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Evaluation and quality control for seasonal forecasts of the Copernicus Climate Change Service

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The European Commission's Copernicus Climate Change Service (C3S) aims at supporting adaptation and mitigation by providing authoritative climate data and information through its Climate Data Store (CDS). A key aspect for the success of the C3S is the Evaluation and Quality Control (EQC) function that provides quality assurance information for all products and ensures that users have access to the information they need to use the service. The QA4Seas (Quality Assurance for Multi-model Seasonal Forecast Products, C3S_51 Lot3) contract, which has been finished successfully in September 2018, aimed at developing a strategy for the EQC of multi-model seasonal forecasts provided by the C3S in response to the needs of a wide range of stakeholders of the CDS from sectors like water resources management, agriculture, health, energy, or disaster preparedness.

In this contribution, we first present some of the key components of QA4Seas such as a survey identifying the needs of CDS users and the development of a software prototype of the EQC system, and a solution to provide provenance metadata together with both forecast products and EQC information. Secondly, as aimed primarily in the contract, we make recommendations on how to evaluate operational seasonal forecasts available through the CDS. Proper verification of seasonal forecasts shows that the information provided by current systems has limitations and forecast quality varies strongly in space, in time (both lead time and forecast valid time), by parameter and forecast system. Further, seasonal forecast models suffer from systematic biases and dispersion errors that need to be corrected in order to render the forecasts useable. Based on an in-depth analysis of global seasonal hindcasts issued monthly from 1993 to 2014 provided by the ECMWF System 5, the Met Office Glosea5, and the Météo-France System 5 sources, we stress the importance of processing both ensemble forecasts and multi-category probability forecasts differently. Results for the three variables used for illustration purposes, near surface temperature, sea surface temperature, and precipitation, underpin the need for bias adjustment in case of ensemble forecasts, but not for multi-category probability forecasts. Likewise, seasonal predictions benefit from applying multi-model combination tailored to the forecast format. Recommendations have been issued to formulate operational forecasts in the context of bias-adjusted, multi-model forecast products.