



# Evidence for a Manus Persistent Near Surface Night Inversion

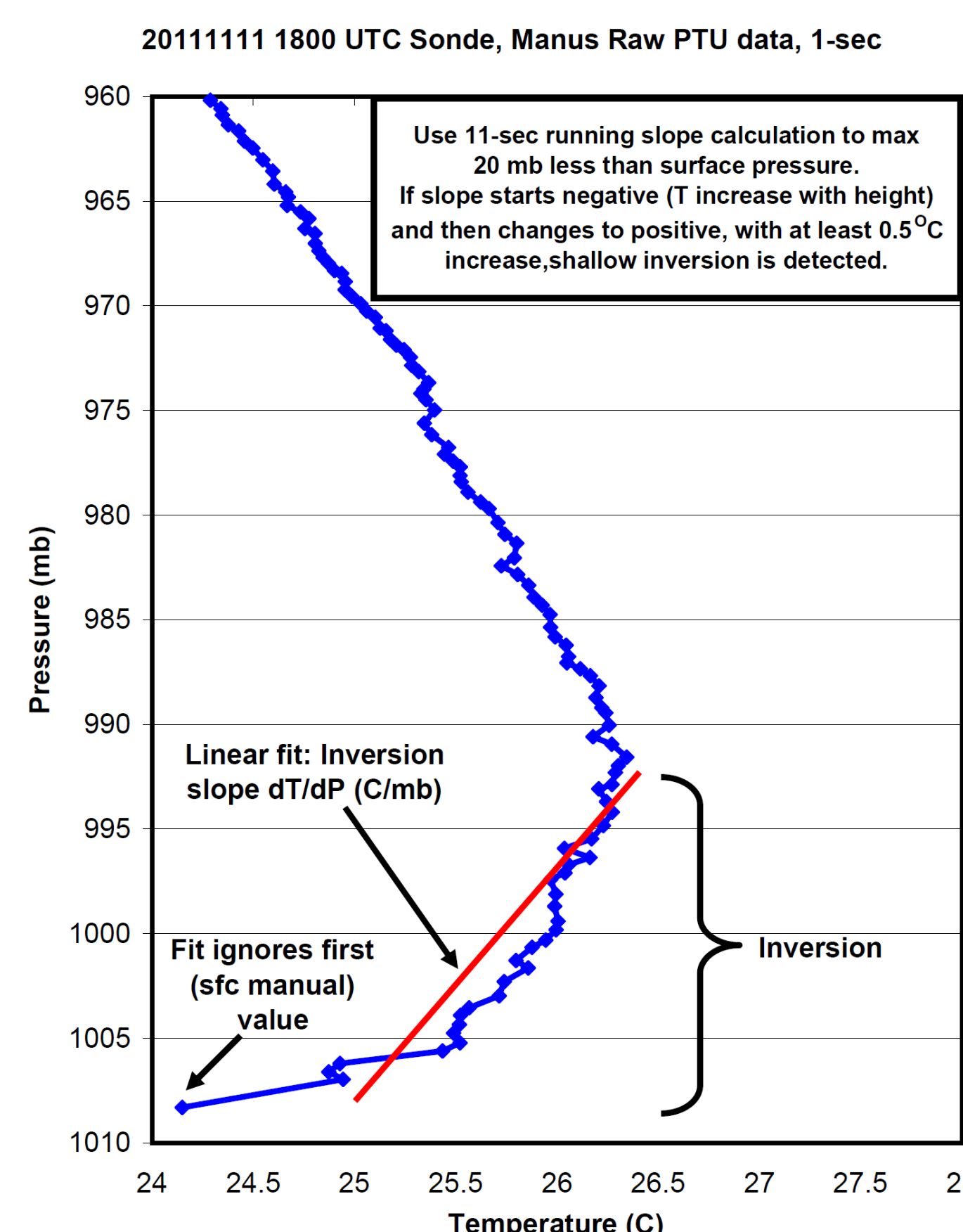
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## AMIE-Manus Night Inversions

