Convective initiation in the vicinity of the subtropical Andes

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Introduction

- TRMM satellite observations have led to the realization that intense deep convective storms just east of the Andes in subtropical South America are among the most intense anywhere in the world (Zipser et al. 2006).

- South American MCSs:
  - ~60% larger than those over the United States (Wasson and Fritsch 1987)
  - Hot spot of deep convection (Zipser et al. 2004)
  - Larger precipitation areas than those over the United States or Africa (Durkee et al. 2005)
  - Largest number of severe hailstorms globally (Cecil and Blankenship 2012)

Background

UW methodology to separate TRMM Precipitation Radar (PR) echoes into wide convective cores (Houze et al. 2007)

Wide convective cores are defined as contiguous 40 dBZ echo that extends over 1,000 km²

Wide convective cores are numerous in subtropical South America

Convective initiation in South America

- WRF modeling study to investigate the the patterns observed by the TRMM PR → convective storms initiating on the immediate foothills of the Andes
- Terrain modification experiments allow for testing of the importance of terrain in convective initiation in subtropical South America

Convective initiation in South America

- Decreasing the height of the Andes decreases the magnitude of the low pressure in the lee, providing less suction and a weaker SALLJ
- Reducing and increasing the height of the Andes has the inverse effect indicating a clear relationship between the storms and the terrain in South America

Conclusions

- Wide convective cores are correlated with strong signatures of lee cyclogenesis and SALLJ from suction effects
- Reducing and increasing the height of the Andes has an inverse effect, indicating the clear relationship between convective storms and orography in this region
- Reducing the Andes provided for a weaker lee pressure pattern and LLJ that resulted in enhanced convective initiation, but overall weaker storms
- The Sierras de Cordoba mountains play a secondary role in focusing convective initiation but the main terrain control is the altitude and large extent of the Andes

Acknowledgements

This research was supported by:
National Aeronautics and Space Administration Grants NNX13AD71G and NNX11AL65H