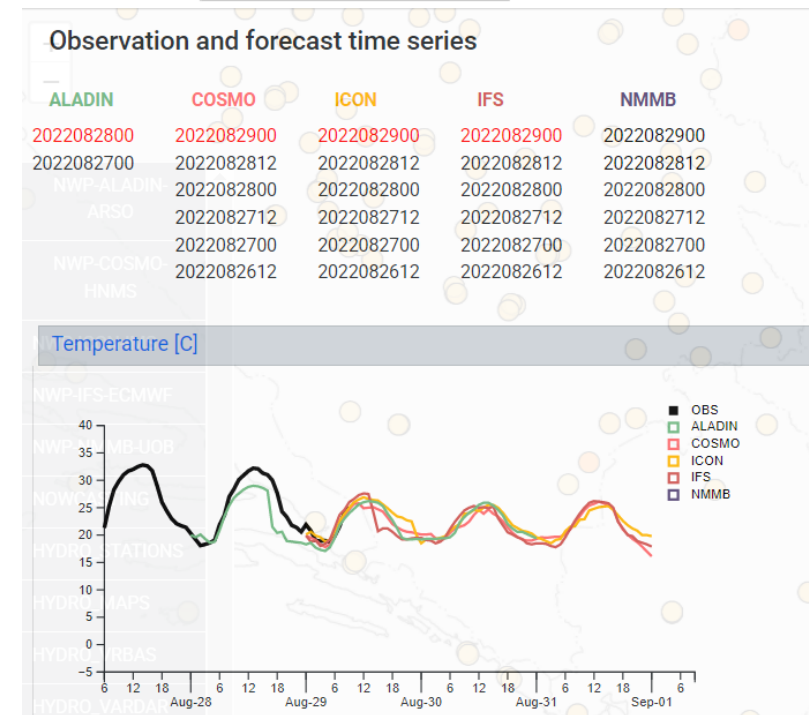
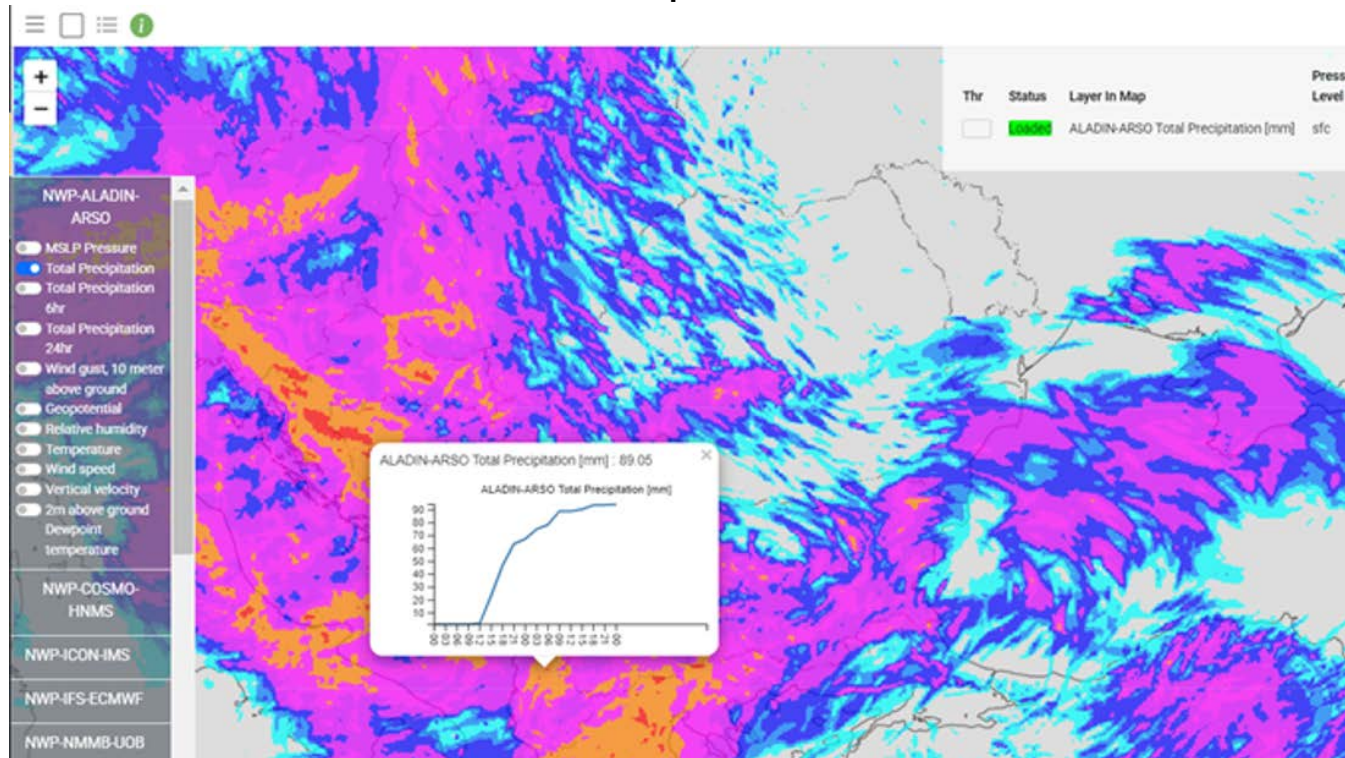
INCA Nowcasting system has been implemented by ZAMG for pilot area (Bosnia and Herzegovina) to provide near-real-time analyses and forecasts of several surface fields in order to improve numerical forecast products in the nowcasting (0–4 h) and very short (up to about 12 h) ranges



