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# Stochastic modelling of hydropower generation from small hydropower plants under limited data availability: from post-assessment to forecasting

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Due to their negligible storage capacity, small hydroelectric plants cannot offer regulation of flows, thus making the prediction of energy production a very difficult task, even for small time horizons. Further uncertainties arise due to the limited hydrological information, in terms of upstream inflow data, since usually the sole available measurements refer to the power production, which is a nonlinear transformation of the river discharge. In this context, we develop a stochastic modelling framework comprising two steps. Initially, we extract past inflows on the basis of energy data, which may be referred to as the inverse problem of hydropower. Key issue of this approach is that the model error is expressed in stochastic terms, which allows for embedding uncertainties within calculations. Next, we generate stochastic forecasting ensembles of future inflows and associated hydropower production, spanning from small (daily to weekly) to meso-scale (monthly to seasonal) time horizons. The methodology is tested in the oldest (est. 1926) small hydroelectric plant of Greece, located at Glafkos river, in Northern Peloponnese. Among other complexities, this comprises a mixing of Pelton and Francis turbines, which makes the overall modelling procedure even more challenging.