

FUTURE HYDROLOGY OF THE MERA RIVER OF ITALY: THE INTERREG PROJECT GE.RI.KO. MERA

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GE.RI.KO. Mera: Interreg project Italy – Switzerland

MAIN GOAL: Define a common strategy for the management of water resources of the international basin of Mera river.

The area of the Mera basin is subjected to problems of slopes stability with consequent **sedimentation and erosion** in the riverbed and in reservoirs. In last years, after a landslide in Bregaglia valley in august 2017, the biodiversity loss for sedimentation has been significant in the Mera river and in the Mezzola lake.

A common strategy is necessary for normal management activities of sediments and water resources, and in particular during landslide events, to protect **biodiversity**, to avoid reservoirs filling with consequences on **hydroelectric production**, and to reduce **flood risk**.

Methodology

An **hydrological model**, *Poli-Hydro*, is calibrated and validated using discharge data available at **Samolaco**, collected by **Consorzio dell'Adda**.

The model uses meteorological data, temperature and total precipitation, given as input and is based on the continuity equation applied to the soil water content:

$$S^{t+\Delta t} = S^t + P + M_s - M_i - ET_{eff} - Q_g - Q_s$$

After calibration for the present hydrological conditions of the Mera basin, the model is used to simulate future conditions, basing on climate projections of temperature and precipitation for the **period 2020 – 2100**, given by **6 GCMs** (3 for AR5 and 3 for AR6) for 3 RCPs of AR5 (2.6, 4.5, 8.5) and 4 RCPs of AR6 (2.6, 4.5, 7.0, 8.5).

After these results the model will be used to evaluate solid transport in the riverbed.

Monthly Degree Day [mm/°C/d] for snow melt calibrated using SWEcum observed data and validated using satellite snow cover maps.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.14	1.07	1.46	2.36	1.56	1.04	1.00	1.00	1.00	1.07	1.93	1.14

DDI [mm/°C/d]	5				
exp Qg	1				
Kg	3				
Sfatt	1.5				
t lag (s) [h]	30				
t lag (g) [h]	35				

Model parameters to calibrate: Degree Day for ice melt (DDI), groundwater parameters (exp Qg, Kg), maximum soil water content coefficient (Sfatt), and lag times for superficial and groundwater flow



The study area

The Mera basin (closed at Novate Mezzola) covers an area of **567** km² between Canton of Grisons (Switzerland) and Sondrio district (Italy).

The basin is covered for the **5%** by **glaciers**.

The 60% of the basin is over the 1500 m asl.

Large areas are Natura 2000 sites, in particular the natural reserve of Pian di Spagna and Mezzola Lake, that is part of the GE.RI.KO. Mera project for the problem linked to sedimentation. Natural reserves are important for the tourism in the valley.





Hydrological model



Data: temperature and total precipitation

→3 meteorological stations (San Giacomo Filippo, Samolaco, Morbegno – ARPA Lombardia)
→ Period: 2009-2018

Poli-Hydro: hydrological, spatially semi-distributed, model (cells: 75m x 75m; time step: 1d)





Climate projections





Downscaling:

- Precipitation: stochastic space random cascade model
- Temperature: ΔT approach





THANK YOU FOR READING