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Studying future weather using a dynamically consistent method

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The study of future weather, and in particular the question on changes in the frequency and amplitude of future extreme climatic events, is essential for impact studies and developing adaptation measures. As such, these studies are relevant for local and national governments who make extensive use of them.

Assessing future weather requires an estimate of the influence of internal climate variability, including the ability to identify and quantify feedback processes between atmospheric dynamics and its boundary conditions. Using KNMIs state-of-the-art global earth-system model, EC-Earth, it is possible to do this for the first time in a dynamically consistent way. This is ensured by the application of a forcing sensitivity technique, which produces optimal model tendency perturbations. These are determined under the requirement that they force the model to reproduce, on average, a prescribed circulation change, leaving the synoptic scale free to interact with and adjust to the large-scale circulation.

Using this technique it is possible to study weather characteristics of a possible climate in 2050, taking into account persistent circulation changes representing, for example, a more persistent westerly circulation in winter and a more persistent easterly circulation in summer. Also, it is possible to provide the boundary conditions for regional climate model simulations, such as RACMO. This makes it possible to reproduce climatological interesting years, for example the exceedingly hot summer of 2003, under 2050 conditions.

The results of these experiments will be presented to the audience, as well as a brief description of the forced sensitivity method applied. The importance of this technique for climate research will be pointed out and compared to current methods.