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Diachronous timing of the MIS11 thermal optimum revealed by a global compilation of sea-surface temperature records

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Marine Isotope Stage 11 (MIS11) (424 to 374 ka BP) was the interglacial period in the past 500 ka with the longest thermal optimum. The climatic mechanisms responsible for the long duration of the MIS11 thermal optimum have been a matter of debate. It remains unclear whether the interglacial warmth has been sustained by greenhouse-gas forcing or unusually low eccentricity of the Earth's orbit at that time. Here we present a compilation of marine stable benthic and planktic isotope as well as sea-surface temperature (SST) data from sediment cores covering a wide range of latitudes in all oceans. This compilation is used to investigate the spatial and temporal patterns of surface ocean conditions during MIS11. The compilation contains a total of 159 data sets including 59 SST records (that are associated with either planktic or benthic isotope data) and 100 planktic and benthic isotope records, covering the last 300-500 ka (corresponding to MIS 9-13). In order to establish a robust stratigraphic framework for all records, the stable isotope records have been tuned to the well-established benthic stable isotope stack LR04. For an evaluation of the records' significance, the data sets have been classified in terms of their temporal resolution and age model quality, and the type of quantitative methods that were applied for the SST estimates. The pattern of surface-ocean conditions throughout MIS11 has been analyzed using an empirical orthogonal function (EOF) approach, which allowed us to extract principal global and regional trends in the paleoclimate signals, their spatial distribution and covariance with the main climate forcing parameters of MIS11 such as insolation. The results show a prominent pattern of regional diachrony in the onset and termination of the MIS11 interglacial optimum between the southern and northern Hemisphere, especially in the Atlantic region. A comparison of the SST records with climate model outputs from the Community Climate System Model (CCSM3) is still in progress for the 390-400 ka, 400-410 ka and 410-420 ka time slices and will allow for a direct comparison of proxy data and climate model outputs for MIS11.