# Seasonal forecasting for water resource management: the example of CNR Genissiat dam on the Rhone River in France

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Compagnie Nationale du Rhône (CNR) has been granted the concession to operate the Rhone River from the Swiss border to the Mediterranean Sea since 1933 and carries out three interdependent missions: navigation, irrigation and hydropower production. Nowadays, CNR generates one quarter of France's hydropower electricity.

The convergence of public and private interests around optimizing the management of water resources throughout the French Rhone valley led CNR to develop hydrological models dedicated to discharge seasonal forecasting. Indeed, seasonal forecasting is a major issue for CNR and water resource management, in order to optimize long-term investments of the produced electricity, plan dam maintenance operations and anticipate low water period.

Seasonal forecasting models have been developed on the Genissiat dam. With an installed capacity of 420MW, Genissiat dam is the first of the 19 CNR's hydropower plants. Discharge forecasting at Genissiat dam is strategic since its inflows contributes to 20% of the total Rhone average discharge and consequently to 40% of the total Rhone hydropower production.

Forecasts are based on hydrological statistical models. Discharge on the main Rhone River tributaries upstream Genissiat dam are forecasted from 1 to 6 months ahead thanks to multiple linear regressions. Inputs data of these regressions are identified depending on river hydrological regimes and periods of the year. For the melting season, from spring to summer, snow water equivalent (SWE) data are of major importance. SWE data are calculated from Crocus model (Météo France) and SLF's model (Switzerland).

CNR hydro-meteorological forecasters assessed meteorological trends regarding precipitations for the next coming months. These trends are used to generate stochastically precipitation scenarios in order to complement regression data set. This probabilistic approach build a decision-making supports for CNR's water resource management team and provides them with seasonal forecasts and their confidence interval.

After a presentation of CNR methodology, results for the years 2011 and 2013 will illustrate CNR's seasonal forecasting models ability. These years are of particular interest regarding water resource management seeing that they are, respectively, unusually dry and snowy. Model performances will be assessed in comparison with historical climatology thanks to CRPS skill score.