



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Commentary: Value of weather data for optimizing hydropower production, hydrological forecasts and climate impact assessments

Sarajevo Energy & Climate Week

26.9.2023

Anni Karttunen



Finnish Meteorological Institute

- National Meteorological Institute of Finland, established in 1838
- The FMI provides high-quality services and scientific know-how on the weather, atmosphere and seas for the safety of the society and businesses.
- All services are based on high-quality research, observations and expertise.
- World leading weather observation, modeling and forecast production systems

Public and commercial weather services



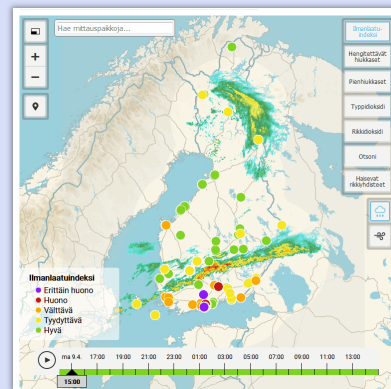
Civil and military aviation



Observation networks



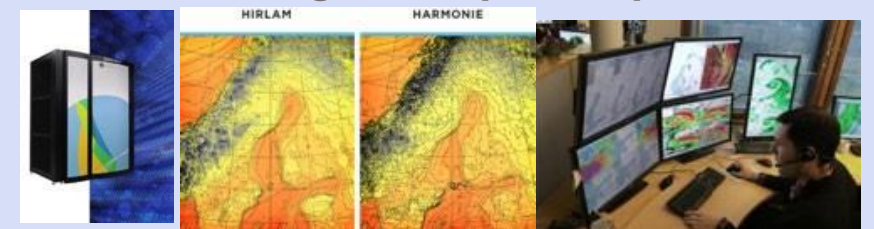
Air Quality



Forecast and Early Warning Services



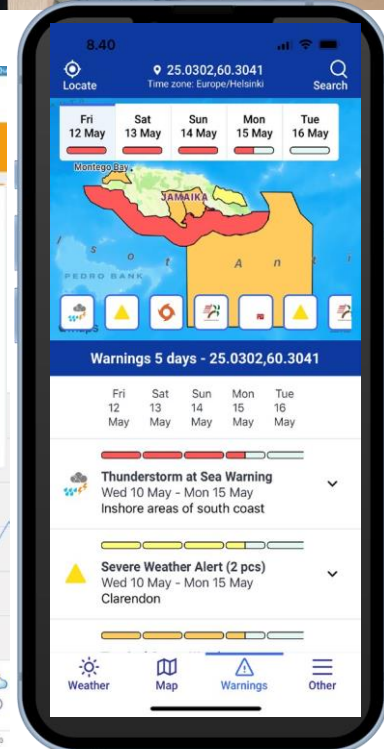
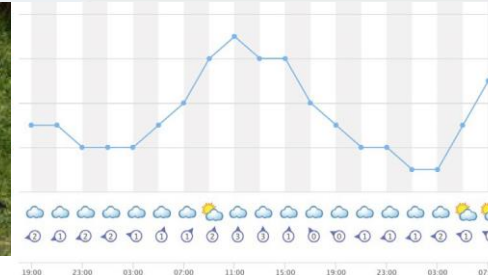
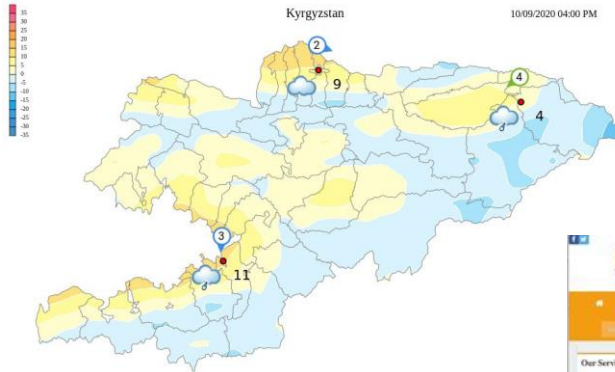
Modelling and supercomputers



