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Deciphering the signal of Holocene temperature proxy records

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Knowing the temperature evolution of the Holocene would provide an important step towards understanding the present climate and testing climate models. Different proxy records are available for determining Holocene climate changes. However, noisy data and differences between various types of proxy data lead to discrepancies between results, and ambiguous interpretations - even at regional scale. Resolving these difficulties is important, as presently estimates of the global Holocene temperature evolution, as well as estimates of Holocene temperature variability, are largely in contradiction to those from state-of-the-art climate models.

In this contribution, we attempt to decipher the signal content of a global set of marine and terrestrial Holocene temperature proxy records. Therefore, we analyze the spatial covariance of the proxy signals across time-scales, proxy types and spatial separation. Combining this with estimates of the spatial temperature covariance from instrumental and model data provides insight into the signal content and proxy-specific biases. Estimates of the effect of time-uncertainty and variable attribution (e.g. seasonality) allow to explain the observed covariance structures. This provides a basis for the understanding of the degrees of freedom and the uncertainty of Holocene proxy records in reconstructions of the temperature evolution and climate variability.