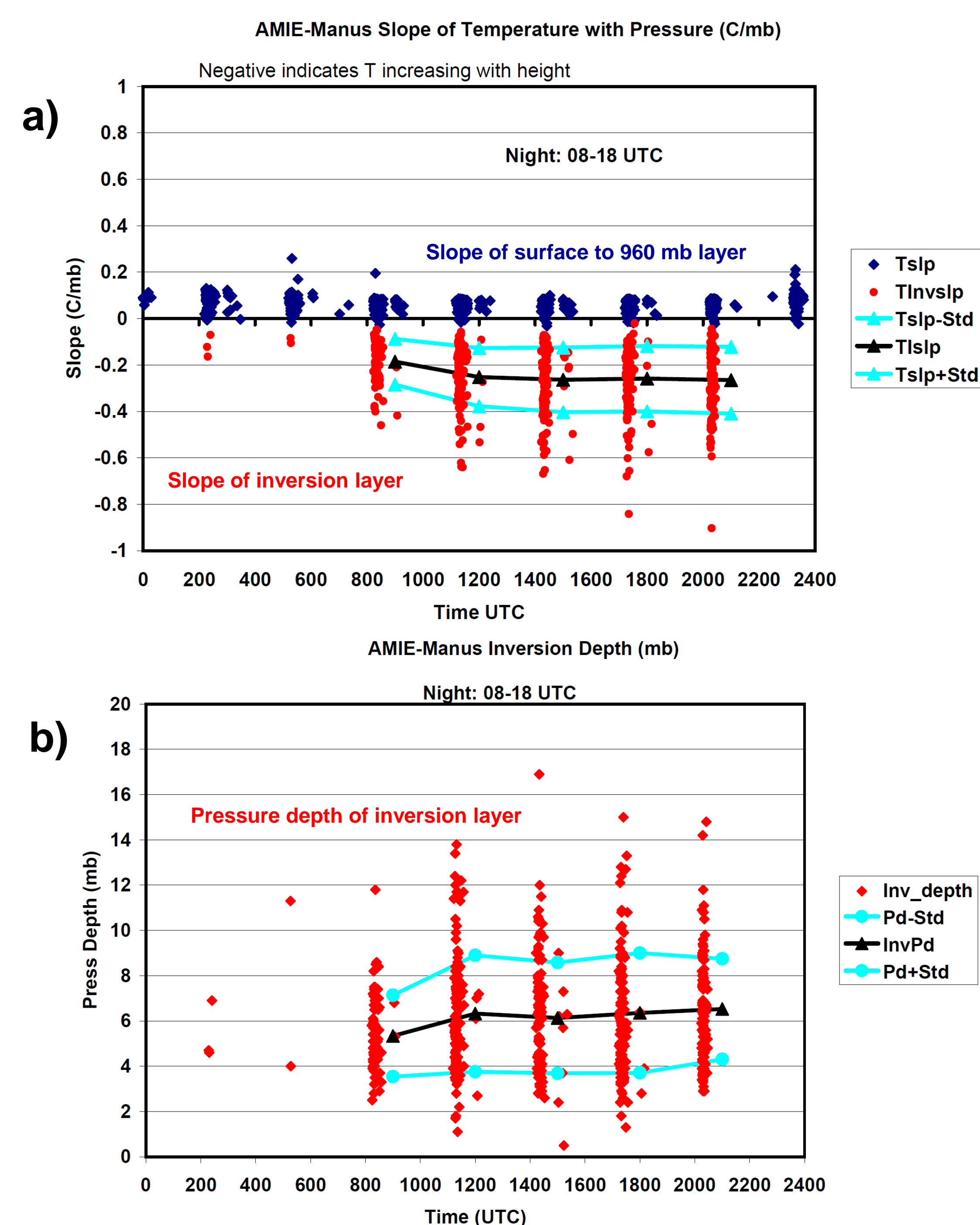


An example of night time shallow temperature inversion at Manus. Shallow inversion is detected using 11-point running calculation of dT/dP slope and minimum 0.5°C change in the lowest 7 mb. If detected, overall inversion slope is calculated, and inversion top pressure noted.