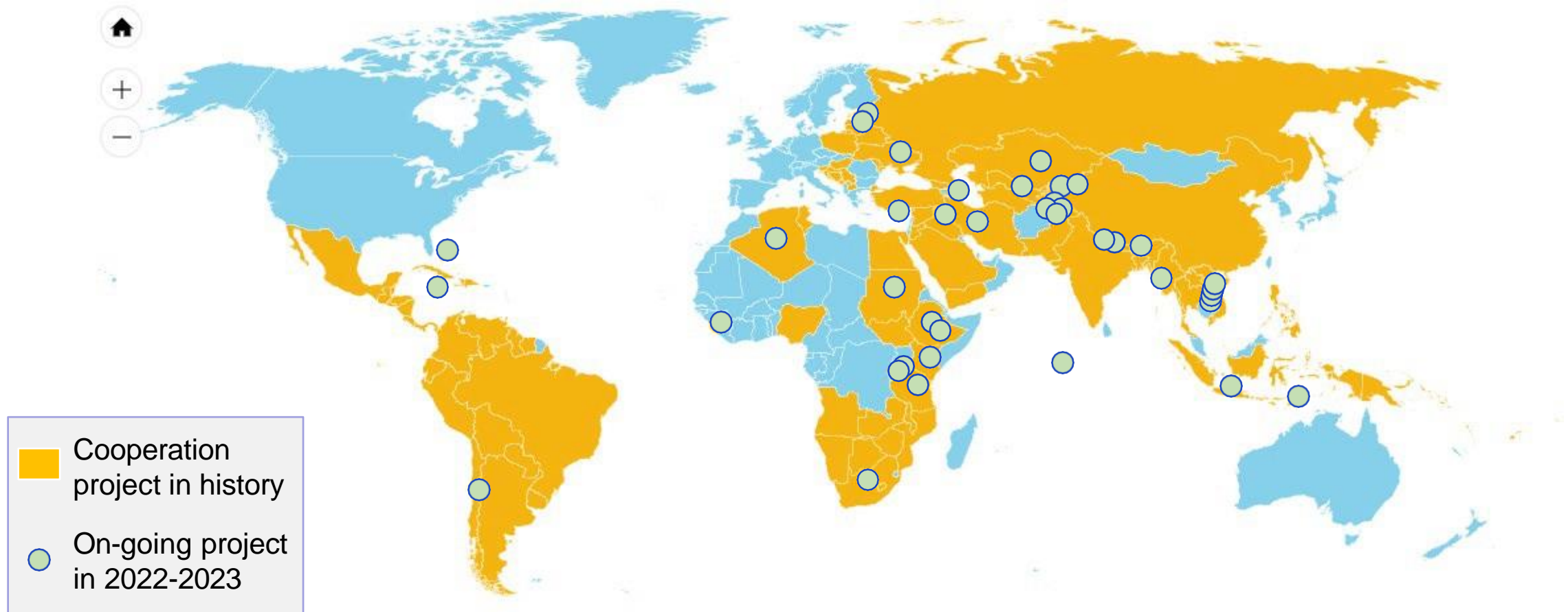
FMI - International Projects Activities

All projects aim to support national Hydrometeorological services or equivalent institutes to provide better weather, environmental and early warning services:

- Institutional Capacity Building
 - Training
 - Technical Assistance
 - Feasibility and Socioeconomic Studies
- Instruments and network development
 - Automatic Weather Stations
 - Weather radars & lightning detection
 - Weather satellites
 - Data management
- Numerical Weather Prediction models
- Verification and validation methods
- Quality Management Systems
- Weather and climate services & products
- FMI SmartMet Weather Information System
 - SmartMet mobile app
- Energy studies, hydro, wind & solar
- Air quality measurements and modelling



FMI – over 100 countries of development co-operation



FMI - International Projects Activities

- Several co-operation projects in the region
 - Different funding instruments e.g. EU twinning, Finnish ICI instrument
 - Hydrometeorological and air quality topics



- The Rehabilitation and Modernization of the Hydrological and Meteorological Observing Network and Data Exchange Procedures in Serbia and Bosnia Herzegovina 2015-2016
 - Rehabilitate the damage on observation stations caused by floods in 2014 and improve the network along Sava river
 - Strengthen data collection process and exchange in the Sava Basin
 - Improve capacities in flood forecasting and warning

