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An enhanced analysis of increasing-resolution coupled seasonal prediction experiments with EC-EARTH 3

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With a focus on the ocean component, we use the EC-Earth coupled model to investigate the forecast quality of a set of ensemble seasonal predictions with different spatial resolutions in the atmospheric and oceanic components. Starting from relatively standard atmosphere and ocean model grid-sizes, we examine the impact of increasing resolutions to values rarely attained in global climate forecast systems, like 40 km in the atmospheric component and 25 km in the ocean component.
In order to take into account atmospheric model uncertainties we introduce random Gaussian perturbations to the wind, temperature and humidity tendencies in the IFS atmospheric model, following the Stochastically Perturbed Parameterization Tendencies scheme developed at ECMWF (SPPT). Although no perturbations are made in the lower levels of the atmospheric model, SPPT stochastic perturbations have an impact on the mean state of surface variables such as SST and surface winds.

Here, we examine the differences of a set of experiments with standard resolution, high resolution of the ocean/atmosphere component, and the combination of these with SPPT schemes. The outcome of a standard set of forecast quality measures is enhanced by a three-dimensional scan of some key features of the ocean, taking into account the change with forecast time.