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Impact of the intraseasonal Kelvin wave on the regional circulation of the Humboldt system: the idealized case

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The equatorial Kelvin wave exhibits a significant variability at intraseasonal timescales. This variability is also apparently modulated at interannual to decadal timescales as revealed by the SODA oceanic Reanalysis, which could have a large impact on the regional circulation off Peru and Chile. Here a linear ocean equatorial model is used to force the ROMS (Regional Ocean Modelling System) eddy-resolving regional ocean model (1/6°) implemented in the Peru-Chile region. Academic experiments using idealized intraseasonal equatorial forcing are carried out with the objective to quantify how the solution deviates from linear theory which predicts that the Kelvin wave is trapped south of the critical latitude and the extra-tropical Rossby wave radiates north of it. Based on the results of a modal decomposition of the regional model variability, it is shown that there is significant deviation from the linear solution, which is due to a number of processes including modal dispersion of the equatorial Kelvin wave in the far eastern equatorial Pacific and the non-linear interaction with the mean state and seasonal cycle. Sensitivity experiments to the characteristics of the equatorial forcing (frequency and skewness) are also presented and discussed.