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Is climate internal variability to account for in hydrological impact studies of climate change?

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A critical issue in climate change impact studies is the assessment of uncertainties associated with future projections. A correct quantification of the different sources of uncertainty is necessary in order to obtain the range of possible future changes, their significance, and the value of possible adaptations. The identification of the most important uncertainty sources is also important for the allocation of research and development resources. Uncertainty sources include 1) scenario uncertainty, 2) the different components of model uncertainty (uncertainty due to climate models and due to subsequent impact models when sectorial declinations such as ecology, water resources, hydropower, etc. are considered) and 3) climate internal variability.
Unlike scenario and model uncertainty, which could potentially be reduced if our estimates of future emissions and our knowledge and representation of geophysical processes were improved, climate internal variability is due to the chaotic nature of climate and is thus irreducible. Climate internal variability was estimated to contribute to a non-negligible fraction of the total uncertainty variance in climate projections, for a number of climate variables, such as precipitation and temperature. It has been thus given even more consideration by climate scientists in the recent years. It is conversely often disregarded by hydrologists and scientists from other climate-related domains. The contribution of internal variability to total uncertainty in projections is however also likely to be non-negligible for impact studies in hydrology, agroforestry, weather energy...
We will give different illustrations of this contribution from ensembles of transient climate projections produced for different regional systems. We will discussed different approaches used for this estimation, introducing the most recent ones developed for unbalanced and incomplete ensembles. Such ensembles obtained for multiple emission scenarios and multiple combinations of different models (eg. Multiple GCM x multiple Hydrological Models), actually typically correspond to those produced in the recent years by and made available to scientists.

Reference

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