



RAIN2ROOT: Probabilistic forecast of season irrigation water demand

Keta Basin



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Keta Basin: Region and Climate



The Keta basin, in the Volta region (south-east Ghana), is a coastal plain mainly drained by the Volta River. It is characterised by a tropical wet-dry climate with two rain seasons: the major peaking in June, the minor in October (see ERA5 precipitation climatology in Keta on the right).

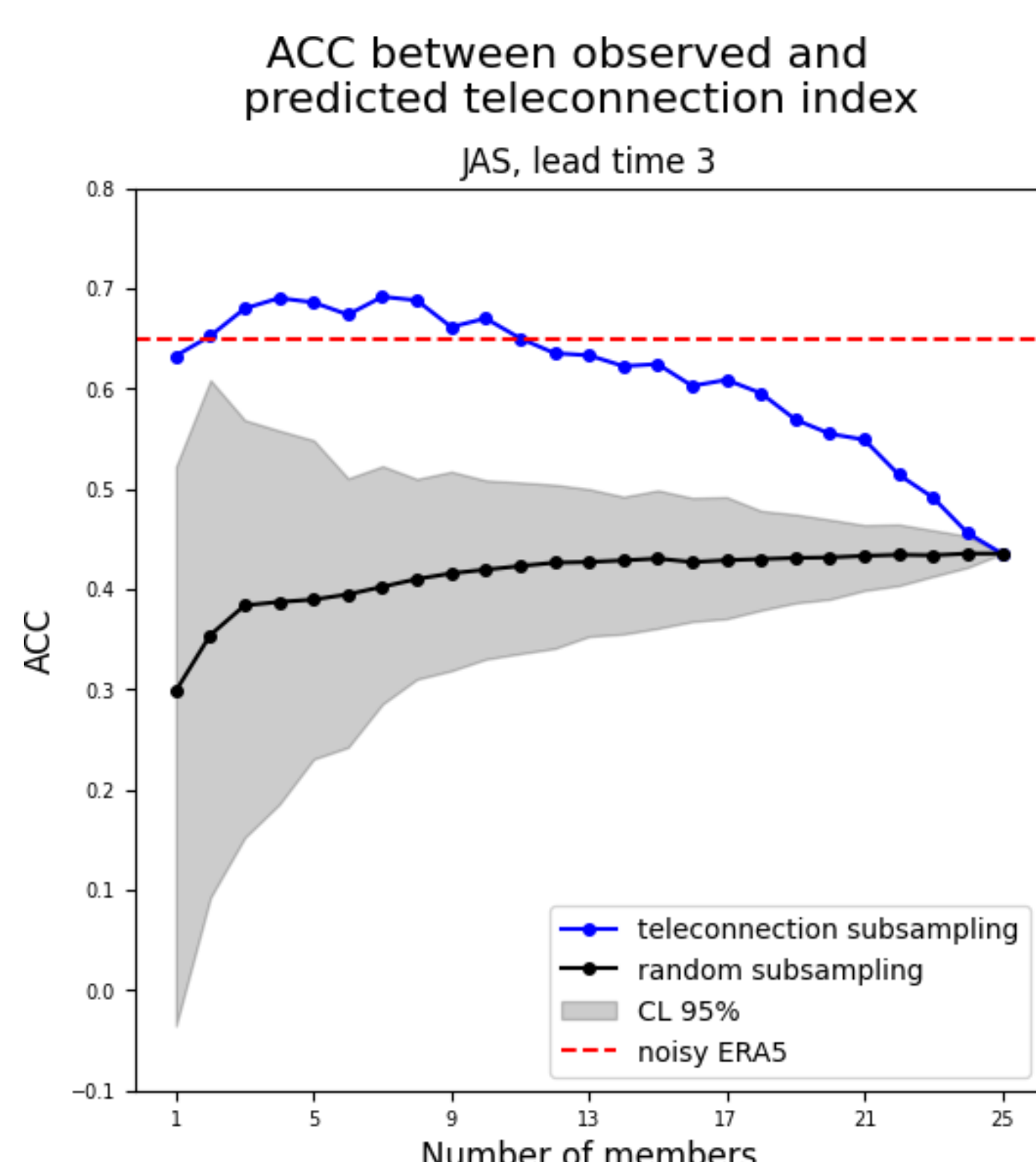
Hub users and planned applications

The Keta Basin is a rural, densely populated region. In this hub, ALBATROSS supports nature-based solutions, including mangrove restoration and community woodlots for alternative fuelwood, through the development of Climate Services. We aim to provide seasonal forecasts of the onset and duration of the main wet season and of accumulated precipitation anomalies to anticipate drier- or wetter-than-normal conditions. We have demonstrated the potential to improve seasonal forecasts for this region through statistical subsampling based on the Atlantic Niño teleconnection index (ATL3; see below), a method that can be applied operationally.

