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Low frequency modulation of the stability in a conceptual model of the equatorial Pacific: an estimate of the most influential changes in ENSO parameters over the recent decades

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We document the impact the El-Niño Southern Oscillation (ENSO) of two significant decadal changes in the tropical Pacific background mean state that occurred in recent decades, namely the climate shift of the 1970s as well as the transition from before and after 2000, in an extended version of the Jin recharge-discharge conceptual model. The leading linear mode of the model is used to represent the ENSO variability. The mean state is derived from the output of either the SODA or the GODAS Reanalyses. Eight parameters represent the mean state in the model, representing the following processes: thermodynamic feedbacks, atmospheric modes and stratification. We evaluate the isolated influence of each parameter on the changes in frequency and growth rate of the ENSO mode and show that the overall change in ENSO stability can be considered as a linear combination of the effect of each parameter change. The results indicate that the increase in thermocline feedback and in stratification are the most influential for explaining the change in ENSO stability associated to the climate shift of the 1970's, while the change in the atmospheric modes associated to the mean state transition from before and after 2000 has the largest impact on the solution of the conceptual model.