



Draft

Upscaling water services from national to global scales

Summary

Wind maps and wind atlases for offshore wind energy planning

Sponsor	Project	Solution provider	User
 <p>The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 82085</p>			

Taxonomy

- Water run-off
- Water quality
- Surface soil moisture
- Waterbody
- Hydrological network and catchment areas (water catchment)

User profile

The Geological Survey of Sweden, SGU, is the expert agency for issues relating to bedrock, soil and groundwater in Sweden. The agency aims **to meet society's need for geological information**. SGU is also responsible for the Good-Quality Groundwater objective, which also involves reducing the use of natural gravel.

The Swedish Agency for Marine and Water Management, SwAM, is a government agency that works for flourishing seas, lakes and streams. SwAM is responsible for managing **the use and preventing the overuse of Sweden's marine and freshwater environments**, taking into consideration the requirements of the ecosystem and people, both now and in the future.



Service description

The Swedish Meteorological and Hydrological Institute, SMHI, provides new information, forecasts and knowledge of water resources in Sweden and world-wide, covering different spatial and temporal scales and a broad range of users. The information is used in decision support for a safe and sustainable society, water management, environmental protection, and building of infrastructure.

SMHI's service is based on **integrating EO data mainly from open sources with existing operational hydrological models and services**. The sustainability of the service developed thus depends mainly on the usefulness to provide improved water information, the capacity of the users to make use of this information, and the future request from the users.

SMHI Hypeweb

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Historical Data

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Historical data is important to understand the character and natural variability of water resources, so that both societal and environmental concerns can be planned accordingly. From long time-series of historical data we can identify normal conditions and detect trends towards new states. Identify extreme values and the risk to be exposed to these, and evaluate the model performance against observations.




The HYPE model provides at least 30 years of water-related data in each geographical domain, also for areas and periods without measurements. The time periods may differ but often starts in 1970s or 1980s. The calculations are made on a daily time step and modelled data is given for a number of variables (such as river flow, soil moisture, groundwater fluctuations, water temperature, and nutrient concentrations). The spatial resolution is given by landscape delineation into catchments, for which HYPE data represents average conditions or the outlets.

The historical data differ between the geographical domains, regarding time period, variables and resolution (i.e. catchment size) as these models were set-up with different purposes. Please, read the info button carefully in each of the applications below (top-right corner in the application). Here you can see long-term means and download time-series at specific sites:

Historical Long-Term Means

Long-term means for 30-year periods are given to show the normal water balance without annual fluctuations or influence of specific weather events. Hydrological results from HYPE are accompanied with modelled meteorological data, such as precipitation, temperature and evapotranspiration. For each domain we provide maps to give an overview of the spatial pattern for the most important variables or flow signatures in that specific region. For instance, dry regions can be separated from wet regions.




Explore spatial variability of average conditions by selecting variables in the menu of the interactive maps below!



Historical time series

Time-series are given to show the temporal variability of river flow at a specific site. HYPE provides daily or monthly values of river flow for at least 30 years of continuous calculations, which can be downloaded as Excel files for single catchments. Each year can be visualized in a graph to show the seasonal changes in flow and the variability between years. In this way, dry years can be separated from wet years and starting date of seasonal floods or droughts can be identified.

Explore temporal variability of flow in graphs and download time-series by clicking a catchment in the interactive maps below!



Customer experience

They current users are within the **Swedish geographical domain**; however the upscaling of the service from national to global leads to its **higher usability**. Input received from the users are:

SwAM: “We are particularly interested in services that can support development, application and review of **environmental quality criteria**.”

SGU: “The development of this service is of our interest to improve our methods to assess and forecast the groundwater quantity status in Sweden. We have recently initiated a government commission to expend and improve our national monitoring and to develop forecasting services on groundwater quantity status, and so we are delighted to **co-design a service** relevant to developing our groundwater-level modelling **on national scale**.”

Need

- Compare and correlate a number of hydro-climatic variables (snow water storage, evapotranspiration, soil moisture) from the hydrological model and in-situ observations to their corresponding EO-based variables to better understand model setup limitations (linked to location and physiographic characteristics) and assess added-value from EOs.

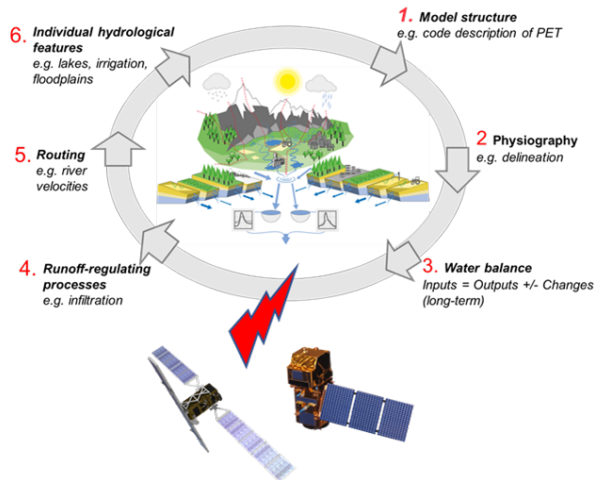
Challenges

- Couple the EO maps to the HYPE model setups, which have been developed with the main focus on simulating correctly the water flows and water balance (precipitation, snow accumulation and melt, infiltration, evapotranspiration, runoff and river discharge) at different geographic domains and spatial resolution.
- Availability of in-situ observations (river and lake water level, river discharge) with matching EO-based observations (Sentinel-3 track, Flood extent mapping) and matching HYPE model representation

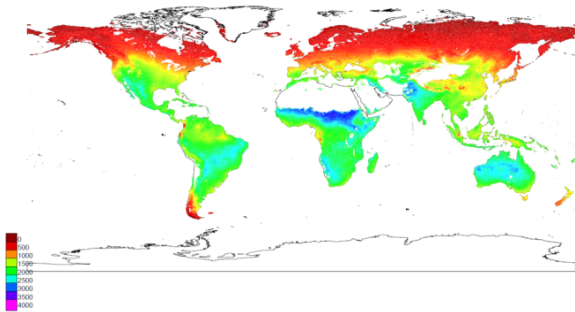
Results

- Get access to a set of hydrologically relevant EO datasets, which after post-processing can be used for water resources management applications
- Contribute to an improved set of HYPE hydrological model output data: River discharge, Water balance (precipitation, evapotranspiration, runoff), and total and key water storages (snow, soil, lakes, rivers)
- Improved water availability and quality information will be published at the SMHI dissemination web-based platform (<http://hypeweb.smhi.se>)

- Enable and motivate water-related users by providing accurate and reliable long historical records of hydro-climatic information over Sweden and the globe



PET 2000 (mm/year)



References

Learn more about the service: <https://hypeweb.smhi.se/explore-water/historical-data/>

Learn more about e-shape: www.e-shape.eu

A question? Contact the Helpdesk: <https://helpdesk.e-shape.eu>