

EGU24-15294, updated on 20 May 2024

<https://doi.org/10.5194/egusphere-egu24-15294>

EGU General Assembly 2024

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Towards a better understanding of ENSO diversity: a paleoclimate perspective

Isma Abdelkader Di Carlo¹, Pascale Braconnot¹, Matthieu Carré^{2,3}, Mary Elliot⁴, and Olivier Marti¹

¹IPSL/Laboratoire des Sciences du Climat et de l'Environnement, unité mixte CEA-CNRS-UVSQ, Université Paris Saclay, Gif-sur-Yvette, France (isma.abdelkaderdicarlo@lsce.ipsl.fr)

²IPSL/Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques (CNRS-IRD-MNHN-Sorbonne Universités), Paris, France

³Facultad de Ciencias y Filosofía, LID, CIDIS, Universidad Peruana Cayetano Heredia, Lima, Peru

⁴LPG (Laboratoire de Planétologie et Géosciences), UMR, Nantes Université, France, France

El Niño-Southern Oscillation (ENSO) events are hard to put in one category because they differ in intensity, spatial pattern, and temporal evolution. Studies have characterized events into two main categories: central Pacific (CP) and eastern Pacific (EP) events. The indicators used to compute EP and CP events are varied, from area-averaged regions to Empirical Orthogonal Function (EOF) analysis. In the recent climatic period, they all show similar results. However, future projections show differing results when using two different methods of computing EP and CP events. Since the observational period is too short, we use paleoclimate reconstructions, which provide unique and quantitative measures of past climate changes over long time scales. We will first synthesize previous studies and discuss how they have used paleoclimate modeling and/or data to provide clues into how ENSO diversity may have been shaped in past climates. Our results indicate that many apparent inconsistencies in future projection studies are due to misleading use of ENSO diversity indicators and that investigating ENSO diversity with a climate change perspective requires assessing both changes in the climate mean state (annual mean and seasonality) and changes in variability.