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# An operative chain of probabilistic seasonal forecast based on circulation type classifications driven by an ensemble global model

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In the last years, many studies made efforts to develop seasonal forecasts more reliable and applicable in various activities such as agriculture, water management and heat waves risk prevention.
A new seasonal forecast approach has been developed combining the NCEP-Cfsv2 seasonal model, a fully coupled model representing the interaction between the Earth's oceans, land and atmosphere with circulation type classification derived from the COST action 733 experience. Two classifications with nine classes (PCT9 – Principal Component Transversal and SAN9 - Simulated Annealing clustering) were computed through the cost733class-1.2 software using gridded daily data for mean sea level pressure and geopotential height at 500 hPa from NCEP Reanalysis 2 between 1955 and 2014. PCT9 and SAN9 have been optimized on a spatial domain representative for the whole Italian territory in order to describe precipitation and surface temperature respectively. A 30 years climatology (1981-2010) was calculated for each month and for each circulation type using the E-OBS European gridded dataset at about 25 kilometers of horizontal resolution either of surface temperature and precipitation or the risk of severe weather (heavy rain, dry series, heat waves or cold spell). Everyday a daily circulation type forecast (for both PCT9 and SAN9) is computed for the next three months using each of the forty ensemble members of Cfsv2 dataset.
The results of this forecast chain consist of probabilistic maps not only of ensemble mean anomalies of surface temperature and precipitation but also for the probability for the lower, middle and upper tercile of the climatological distribution. Furthemore other temperature and precipitation related variables such as risk of heavy precipitation, dry series, heat waves or cold spells are computed following this methodology, with potential benefit in agriculture, energy, hydrology and civil protection.