

## Does stratospheric sudden warming occur more frequently during ENSO winters than during normal winters?

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Stratospheric sudden warming (SSW) events exhibit pronounced interannual variability. Based on WMO definition of SSW, it has been suggested that SSW events occur more preferably during El Niño-Southern Oscillation (ENSO) winters (both El Niño and La Niña winters) than during normal winters. This nonlinear relationship is re-examined here by considering six different definitions of SSW. For all definitions, SSW events are detected more frequently during El Niño winters than during normal winters, in consistent with an enhanced planetary-scale wave activity. However, a systematic relationship is not found during La Niña winters. While two SSW definitions, including WMO definition, show an increased SSW frequency during La Niña winters, other definitions show no change or even a reduced SSW frequency. This result is insensitive to the choice of reanalysis datasets and ENSO index, indicating that the reported ENSO-SSW relationship is not robust but dependent on the details of SSW definition. Implication of this finding to SSW-related downward coupling and surface climate variability is also discussed.

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