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Sources of predictability on stratospheric dynamics

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A large inter-annual variability exists in the strength of the Northern stratospheric polar-vortex in the extra-tropics. Variations of the polar vortex are influenced by external factors and by internal atmospheric dynamics. Part of variability may be linked to the sudden stratospheric warming (SSWs) in the extra-tropics and to the quasi-biennial oscillation (QBO) in the equatorial stratosphere which appears to affect the zonal mean circulation. SSW correspond to extreme 'polar vortex events' influencing the Arctic Oscillation and mid-latitude extreme weather . The QBO is the major wind variability source in the tropical lower stratosphere.
We examine the decadal variability and predictability of the climate system, associated with these processes occurring in the stratosphere. We base our analysis on a set of near-term predictions performed with state-of-the-art stratosphere-resolving climate models, initialized with an estimated state of the ocean and atmosphere.
We conclude that the atmosphere initialization has a key role on the variability and predictability of stratospheric processes providing evidence that a proper initialization of the QBO might be beneficial not only for the predictability of the tropics but also in the extra-tropics.