# Tropical Upper Tropospheric Trough (TUTT)

- A mid-oceanic trough situated in the tropics at 200 mb
- Formation mechanism usually from complicated mid-latitude interactions
- Once present, they maintain themselves by subsidence warming near the tropopause to balance radiational cooling.
- Cold-core aloft.
- A persistent tropical feature in the summer
- Generally hostile to tropical cyclones due to shear. There are rare exceptions of positive interaction
- Upper-level lows can break off and retrograde to the west. Sometimes have a surface feature that looks like an inverted trough
- Generally mundane weather features unless they move inland. Then, can be proficient rainmakers, especially if they move slow or stall. The upper-level low eventually dissipates due to latent heat from the rainfall, as well as heat fluxes from the land, but it can be a slow dissipation.

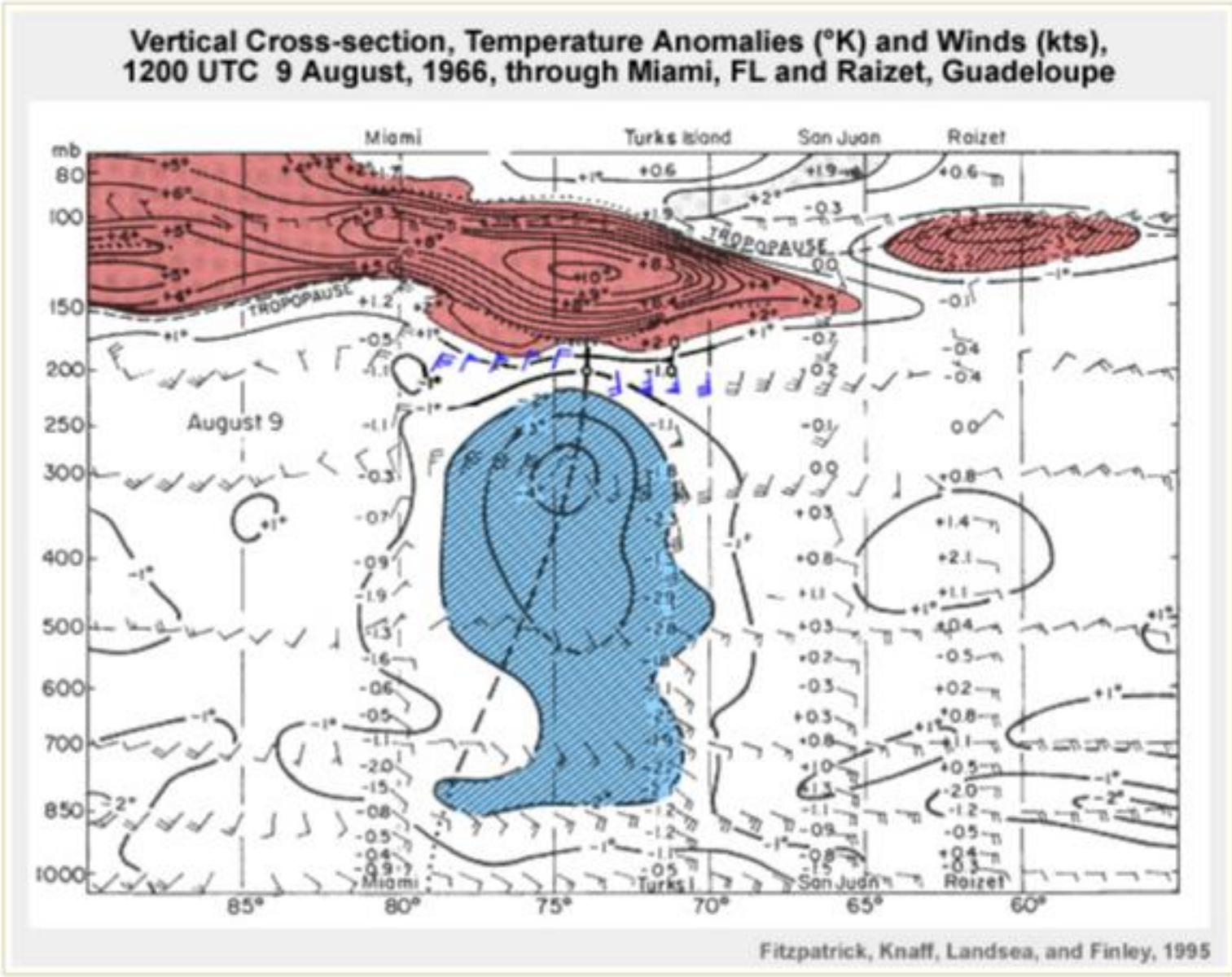



Fig. 7.42. Vertical cross-section through a TUTT on 9 Aug 1986. Blue shows cold core anomalies and red shows warm anomalies.[89]