Sava HIS

Real-time data

SAVA HIS
HISTORICAL DATA

METADATA
CATALOGUE

SAVA GIS
GEOPORTAL

Hydrological stations Meteorological stations Help

Search Reset

Station name:

River basin:

Country:

River:

Station name	River	Country	Time of measureme	Water level (cm)	Discharge (m3/s)	Water temp. (°C)	Sediment (mg/l)
<input type="checkbox"/> Radovljica I	Sava	Slovenia	10:00:00	92	64.60	8.6	
<input type="checkbox"/> Okroglo	Sava	Slovenia	02.05.2017 21:30...	194	85.80	10.4	
<input type="checkbox"/> Medno	Sava	Slovenia	02.05.2017 22:00...	178	126.0	10.0	
<input type="checkbox"/> Šentjakob	Sava	Slovenia	10:00:00	365	127.0	9.8	
<input type="checkbox"/> Litiija	Sava	Slovenia	02.05.2017 21:30...	135	258.0	11.4	
<input type="checkbox"/> Hrastrnik	Sava	Slovenia	02.05.2017 22:00...	332	273.0	11.5	
<input type="checkbox"/> Čatež I	Sava	Slovenia	02.05.2017 22:00...	265	500.0	13.1	
<input type="checkbox"/> Jesenice na Dolenjsk...	Sava	Slovenia	10:00:00	169	334.0	13.0	
<input type="checkbox"/> Crnac	Sava	Croatia	08:00:00	293			
<input type="checkbox"/> Podsused-žičara	Sava	Croatia	08:00:00	-92	317.6		
<input type="checkbox"/> Zagreb	Sava	Croatia	08:00:00	-134	343.4		
<input type="checkbox"/> Rugvica	Sava	Croatia	08:00:00	127			
<input type="checkbox"/> Trebež-ustava	Sava	Croatia	08:00:00	321			
<input type="checkbox"/> Jasenovac	Sava	Croatia	08:00:00	550	1292		
<input type="checkbox"/> Stara Gradiška	Sava	Croatia	08:00:00	499	1518		
<input type="checkbox"/> Gradiška	Sava	Bosnia a...	09:09:00	516			

03.05.2017

Position (Spherical Mercator): 1559554.866, 5457771.781

Scale 1 = 4 367 800

The data is uploaded from automatic gauging stations and is not verified!

Sava HIS project is funded by the
ICPDR, Finnish Meteorological Institute and ISRBC

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About Sava-HIS application

Optimised for: IE10+, Firefox, Chrome, Opera, Safari

National flood center

Finnish Environment Institute: SYKE
Transport and the Environment: ELY

- The National Flood Centre's main task is to **forecast, warn, develop and share information about Finland's flood and draught situations.** (services 24/7)

- Fresh water floods**

- Warnings (SYKE)
- Water situation and forecasts (SYKE)
- Flood maps (SYKE, ELY)

- Heavy rain floods**

- Warnings (FMI)

- Seawater floods**

- Warnings (FMI)
- Sea level forecasts(FMI)
- Flood maps (SYKE, ELY)

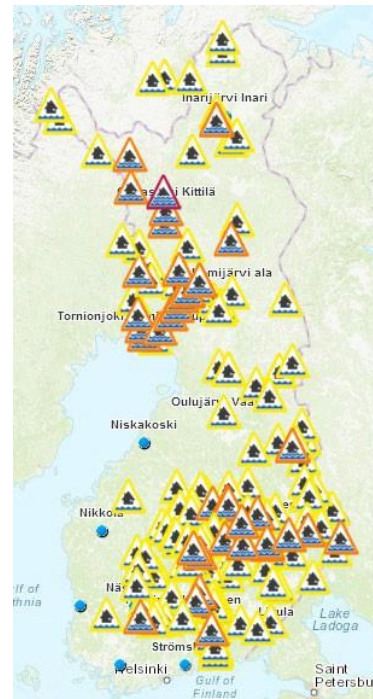
Vaasa Vaskiluoto vedenkorkeus



Klikkaa allaolevia vedenkorkeuksia nähdäksesi tulva-alueen

- Havainnot
- Keskiennuste
- 1.01 (m) (-1/2 a)
- 1.24 (m) (-1/5 a)
- 1.37 (m) (-1/10 a)
- 1.51 (m) (-1/20 a)
- 1.68 (m) (-1/50 a)
- 1.81 (m) (-1/100 a)
- 1.99 (m) (-1/250 a)
- 2.25 (m) (-1/1000 a)

Tulvakoski / Il.meriemasteet



Hyvin vaarallinen tai poikkeuksellinen tulva.

