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The HYPOS project as a support to the hydroelectric sector

Erica Matta[1], Mariano Bresciani[1], Claudia Giardino[1], Marina Amadori[1], Thomas Heege[2], Karin Schenk[2], Kim Knauer[2], Alena Bartosovar[3], Ilias Pechlivanidis[3], Marcelo Leite Ribeiro[4], Marina Launay[4], José Pedro Matos[4], Declan Kelleher[4], Nils Rüther[5], and Kordula Valerie Anne Schwarzwälder[5]

[1]IREA-CNR, Milan, Italy (matta.e@irea.cnr.it)
[2]EOMAP, Seefeld, Germany
[3]SMHI, Norrköping, Sweden
[4]STUCKY, Renens, Switzerland
[5]NTNU, Trondheim, Norway

The EC HYPOS (HYdro-POwer-Suite) project (https://hypos-project.eu/) has the main goal of assessing the environmental impact of existing and future hydropower systems. The project will provide a suite of data analysis applications which integrates Earth Observation (EO) technologies and hydrological modelling. These include an online Decision Support Tool (DST) for investment planning and monitoring, as well as a subscription portal combining satellite data over time, current measurements and detailed estimates for present and near future assessments. A dedicated analysis on the “blue footprint” (i.e. the amount of water used to produce a service) of reservoirs is included for addressing sustainable monitoring solutions. Such analysis comprises the evaluation of the climate change effects on reservoirs management and hydropower production. For instance, extreme weather events like short-term heavy precipitations are connected with flooding and transport of large amounts of sediments in dammed reservoirs, with critical consequences for their management. Similarly, global warming can heat the surface of water bodies and induce higher evaporation rates, thus decreasing the amount of water available for energy production.

In this study we present the first products from HYPOS project. These products are representative of what can be generated within the DST using elaboration techniques of EO data. Gridded products of water quality parameters (e.g. water turbidity, Chlorophyll-a concentration, suspended sediments concentration) are generated for the test sites of the project, which are small dammed reservoirs located in Switzerland, France, Albania and Georgia. These products are obtained using the Modular Inversion and Processing System (MIP), a sensor independent image processing chain based on radiative transfer models, which works in a multi-layer system, solving the light transfer in the atmosphere, at the water surface and inside the waterbody.

For the assessment of the “blue footprint” of a reservoir, the water loss due to evaporation is computed by applying a consolidated mass transfer evaporation method to EO data. The resulting evaporation rates are first compared with the outputs of semi-automatic evapotranspiration EO-

based models (e.g. SEBAL), and then with the estimates obtained from two different numerical models: a hydrological model (E-Hype) and a 3D hydrodynamic model (Delft3D). The key parameters influencing water evaporation rates, their behavior and the issues related to each approach are analyzed. The first comparison results are made for lake Garda, where a complete set of data is available for the production of evaporation maps.