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Investigating the different "flavours" of ENSO using the Linearised Ocean Atmosphere Model, LOAM

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In recent years there has been much discussion about the characteristics of different ENSO events and how these may change in the future. In particular there has been a focus on the increasingly frequent ENSO events whose largest changes occur in the central Pacific. A number of questions have arisen from this apparent change in the nature of ENSO: is this the result of a fundamental change in the nature of ENSO which will require a new understanding of the physics that cause ENSO; is this the result of naturally occurring variability in the climate system which our instrumental record has undersampled; is ENSO responding to a fundamental change in the mean state in the tropical Pacific that causes a prevalence of ENSO events centred in the central Pacific. I shall investigate these questions using a simple model of ENSO.

I use a version of the Cane Zebiak model of the tropical Pacific, particularly a linearised version - the Linear Ocean Atmosphere Model (LOAM). LOAM uses a set of mean states and subsurface temperature parameterisations derived from observations which allows us to investigate how ENSO responds to changes in the mean state.

I show that different “flavours” of ENSO exist within some versions of LOAM, suggesting that no new physical understanding is needed to explain the occurrence of different types of ENSO. Using different subsets of the observations I investigate whether the mean state in the tropical Pacific has changed sufficiently to alter the structure of ENSO and whether any such change is large enough to lead to an increased occurrence of central Pacific ENSO events.