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Changes in ENSO characteristics in EC-Earth

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We present an analysis of ENSO variability and its mechanisms in the EC-Earth model, a new global climate model based on the seasonal prediction system of ECMWF. The EC-Earth climate model shows more realistic El Nino variability compared to that in most models in the CMIP3 archive. The ENSO pattern is connected to the eastern equatorial Pacific and coastal upwelling region, although it still extends too much to the west. The associated time scales show dominant variability at about 2 - 7 years. There is also a clear indication of decadal variability with a time scale around 25 years with a much broader meridional extension. The model features a charge-recharge mechanism that generates the interannual variability in accordance with observations. Multi-century runs with EC-Earth changing ENSO characteristics on multi-decadal time scales. Periods with weak and strong activity are found as well as changes in the skewness of ENSO. We investigate these changes in ENSO characteristics using a multicentury coupled simulation with preindustrial boundary conditions and a long simulation under present-day boundary conditions. A feedback analysis is performed quantifying the couplings between thermocline, SST, wind and damping. The impact of the change in the mean state is discussed. Finally, the consequences for predictability of ENSO are discussed and illustrated with a verification of new seasonal to decadal initialized hindcasts experiments.