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Using seasonal forecasts for a climate service for the power sector in the CLIM2POWER Project

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Climate and weather conditions not only strongly influence energy demand but- with the strong development of the renewable energies - also increasingly electricity generation. The changes of the European energy mix together with ongoing climate change raises several questions on the adaptation of the energy supply system to its environment. To address these issues, the CLIM2POWER project aims at translating the latest scientific findings on the medium (seasonal forecast) to long term (climate projections) evolution of the climate into usable information for end-users. For this purpose, we are developing a web-based Climate Service (CS) enabling a visualisation of how climate impacts the electricity system. The web-service will connect climate data, hydrological models and power generation and energy system models in an interactive and user-friendly layout.
The CS covers the whole interconnected European electric system complemented with four case-studies reflecting various EU contexts regarding climate, hydrology, socio-economic settings, electricity generation portfolios and energy markets in Portugal, Sweden, Germany-Austria and France. In each case study, the wind, solar and hydro power generation as well as the demand will be simulated from climate data and their effect on the energy system will be analysed. Since the effect of climate is expected to have a major impact on hydropower, a special attention will be paid to the modelling of three river basins: the Douro river basin in Portugal, the Lule älv river basin in Sweden and the Danube river basin in Germany and Austria.
In this context this paper has a two-fold objective: 1) to present the used approach to develop an EU-wide CS while considering the regional specificities across Europe, and 2) to describe the approach used to generate seasonal forecasts.
The seasonal climate data used in this project is produced by the German Climate Forecast System (GCFS2.0). It is based on the Max-Planck-Institute Earth System Model (MPI-ESM). To apply the data for European and regional case studies, the model output has to be downscaled from the global scale to a higher spatial resolution. Our approach is to use a statistical-dynamical downscaling method that will relate analysed forecasted weather regimes on the global scale to the regional scale.
From a regional climate model (COSMO-CLM) driven by ERA-Interim we estimate the recent climate. As a first step, this climatological information shall be used as an input to the impact model chain in order to derive products for the typical seasonal climate. If the downscaled seasonal forecasts can be considered reliable, the climatological products can be replaced by predictions. In order to estimate uncertainties and to enhance the forecast skill we will use a wide range of ensemble seasonal forecasts as will be available in the upcoming C3S climate data store.