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Climate variability in the South-Eastern Tropical Pacific and its relation with ENSO: a model study

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It is shown that about a third of the ENSO-like variability in the HadCM3 coupled GCM is associated with variability in the South-East Tropical Pacific (SETP) area which is independent of ENSO and which is at least partly forced by extratropical variability in the Southern Hemisphere.
Equatorward propagation of sea-surface temperature (SST) anomalies along the east Pacific tends to precede ENSO anomalies. SST tendencies in the SETP area are controlled mainly by surface latent heat fluxes, and to a lesser degree by short-wave cloud forcing.
In the model, anomalies in oceanic advection and coastal upwelling only account for a small fraction of anomalous SST tendencies in the SETP, mainly in the southern spring season (SON).
In winter (JJA), an equatorward-propagating wind-evaporation-SST (WES) mode exists. Such a mode is damped and requires additional forcing, which appears to be provided by surface short-wave forcing by the Sc cloud.
In spring, SETP variability and ENSO are coupled via the low-level circulation with a strong mutual reinforcement. Cloud-cover anomalies are not strongly controlled by SSTs, but mainly a function of moisture convergence in a decoupled cloud layer.
The variability of the SETP is strongly linked with global extratropical circulation anomalies along the Southern Hemisphere jet stream. Such large-scale anomalies affect the entire eastern Pacific seaboard simultaneously for time-scale longer than a month, and they are found equally in ENSO active and ENSO neutral conditions.
The simulated SETP climate in HadCM3 is affected by large errors such as lack in stratocumulus clouds, reduced southerly wind stress, and warm SSTs. Investigation of the possible sources of such errors indicates that the near-field orographic forcing of the meridional wind component is the dominant factor for the SST error in this model.
The main properties of the variability in the SETP do not appear to depend strongly on such mean errors, and the meridional propagation of SST anomalies preceding ENSO events are also seen in observational datasets and in several CMIP3 models.