Using CERES Cloud Properties to Assess Lindzen's Iris Hypothesis

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Objective

- **Use CERES Cloud properties to examine the Iris hypothesis put forward by Lindzen in**

Richard S. Lindzen, Ming-Dah Chou and Arthur Y. Hou, "**Does the Earth Have an Adaptive Infrared Iris?**", *Bulletin of the American Meteorological Society*, Vol. 82, No. 3, pp. 417-432.

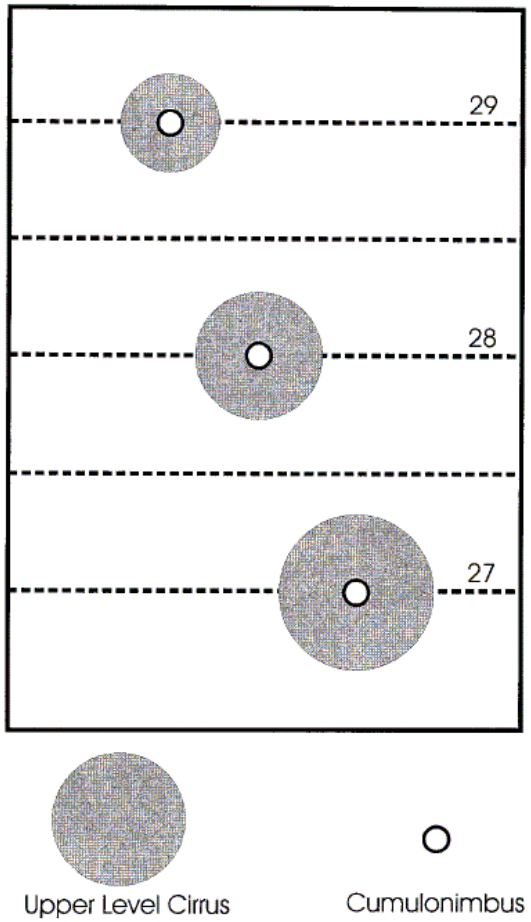


FIG. 3. Schematic illustrating change in cloud-weighted SST due to cloud systems moving from the central position to colder and warmer regions. Dotted horizontal lines correspond to isotherms. Units are nominally °C.

Approach

- Use 9 months of CERES SSF data from TRMM
- Reproduce Lindzen Fig. 5 using CERES Window Channel temperature
- Examine validity of Fig. 5 using cloud properties to improve convective vs. non-convective classification
- Use ERBE-like fluxes to further examine the 3.5 box model (B. Lin)

