

Solar influence on the tropical troposphere from the middle atmosphere

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There are two possible pathways through which solar influence penetrates downward into the troposphere. The extratropical solar signal on the Earth's surface can be well explained by downward migration of wave–zonal mean flow interaction similar to polar night jet oscillation.

The tropical solar signal in the Earth's surface is characterized by cooling over the tropical cold tongue sectors of the ocean in the southeastern Pacific and the South Atlantic. Direct cause of this cooling is a stronger cross-equatorial winds near the surface. Such change in the tropospheric meridional circulation during the solar cycle could be explained from the following process: Increased subtropical westerlies around the stratopause region due to higher solar activity reduces mean meridional circulation in the stratosphere, which lead to a warming in the tropical lower stratosphere and tropopause region. Increased static stability in the tropical tropopause layer tends to suppress convective activity in the equatorial region. More detailed discussion on entire Earth's surface can be found in Kodera et al. (2016).

Key words: Solar influence, tropical convection, Ocean surface temperature

References

Kodera, K., Thiéblemont, R., Yukimoto, S., and Matthes, K., 2016: ACPD, doi:10.5194/acp-2016-138.