



## **Fusing Paleo-Data and Models: A Monthly Reanalysis for the Period 1600 to 2000**

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One of the backbones of numerical weather prediction is the assimilation of all available observations into models to achieve initial conditions close to reality. The assimilation idea also revolutionized climate research with reanalysis becoming the most important data set for studying the last century. Recently, paleo-climatologists began developing new methodologies with the intention to assimilate sparse and temporally averaged proxy information instead of satellite data and instrumental observations. Here, we present the first monthly resolved paleo-reanalysis covering the period 1600 to 2005. Early instrumental temperature and surface pressure observations, temperature indices derived from historical documents and temperature and moisture sensitive tree-ring proxies were assimilated into an ensemble of atmospheric general circulation model using a Kalman-filtering technique. The resulting paleo-reanalysis combines the advantage of traditional reconstruction methods of being as close as possible to observations with the advantage of climate models of being physically consistent and having 3-dimensional information about the state of the atmosphere through time and for various variables. Moreover, it makes no stationarity assumptions, has temporally constant variability and offers error estimates. Using direct and indirect climate observation, climate forcings and models together, we will present the probably best supported northern hemisphere temperature evolution of the past 400 years, as well as spatial imprints of the 1790ies droughts and the 1815 Tambora eruption.