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Characterization of the resilience and variability of vegetation during the Holocene using a large database of pollen data

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Global climatic changes which are expected in the 21st century are likely to create unparalleled disturbances on vegetation. In addition, human activities also increase the risk of fire disturbances and insect epidemies. We investigate the resilience of different biomes by examining their behaviour during the Holocene using a taxonomically harmonized and temporally standardized global fossil pollen datasets,synthesized from 2821 palynological records from the Neotoma Paleoecology Database and additional literature. Specifically, we study the composition variability on millennial time-scale and timescale-dependant scaling of variability from centennial to multi-millennial timescales. A principal component analysis was performed in order to characterize the principal modes of variability of the pollen assemblages. We find coherent regional signals of vegetation variability and scaling of variability from the pollen assemblages, indicating significant millennial scale variability which can be related to vegetation taxa and climates. Particularly, we observe more stability in North America and Northern Europe in areas dominated by boreal forest and deciduous forests. This may be linked to the greater stability of forest ecosystems and also a more stable climate over these areas which may be the result of stabilizing feedbacks. We find that diversity plays a key role in vegetation composition and that more diverse regions allow for greater variability.