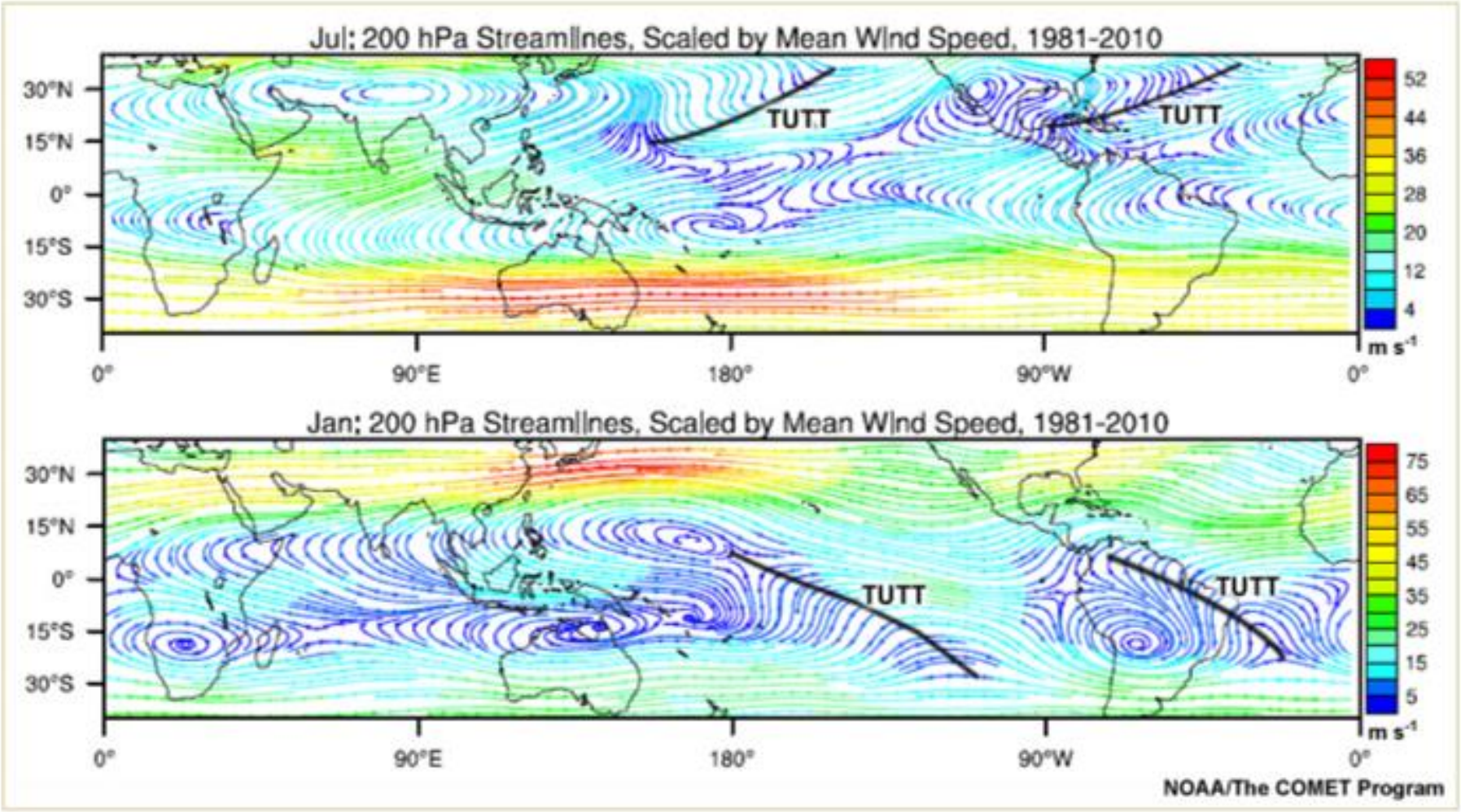