Example of an INCA precipitation analysis over the Vrbas catchment for SEE-MHEWS-A

COMMON INFORMATION PLATFORM (CIP)

- CIP has been developed to provide a mechanism for distribution of SEE-MHEWS-A products and data
- Users are the forecasters from NMHSs of SEE region
- Close to 100 different products available
- CIP is hosted in the European Weather Cloud



SEE-MHEWS-A PLANS FOR THE FUTURE

- Securing overall system management and monitoring at ECMWF IT infrastructure (Implementing Agreement between ECMWF and WMO agreed for 2023-24)
- Full operationalization of the SEE-MHEWS-A system:
 - **Data Exchange:** Foster open exchange of meteorological, hydrological and marine observational data with improved spatial and temporal resolution, for the purpose of the system
 - **Centralized Observational Database:** Further develop the CODB for other types of data in addition to meteorological surface observations
 - **Modelling:** Fully operationalize a suite of coupled meteorological, hydrological and marine high-resolution models
 - **Verification:** Implement performance monitoring and verification tools
 - **Common Information Platform:** Further develop CIP for interactive access to models' output, nowcasting, warning advisories, observational data, and products, and the exchange of warnings and communication among forecasters
 - **Capacity development:** Promote capacity development and ensure sustainability, exchange of know-how, technology-transfer, and scientific developments for building and maintaining the SEE-MHEWS-A

EXPECTED OUTCOMES AND OUTPUTS - NEXT PHASE

Outcome 1: Improved availability of forecasts and warning advisories on regional level

Output 1.1: SEE-MHEWS-A system established for provision of forecasts and warning advisories

Output 1.2 SEE-MHEWS-A system tested and verified

Outcome 4: Improved utilization of SEE-MHEWS-A data, products, and warnings

Output 4.1: Common Information Platform established

Outcome 2: Improved regional data exchange

Output 2.1: Data accessible for different SEE-MHEWS-A project purposes

Output 2.2: Close collaboration established with WMO GDPFS global centers on data exchange

Outcome 5: Improved regional cooperation related to MHEWS

Output 5.1: Efficient governance and long-term development mechanism for SEE-MHEWS-A system development, including coordination of activities delivering long-term research and development plan for continuing improvement of SEE-MHEWS system established

Output 5.2: Knowledge improved on regional data exchange, forecasting, and warning provision

Output 5.3: Collaboration established with WMO technical bodies, academia, private sector, other development projects related to SEE-MHEWS-A and end-users of the system products

Outcome 3: Improved regional forecasting

Output 3.1: Comprehensive operational regional data assimilation and suite of numerical weather prediction (NWP) models for SEE-MHEWS-A established

Output 3.2: Operational hydrological forecasting system for SEE-MHEWS-A established

Output 3.3: Operational marine/oceanographic modelling system for SEE-MHEWS-A established

Output 3.4: Operational sand and dust forecasting system for SEE-MHEWS-A established

Output 3.5: Nowcasting system for SEE-MHEWS-A established



WMO - Regional
Association VI (Europe)

Thank you

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