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Experimenting with stochastic radiation in the ECMWF medium-range ensemble forecast

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Recent studies have highlighted the potential from using the Monte-Carlo Spectral Integration (McSI) radiation scheme for weather and climate simulations. By stochastically sampling the spectral intervals used to represent the long-wave and short-wave spectra, the cost of the radiative transfer computations can be significantly reduced while introducing unbiased small-scale noise. Due to the cost of the radiation integrations, it is typical in weather and climate models to update the radiation tendencies on a coarser grid and time-interval than is used for the underlying dynamical model. Under the McSI approach, the savings achieved from the spectrally-sparse radiation computations could be spent on more frequent and/or spatially-resolved radiation updates, offering the potential for an overall increase in accuracy for a given cost.

This work will consider the impact of including stochastic representations of radiation processes, including using the McSI scheme, in the European Centre for Medium-Range Weather Forecasts' (ECMWF) ensemble forecast (ENS). The studies consider the overall impact and interactions with the existing stochastic parametrizations - the Stochastically Perturbed Parametrization Tendency (SPPT) scheme and the Stochastic Kinetic Energy Backscatter (SKEB) scheme. Results will be shown based on medium-range forecasts performed at the ENS operational resolution.