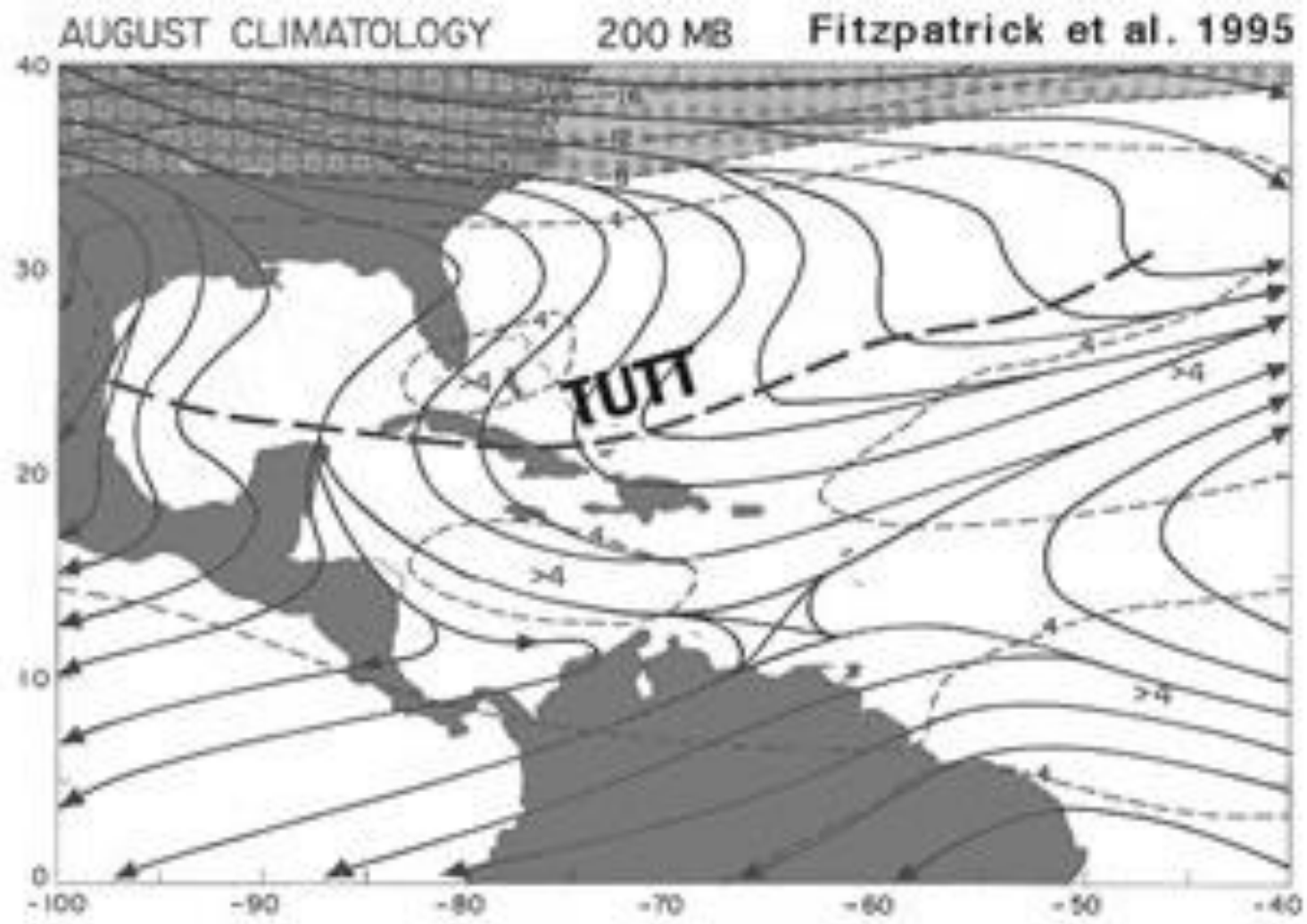
