## How well do climate models simulate two-types of El Niño?

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Recent studies reported that there are two types of El Niño events in terms of zonal distribution of SST anomalies. In this study, we evaluate a fidelity of current climate models in simulating two-types of El Niño using the pre-industrial run in CMIP3 archives and future CMIP5 archives. It is shown that a few climate models simulate two types of El Niño events to some extents, while most models have serious systematic problems in simulating distinctive pattern of SST and precipitation associated with twotypes of El Niño. That is, they tend to simulate single type of El Niño event. It is shown that the ability of climate models in simulating two-types of El Niño is related to how much atmospheric responses are different to the different SST patterns. For example, climate models whose convective location is shifted to east (west) as the SST center move to east (west) tends to simulate two types of El Niño events successfully. On the other hand, climate models whose location of convective anomaly is confined over western or central Pacific regardless of location of SST anomaly tends to simulate only single type of El Niño event. It is demonstrated that the confined convective anomaly over western or central Pacific is closely linked to the dry bias and associated cold bias over the eastern Pacific, because the positive SST anomalies over the eastern Pacific cannot increase local convection effectively because total SST during the El Niño is still too cold due to cold bias over the cold tongue region. It implies that the realistic simulation of climatology especially over the equatorial eastern Pacific is essential to the successful simulation of two-types of El Niño in climate models.