



Precipitation anomalies in the deep tropics following stratospheric sudden warming events

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A composite analysis the 35 major Sudden Stratospheric Warming (SSW) events between that have occurred between 1958 and 2010 reveals that each event is associated with a marked increase in precipitation in the deep tropics, specifically in the equatorial band 5N-5S. This anomalous precipitation starts 5 days after the central date of the SSW and lasts for up to 40 days, reaching a maximum amplitude at day 10. This equatorial precipitation anomaly is interpreted as a shift of convective activity to the south, and is readily apparent in the OLR fields.

We show that these SSW induced equatorial precipitation anomalies are due to the development of an anomalous tropical mean meridional circulation which, in turn, results from anomalous eddy momentum flux convergence in the tropical latitudes originating in the extratropics. The latter is linked to the downward propagation of the extratropical zonal wind anomalies from the stratosphere to the troposphere, which cause an equatorward shift of the eddy-driven jet following the SSW.

The shift is greatest in the Atlantic sector. Further we demonstrate that, contrary to naive expectations, the downward propagation of temperature anomalies in the tropical stratosphere associated with the SSW have no significant effect on tropical convection, as they do not extend below the tropopause and are thus unable to affect the tropospheric static stability in the equatorial regions.

These robust equatorial precipitation anomalies following SSWs provide another example of the strong coupling between the stratosphere and troposphere, and suggest a new pathway by which the extratropics can influence the tropical circulation.