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Mid-latitude leading double-dip La Niña

Abstract

Understanding the asymmetry in the evolution of El Niño and La Niña events remains a key challenge in climate science. Unlike El Niño, La Niña events often exhibit a double-dip or multi-year cooling pattern. This study investigates the underlying mechanisms distinguishing single-year and multi-year La Niña events using both observational data and climate model simulations. Findings reveal that single-year La Niña events typically emerge narrowly within the tropics following a central Pacific (CP)-type El Niño (Niño-4 > Niño-3), whereas multi-year La Niña events are more likely to originate from an eastern Pacific (EP)-type El Niño (Niño-3 > Niño-4) and exhibit stronger teleconnections with the mid-latitudes via the Pacific Meridional Mode (PMM). This enhanced PMM linkage induces a broader off-equatorial low-level anti-cyclonic circulation, which in turn suppresses equatorial upper-ocean heat recharge through Sverdrup transport. Efficient heat recharge during single-year events facilitates a quick termination or transition to El Niño, while the reduced recharge associated with multi-year events prolong surface cooling, thereby increasing the likelihood of a consecutive La Niña.

Keyword

Pacific Meridional Mode (PMM)

Wind-Stress Curl(WSC)

Reference

Park J-H, An S-I, Kug J-S, Yang Y-M, Li T, Jo H-S. Mid-latitude leading double-dip La Niña. *Int J Climatol*. 2021; **41** (Suppl. 1): E1353–E1370. <https://doi.org/10.1002/joc.6772>