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Assessment of climate change at near-term (2020-2040) over Northern Europe through internal variability storylines

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It is well established that internal variability arising spontaneously from the chaotic nature of the climate system can amplify or obscure anthropogenically-forced signals, especially at near-term and at regional scale in the extratropics. In this talk, we focus on Northern Europe (NEU) winter climate changes over the 2020-2040 period and propose a set of internal variability storylines (IVS) to tackle related uncertainties. IVS are built from the combined evolution of the North Atlantic Oscillation (NAO) and the Atlantic Meridional Overturning Circulation (AMOC) diagnosed as drivers of variability for temperature over NEU.

We first show, based on a large ensemble of historical-scenario simulations from CNRM-CM6-1, that, depending on the near-term [AMOC-NAO] doublet evolution, anthropogenically-forced changes can be either considerably amplified with much warmer-wetter mean conditions, almost doubled, or considerably masked with marginal warming and unchanged mean precipitation with respect to present day. We then provide evidence for the robustness of our results by using large-ensembles from several models which ultimately allows assessing the full range of uncertainties for near-term climate change.

We finally use the 2010 severe winter case as an illustrative example of the added-value in expressing climate change knowledge in a conditional form through IVS to plan at best climate-related risks and local adaptation strategies at near term. Reframing the uncertain climate outcomes into the physical science space through IVS grapples the complexity of regional situations; it is also informative to more efficiently communicate towards the general public as well as for climate literacy in general.