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Multidecadal to multicentennial variability in Holocene transient simulations

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Transient Holocene climate simulations with state-of-the-art Earth system models offers new opportunities to investigate the relationship between multidecadal to multicentennial variability, the long-term climate trends, and interannual to decadal variability (Braconnot et al. GRL, 2019). However, multidecadal to multicentennial variability is still poorly known, both because it is difficult to properly extract from proxy records and because it is at the limit of what can actually be done with Earth System models. In addition, the different feedbacks from ocean or land-surface properties that can shape its characteristics are still poorly understood. Different climate models seem to provide different centennial variability patterns between the different ocean basins that reflect either the chaotic nature of the climate system or a poor representation of these variability scales.

In this presentation, we will consider new mid-to-late Holocene simulations with the IPSL Earth System model, one of which includes interactive dynamical vegetation. We will first investigate the characteristics of multidecadal to multicentenial variability in these new simulations, with reference to recent publications comparing different transient Holocene simulations and addressing temperature variability scales, the thermohaline circulation, or Atlantic Ocean patterns leading to a reduction of the African monsoon interannual variability. We will also focus on key variability events that appear in the simulations and have a substantial impact on rapid changes in the African monsoon or on Northern Europe climate and land surface conditions (snow, soil moisture or vegetation). This opens the way to new research directions as part of the Paleoclimate Modeling Intercomparison Project.