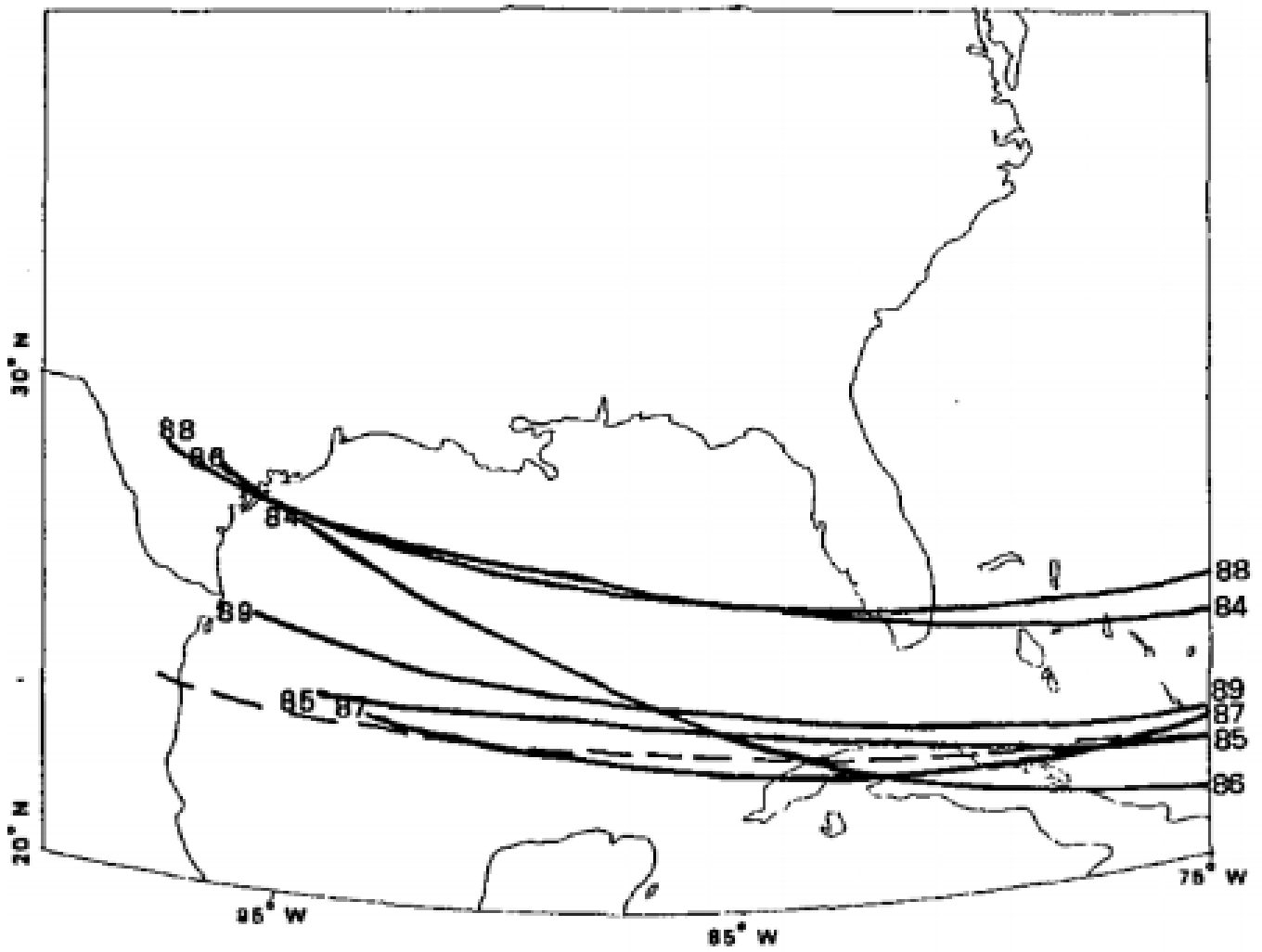



