Transient climate simulation of Last Millennium using integrated Earth System Model

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Transient climate simulation over last millennium (850AD-1850AD) was performed using an integrated earth system model, MIROC-ESM. The model is a successor version of AR4-participated model, which has improved radiation code, 80-layer atmosphere including stratosphere, aerosol transportation model SPRINTARS, dynamic vegetation component SEIB-DVGM, ocean eco-system and improved snow/ice component. Variation in LAI (Leaf Area Index) is considered as a feedback from vegetation component to climate.

The experiment was basically designed following PMIP3 (Paleoclimate Model Intercomparison Project phase 3) protocol: solar- and volcanic forcings and orbital parameters are given, while CO_2 concentration is predicted by the carbon cycle component of the model. Integration was started from Pre-industrial (1850AD) initial values, and spinned-up with 850AD condition.

Since the model has a capability of predicting transitional behavior of vegetation under changing climate, time lags between volcanic forcing and response of vegetation and climate were investigated. Predicted CO_2 concentration is rather stable, which agrees with the reconstruction and shows robustness of the carbon cycle (and vegetation) component.
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