

Interactive comment on “The role of convective overshooting clouds in tropical stratosphere–troposphere dynamical coupling” by K. Kodera et al.

Anonymous Referee #1

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This paper attempts to demonstrate a relationship between tropical stratospheric circulation and tropospheric clouds and precipitation during two large stratospheric warming events. The analyses are based on meteorological data and satellite-derived precipitation, cloud amount and brightness temperatures (with different channels sensitive to deep convection and convective overshooting events). The key point of the study is to show clear relationships between the stratospheric circulation (upwelling and temperatures) and deep convective clouds and precipitation, but the evidence is not convincing. While the links between high latitude stratospheric eddy forcing and tropical temperatures / upwelling are reasonable (and consistent with well-known behavior), the further

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relationships with cloud statistics and precipitation are not convincing or shown to be statistically significant. Although the patterns in Figs. 1 and 3 are suggestive of tropospheric variations ~ 10 -20 days following the stratospheric cooling events, the arguments are hand-wavy and there are no statistically significant relationships deduced (there are no attempts to evaluate the statistical significance levels in Fig. 2). I see much less evidence of any coherent variability in Figs. 4-5. I expect that demonstrating clear effects of specific stratosphere changes on tropical clouds / precipitation will be difficult because of the large natural variability in tropical clouds; there are relatively few degrees of freedom in the ~ 40 day time series utilized here, so that significant relationships require extremely high correlation levels. (This could be evaluated by sampling longer records of cloud / precipitation statistics to see how often such relationships occur by chance). It is also difficult for me to understand the physical links proposed here, especially a ‘direct relationship to lower stratospheric upwelling at around 70-50 hPa’, which is well above the height of 99% of tropical clouds. Overall these observations do not present a convincing or robust case for the proposed relationships. I do not recommend this paper for publication in present form.

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