
Windows of opportunity for multi-annual prediction conditional on ENSO phase

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Abstract

Multi-annual to decadal climate predictions are skillful for a range of different aspects of the climate system, but there has been only little focus on how the predictability depends on specific initial climate states. Based on perfect-model prediction experiments and initialised predictions of the observed climate, we assess multi-annual predictability conditional on the state of the El Niño–Southern Oscillation (ENSO) at the time of prediction initialization. We find that predictions starting with El Niño or La Niña conditions exhibit higher skill in predicting near-surface air temperature and precipitation multiple years in advance, compared to predictions initialized with neutral ENSO conditions. This enhanced skill after ENSO events is related to the representation of phase transitions as part of the ENSO cycle, and related global teleconnections. Our results indicate that certain initial climate states provide increased multi-annual predictability, and in particular initialisation in El Niño or La Niña conditions enables more trustworthy predictions than initialisation with neutral ENSO conditions.

Keywords: climate prediction, conditional predictability, initial state, ENSO

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