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Dynamical proxies as a tool for Mediterranean Seasonal Forecast

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Seasonal forecasts are essential tools to offer early-warning decision support, that can help to reduce the socio-economics related risk associated with anomalous events. Advances in statistical prediction are often linked with the enhance of understanding that usually leads to improve dynamical forecast. Thereby, both approaches are frequently combined in order to increase the robustness of the forecast.

Atmospheric dynamics are described by a set of partial differential equations yielding an infinite-dimensional phase space. However, the actual trajectories followed by the system appear to be constrained to a finite dimensional phase space, i.e. a strange attractor. The dynamical properties of this attractor are difficult to determine due to the complex nature of atmospheric motions. A first step to simplify the problem is to focus on observables which affect – or are linked to phenomena which affect – human welfare and activities, such as sea-level pressure, 2m temperature, and precipitation frequency. We make use of recent advances in dynamical systems theory to estimate two instantaneous dynamical properties of the above fields for the North Atlantic sector and the Mediterranean region: local dimension and persistence. Combining this information with bias correction techniques, we present forecasts computed from one to six months ahead.

The dynamical forecast of daily precipitation is provided by the new CMCC Seasonal Prediction System v3 (SPSv3). The new system features a better horizontal resolution of both the atmospheric and oceanic components, better representation of the stratosphere, more realistic initialisation procedures for atmosphere, land, sea and ice modules and a larger ensemble size (50 members). Such improvements have a positive impact on the climate and on the predictive skill of the system. ENSEMBLES daily gridded observational dataset (EOBS) are used for validation with observations.