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PALAEO-RA: Combining an intermediate-size AGCM ensemble with historical observations and proxies to create a new dataset of the past 600 years of climate history

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The recently started PALAEO-RA project aims at creating a new global monthly 3-dimensional reanalysis dataset of the past 600 years' climate. Large spatial and temporal gaps in the available historical data on these time scale make the climate history being an under-determined problem when using observations only. In PALAEO-RA we will additionally use information from an ensemble of simulations with an atmospheric general circulation model (AGCM). The model offers additional physical constraints. The model reproduces teleconnection patterns and reflects typical large-scale modes of variability to set the historical data into a physically consistent regional to global context.

In brief, the method that we plan to use consists of two steps: First, we are currently producing an ensemble of historical simulations with the atmospheric general circulation model ECHAM6. Once finished, it will have a size of ca. 30 members, covering the period from 1420 to present. The ensemble is supposed to reflect the range of realistic climate states under prescribed historical radiative forcings (based on the PMIP4 setup) and ocean boundary conditions (HadISST.2 & SST reconstructions by Samakinwa et al., see abstract EGU2020-8744).

Secondly, we will apply Ensemble Kalman Fitting, a technique for the offline assimilation of historical observations (instrumental observations, documentary data, tree ring width and other proxies), basing on the assumption that the occurrence of a distinct observation has a different probability depending on the meso- and large-scale circulation patterns of the atmosphere.

Our poster will give a brief overview on the project with a focus on introducing the AGCM ensemble, also to allow for discussions on further applications of the latter.