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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 CO2 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 CO2 concentration is rather stable, which agrees with the reconstruction and shows robustness of the carbon cycle (and vegetation) component.

Keywords: Last MIllennium, General Circulation Model, Land system model, Dynamic vegetaion model