Vaikutusarvio: Merkittävä riski ihmisten turvallisuudelle sekä sähkö-, vesi- ja tietoliikenneverkoille. Rakennusvahinkoja ja liikennehäiriöitä laajoilla alueilla. Varoitus annetaan vaikutusarvion mukaisesta tulvasta tai tulvasta joka toistuu keskimäärin yli 50 vuoden välein.



Vaarallinen tai harvinainen tulva.

Vaikutusarvio: Tulva voi aiheuttaa rakennusvahinkoja. Liikenteelle voi aiheutua merkittäviä häiriöitä. Varoitus annetaan vaikutusarvion mukaisesta tulvasta tai tulvasta joka toistuu keskimäärin 10-50 vuoden välein.



Tulva tai korkea vedenpinta.

Vaikutusarvio: Pelto- ja metsäalueiden tulviminen sekä lievät häiriöt mahdollisia. Varoitus annetaan vaikutusarvion mukaisesta tulvasta tai tulvasta joka toistuu keskimäärin 3-10 vuoden välein.

Kemijoki Hydrological Forecasting

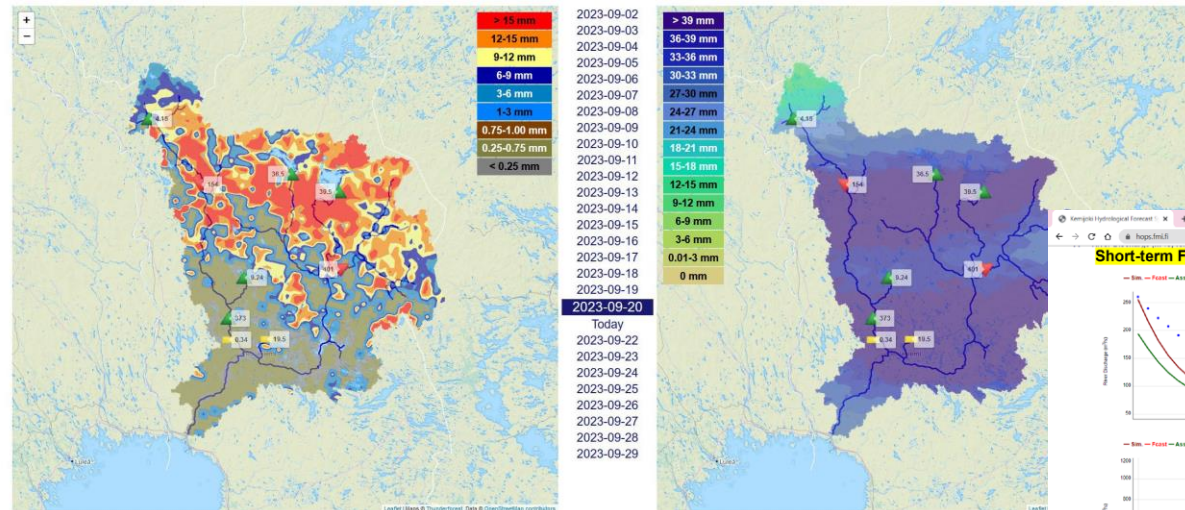


A Webservice Running on FMI Internal Servers

- Daily 10-Day Deterministic Hydrological Forecasts
- Monthly 90-Day Seasonal 51 Ensemble Hydrological Forecasts



Points: River Gauge Network (Forecast/Hindcast) | Assimilation Run Runoff | 24h Precipitation Sum | Animate | Legends | Help



4. Assimilation of snow remote sensing data

- Correction of snowfall with satellite data based snow water equivalent observations → reduces spring peak flow volume errors

4 primary elements:

1. HOPS Land surface parameters modelling (5x5 km spatial resolution)
2. HOPS Streamflow routing: Streamflow Hydrographs/ point forecast
3. Machine learning based streamflow forecasts