Lindzen Cloud Results

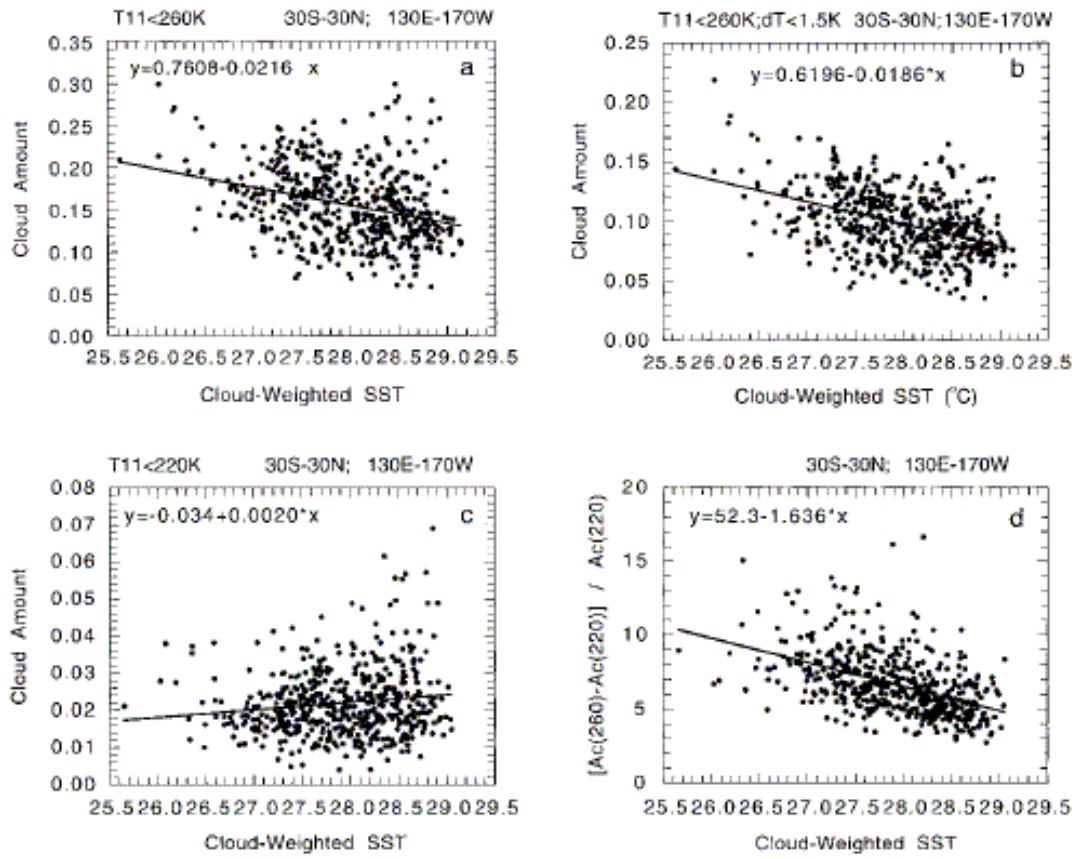
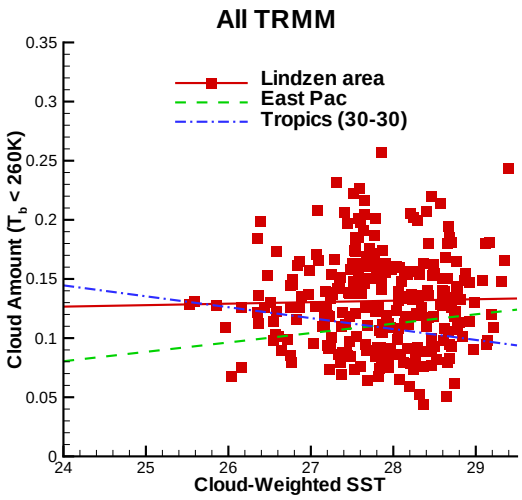
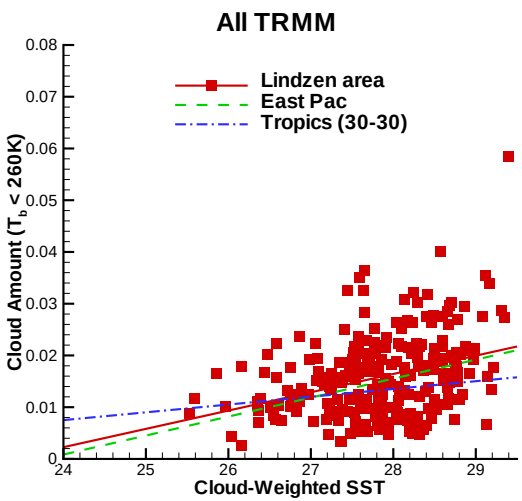


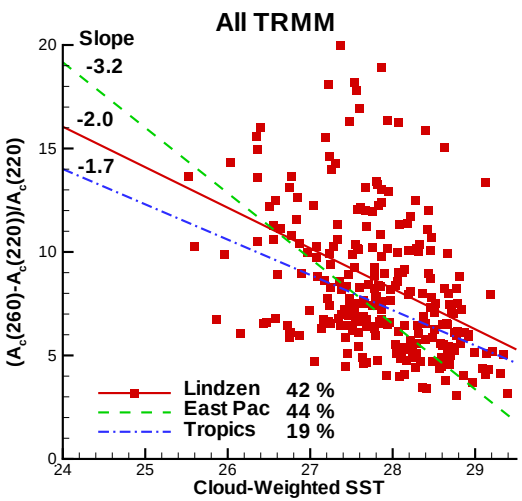
FIG. 5. Scatterplots showing how cirrus coverage varies with cloud-weighted SST for both "all" (a) upper-level clouds and (b) thick clouds. Also shown is (c) the variation of cumulus area with cloud-weighted SST and (d) the variation of cirrus coverage normalized by cumulus coverage. Data points correspond to daily averages. (See text for details.)

