



Weak El Niño and Winter Climate in the mid-high latitude Eurasia

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According to the sea surface temperature anomaly (SSTA) intensity in the Niño3.4 region and the east-west gradient across the Pacific, three types of El Niño are identified in this work. An event with larger than average intensity is defined as a strong El Niño, else as a weak event. Almost all strong El Niños are concurrent with a large gradient, which is featured by negative SSTAs in the western Pacific and positive SSTAs in the equatorial eastern Pacific (EP) and Indian Ocean (IO). According to the east-west gradient, the weak events can be subdivided into gradient-weak (GW) El Niño and equatorial-weak (EW) El Niño. The GW El Niño characterizes a great east-west gradient without a significant IO SSTA. In contrast, the EW event features a positive SSTA over the tropical IO and EP. The impact of GW El Niño on the North Atlantic [U+F02D] Eurasia continent (NA [U+F02D] Eurasia) displays a negative North Atlantic Oscillation (NAO)-like atmospheric anomaly, resulting in a drier and cooler-than-normal winter over Eurasia. Observational and numerical evidences indicate that the prolonged subtropical jet from North Pacific to NA act as a waveguide that captures the planetary Rossby waves generated by the GW El Niño. This waveguide favors the propagation of the perturbations into the downstream regions, which would affect the NA [U+F02D] Eurasian climate. However, the EW El Niño is accompanied by a relatively weak subtropical jet that cannot impact the NA [U+F02D] Eurasian climate significantly. For the strong El Niño, the absence of the NAO signal can be attributed to the counteracting of the teleconnections triggered by the Pacific and the tropical IO.