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Sensitivity of seasonal hydrological predictability sources to catchment properties

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Seasonal hydrological forecasts are a powerful tool for water-related decision making associated to hydropower production, water supply and irrigation. The skill of these forecasts depends mainly on knowledge of the initial hydrologic conditions (ICs) on the start date of the forecast and knowledge of climate forcing (CF) during the forecast period. Identification of the sensitivity of the forecast skill to these two main predictability sources is crucial to funnel the efforts into improving the appropriate predictive tools, by either improving the ICs estimates or by enhancing the quality of the CF. This work aims at investigating the impact of catchment properties in terms of soil permeability on the contribution of the dominant predictability sources (ICs, CF) to the seasonal forecast skill. To this end, we apply the End Point Blending (EPB) framework to create forecasts with intermediate levels of uncertainty concerning ICs and CF. The methodology is applied in two catchments in the upper Adige River Basin that are representative of the two extremes of hydrological response: the Gadera catchment closed at Mantana (area: 390 km^2, elevation range: 810–3050 m a.s.l.) that is highly permeable, hence slow-responding and the Passirio catchment closed at Merano (area: 402 km^2, elevation range: 360–3500 m a.s.l.) that is characterized by low permeability, hence by a fast-responding regime. Our analysis highlights the contribution of each predictability source to the forecast skill over catchments of contradicting hydrological response, as well as the added value of the elasticity framework introduced by the EPB in comparison to the traditional ESP/revESP approach for identifying the sources of seasonal hydrological predictability in alpine areas.