Fig. 7.41. July and January mean 200 hPa streamlines and wind speed (m $s^{-1}$) for 1981-2010. Thick black lines mark the TUTTs.

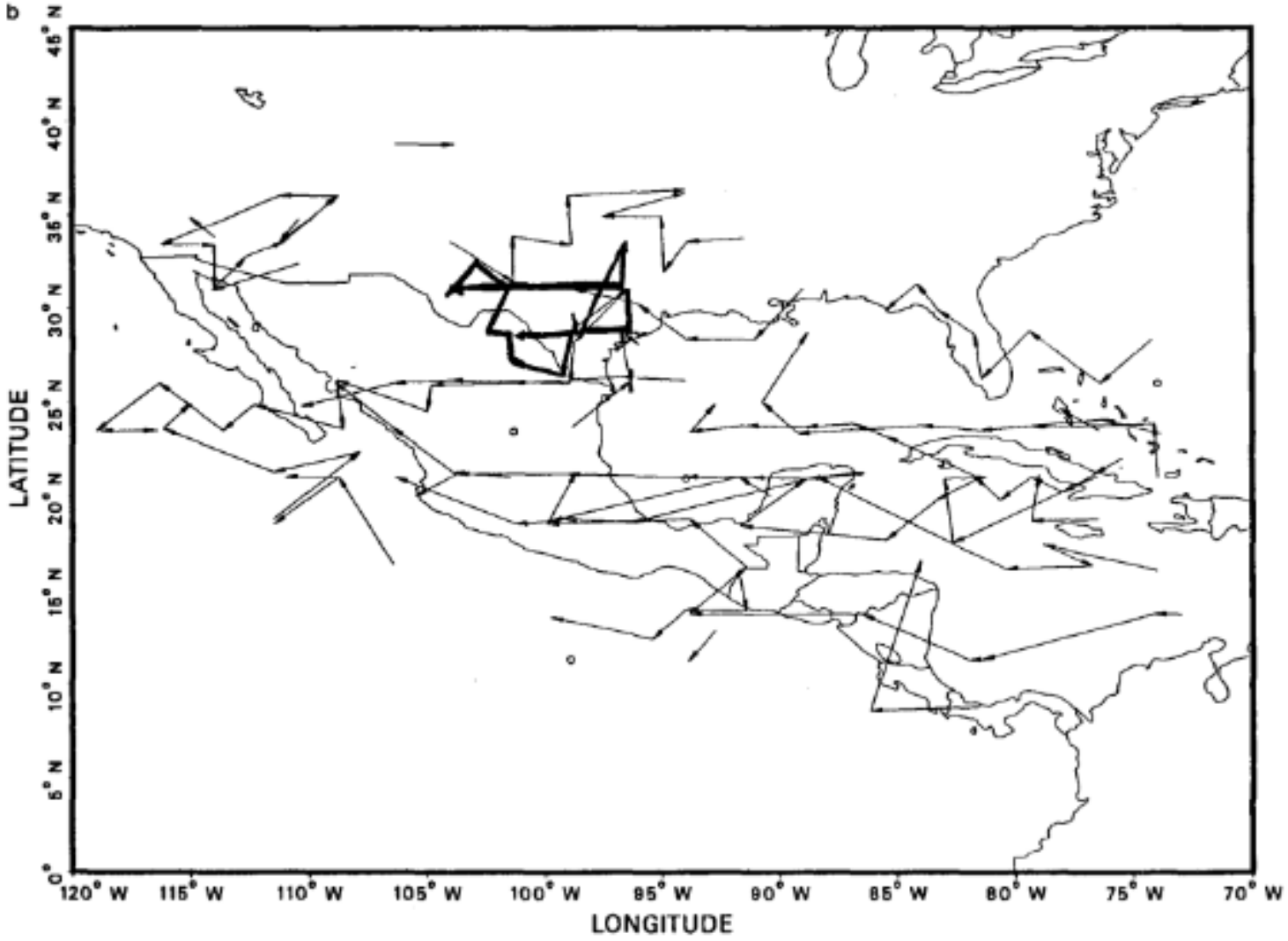
*Best seen in water vapor loops*


AUGUST CLIMATOLOGY
200 MB
Fitzpatrick et al. 1995
TUTT
40
30
20
10
0
-100
-90
-80
-70
-60
-50
-40

# Mean location of July/August TUTT in Gulf of Mexico from 1984-1989 (from Whitfield and Lyons, 1992)



# Tracks of 37 TUTT lows in July and August 1988 (from Whitfield and Lyons, 1992)



# An Upper-Tropospheric Low over Texas during Summer

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Our results indicate that the TUTT low, in combination with the diurnal heating cycle, is a significant rain-producing synoptic-scale disturbance that can become a major overall rainfall producer when it becomes quasi-stationary. We believe that the persistent and abundant rainfall associated with the TUTT low over land is a direct consequence of the interaction between the dynamic and thermodynamic forcing by the TUTT low and the large diurnal heating cycle observed over land during summer. Subtle and often weak disturbances, such as a TUTT low, can enhance the diurnal heating effects on convection and can change the weather from the typical isolated afternoon thunderstorm event to a widespread rain event. Our observations of TUTT lows over oceanic regions (based on satellite imagery) indicate small diurnal variations in cloudiness and significantly less cloud/convection as compared to TUTT lows over land. Hence, as a TUTT low moves from ocean to land, the weather forecaster should anticipate an increase in cloud and convection associated with the TUTT low, particularly during daytime heating hours, and a well-defined afternoon and early-evening peak in the probability of rain and/or thunderstorms. This scenario is likely to occur not just over Texas, but also over other Gulf Coast states where TUTT lows are observed in the upper troposphere during summer.

http://journals.ametsoc.org/doi/abs/10.1175/1520-0434(1992)007%3C0089%3AAUTLOT%3E2.0.CO%3B2