



Multi-model seasonal forecast generation and quality of the Copernicus Climate Change Service

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Forecasts for the seasonal time scale based on dynamical models show clearly a predictive skill beyond climatological information. But this predictability varies highly in space, season and with forecast time. Only with detailed and robust understanding of the predictive capabilities of such systems, this kind of information can be used in an appropriate way in sectors like agriculture, energy, health, water management and disaster preparedness. Within the framework of the Copernicus Climate Change Service (C3S) QA4SEAS project, we analyze the predictive skill of the C3S operational dynamical seasonal forecast systems. Specifically, we assess global seasonal hindcasts issued each month from 1993 to 2014 and a forecast time of 1 to 6 months provided by the ECMWF System 5, the UK Met Office GloSea5, the Météo-France System 5, and several multi-model combinations thereof. With a focus on tropical Pacific SST indices, the NAO index, and a global analysis of near-surface temperature and precipitation rates, we address the following questions: Are there significant differences in the forecast quality between the models? Are there approaches to construct a multi-model consistently outperforming the single models? What are possible challenges in constructing multi-models? Can we characterize the forecast quality horizon of multi-model seasonal forecasts, i.e. for what variables, in what regions and at what times of the year can skillful and reliable forecasts be issued? Are the potential differences in forecast quality of the hindcasts of the different forecast systems consistent over the set of forecast cases considered?