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# The impact of tropical heating on the tropospheric response to stratospheric sudden warmings

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Imposing large-scale tropical heating in a Polvani-Kushner-like setup of a dry-dynamical core is found to nearly double the amplitude of tropospheric wind anomalies in the aftermath of stratospheric sudden warmings, despite only weak changes in the strength of the stratospheric anomalies associated with the warmings.

In contrast to our expectations, further experiments reveal that the enhanced sensitivity is associated not with the stationary wave field produced by the zonally asymmetric heating, but with subtler basic state changes associated with the symmetric component of the heating. Moreover, the enhanced sensitivity is not a result of stronger tropospheric feedbacks. The sensitivity arises instead from the stronger effective forcing of the stratospheric anomalies on the tropospheric jet via the stationary wave field and meridional circulation.

While a number of previous studies have highlighted the relevance of internal tropospheric feedbacks, this study demonstrates that details of the direct coupling mechanisms can also have substantial impact on the strength of tropospheric response to stratospheric sudden warmings. The strength of the direct coupling can be sensitive to details of the tropical diabatic heating field, leading to the speculation that the strength of the coupling may depend on, e.g., ENSO conditions. This study also suggests that better means of isolating the direct coupling mechanisms are required to evaluate their fidelity in comprehensive models.