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Long-term transient response of ENSO to climate change in a coupled model of intermediate complexity

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We study the response of El Niño/Southern Oscillation (ENSO) to different forcing scenarios within a model configuration of intermediate complexity. The global coupled climate model CLIMBER-3α was coupled both ways with the Zebiak-Cane ENSO model. On the one hand, ENSO variability is introduced into CLIMBER-3α by supplying anomalous heatflux to the upper ocean, and on the other hand the CLIMBER-3α Tropical Pacific climate state is used as a background for the ENSO anomaly model. Here, we focus on the latter case and study the response of ENSO to scenarios of greenhouse warming and of a shutdown of the thermohaline circulation forced by freshwater input in the North Atlantic. The greenhouse warming causes changes in the wind and sea surface temperature mean state which initially lead to a higher ENSO amplitude. Later, the response is dominated by a deepening thermocline which suppresses ENSO variability. Although very small, thermocline depth anomalies are also the controlling factor in the ENSO response to a shutdown of the thermohaline circulation.