Statistical subsampling of forecast ensemble

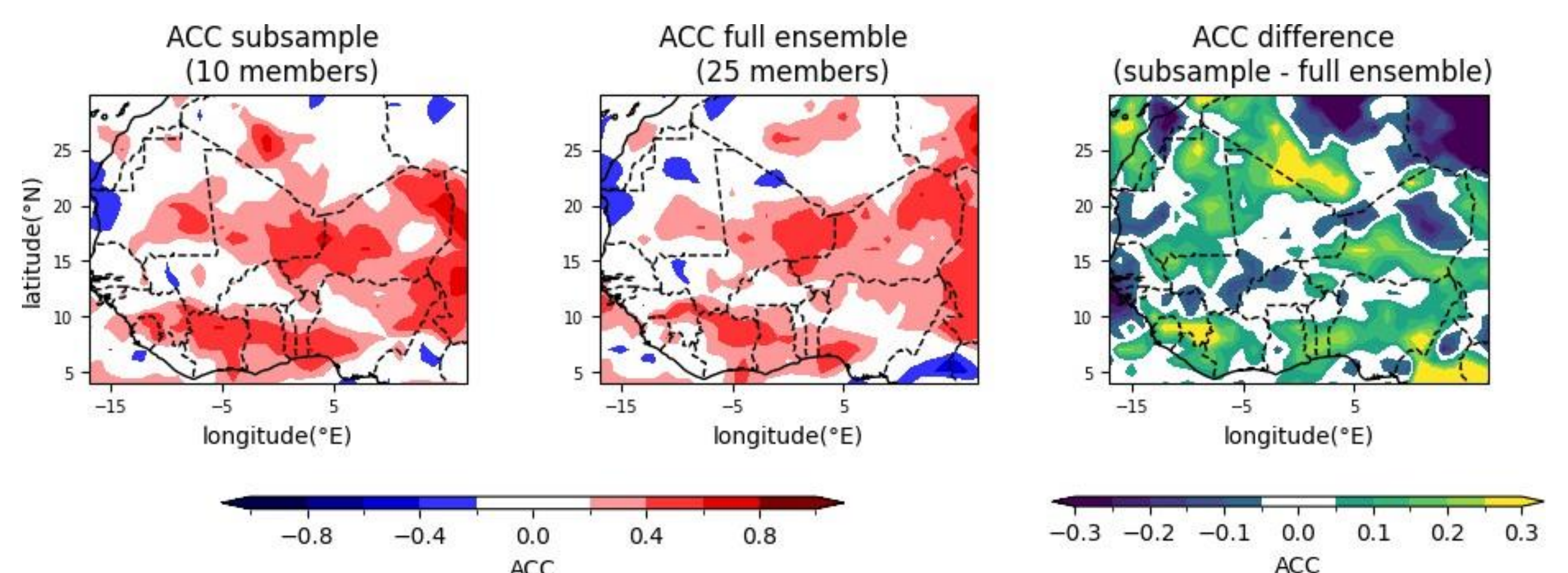
We apply a statistical teleconnection-subsampling technique, which consists in taking an observed teleconnection index from ERA5 as prior information to subsample ensemble members from the dynamical model. The resulting subsample is then used to produce a hybrid statistical-dynamical rainfall forecast. The ERA5 index is perturbed with Gaussian noise to emulate a Convolutional Neural Network (CNN) prediction.

In the example below we take the ECMWF SEAS5 seasonal hindcasts initialised in April from 1993 to 2016, and subsample the ensemble based on the Atlantic Niño teleconnection index (ATL3) in July-August-September (JAS). On the left we show the ensemble skill in predicting the observed JAS ATL3, on the right we show the skill for JAS precipitation over West Africa.



ACC between ERA5 ATL3 and predicted ECMWF ATL3 for increasing subsample size using statistical subsampling (blue curve) and using random subsampling (black curve).

ACC and covariance of JAS precipitation at lead time 3 (ERA5 vs ECMWF): subsample, full ensemble, and their differences



ACC of hybrid versus full ensemble precipitation forecasts over West Africa during JAS at 3-month lead. From left to right: ACC between ERA5 precipitation and the statistical subsampling of ECMWF precipitation forecast; ACC between ERA5 precipitation and the full ensemble forecast; ACC difference between the previous. The statistical method increases forecast skill over the Gulf of Guinea and the Sahel.

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