CERES Cloud Results



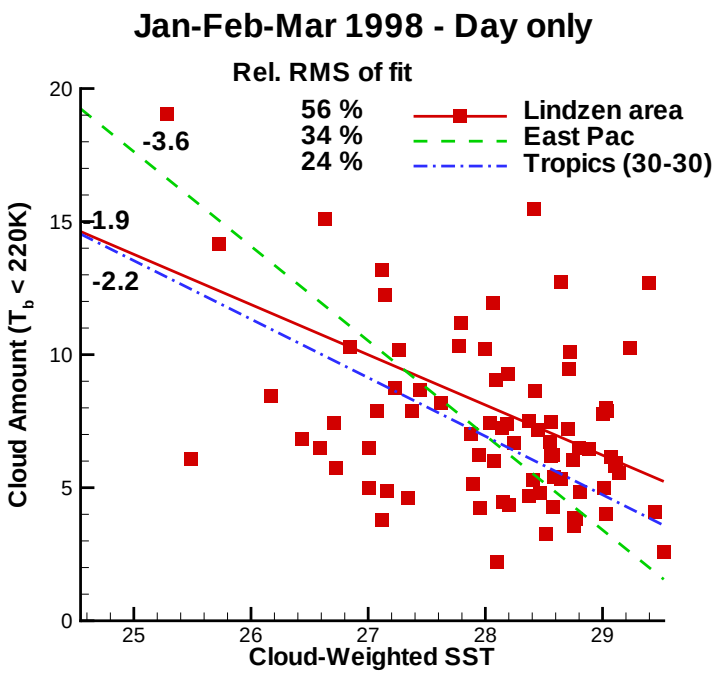
All TRMM
Day + Night

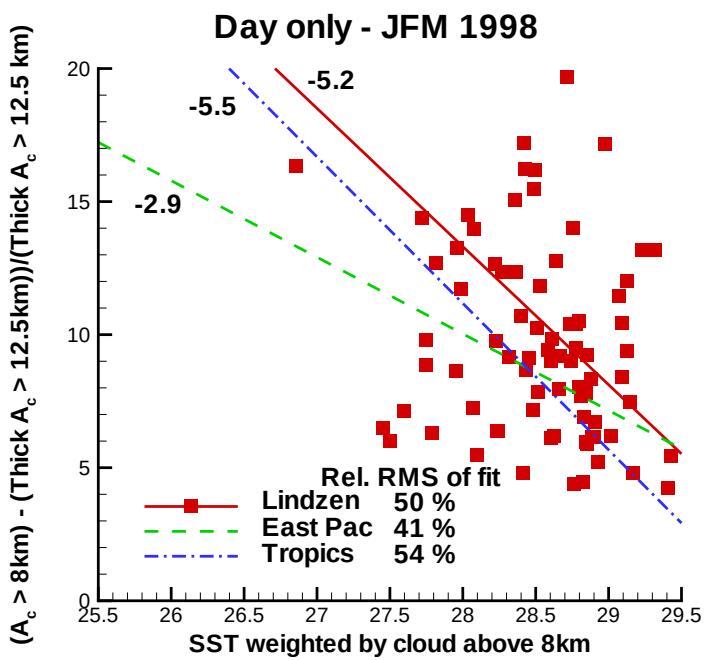




CERES Cloud Results - 2

Jan-Feb-Mar 1998
Day only

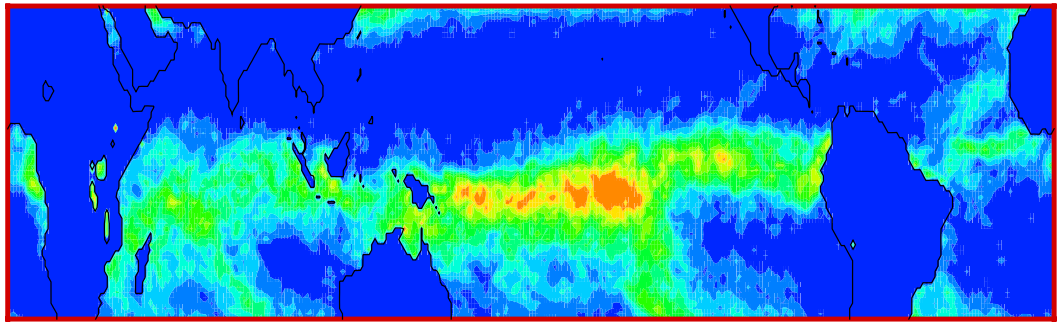




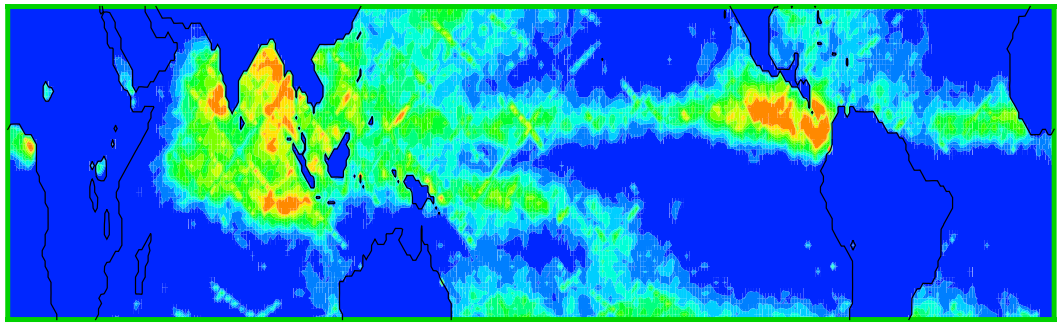
CERES Cloud Results - Map

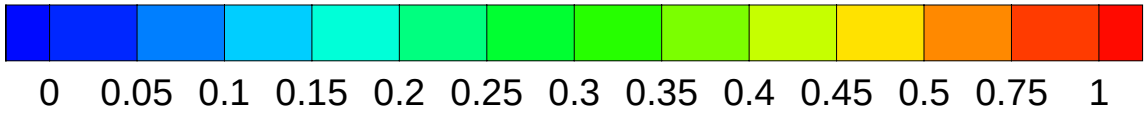
DAY ONLY

Jan-Feb-Mar 1998



Jun-Jul-Aug 1998

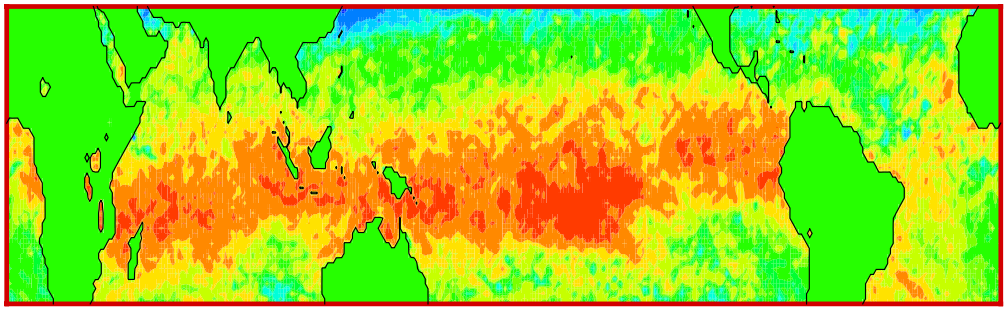




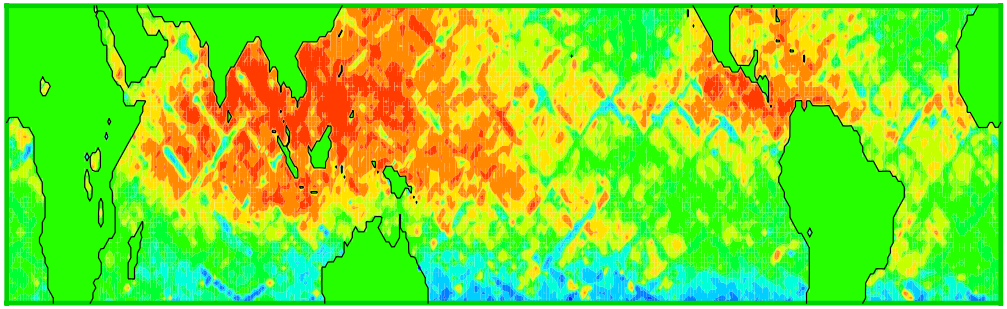
Fraction of Cloud with T_b(WIN) < 260 K

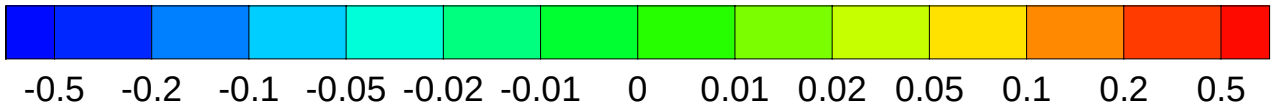
CERES Cloud Results - Difference

Jan-Feb-Mar 1998



Jun-Jul-Aug 1998





(Fraction > 8 km) - (Fraction T_b < 260 K)

Summary

- TRMM SSF data have been used to assess Lindzen's cloud vs SST variation.
- An attempt at improving the relation was made using cloud height.
- Non-convective to convective cloud vs SST has the same slope.
- Using cloud height we pick up more high cirrus
- Bing Lin will now discuss fluxes and 3.5 box model