A radar-based climatology of tropopause folds and deep convection

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Tropopause folding
Stratospheric Intrusions
and Deep Convection
From the perspective of the ingredients based methodology, tropopause folds can affect all three ingredients.
Tropopause folds

- dry air
- warm moist air in the boundary layer (Danielsen 1968, Roberts 2000, Griffiths et al. 2000)
- potential instability

- static stability
- characteristic of the stratosphere (Danielsen 1968)
- capping environment

Convective storms
How is deep convection modulated by tropopause folds?

How the structure of tropopause folds affect the location, intensity and morphology of the resulting convection?
Radar-based climatology of tropopause folds and deep convection

MST radar and tropopause folds
Sharp change in tropopause height

Sloping layer of high echo power

Upper-level jet stream

Strong vertical wind shear
183 tropopause folds were identified in MST data between 2006–2011.
Radar-based climatology of tropopause folds and deep convection.
695 convective storms were identified in RADARNET data between 2006–2011!
The annual cycle does not appear to provide an explanation for the minimum in convective storms in February–April, since the sounding characteristics are not substantially different from the more active period in November–January.
Multicellular lines were most prevalent with 298 cases (43.5% of all convective storms), followed by 227 isolated cells (31.1%).
Radar-based climatology of tropopause folds and deep convection
Main maximum in December and a secondary one in September, with a minimum in March.
Convective storms associated with tropopause folds
Conclusion: more organized storms tend to form in environments favorable for synoptic-scale ascent.