## Manus Night Inversions Summary

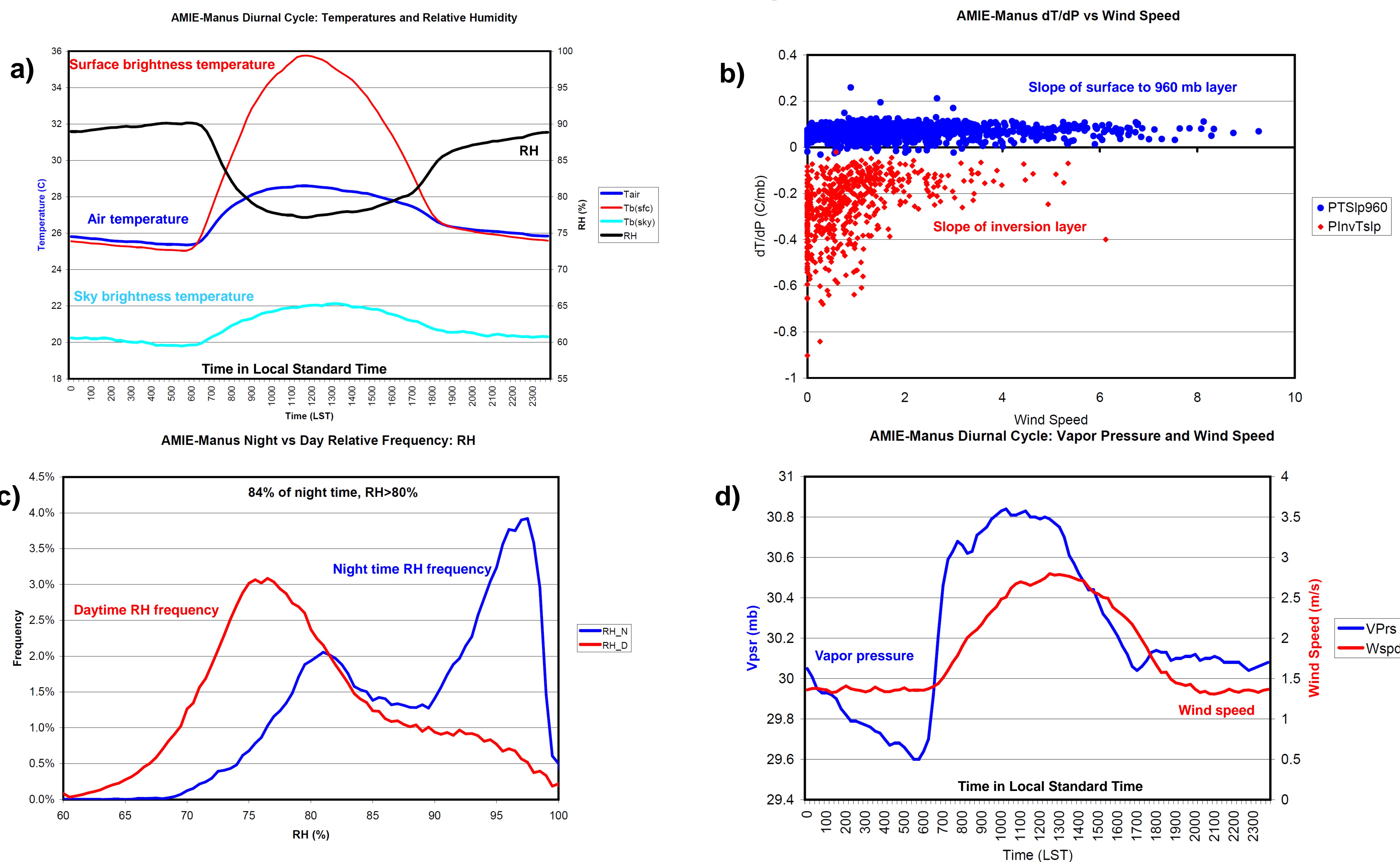
- 1) Night and early morning significant shallow temperature inversions are common on Manus during AMIE - Occurring 66% of the time during AMIE
- 2) Surface radiative cooling and light wind conditions favor inversion formation
  - Surface Net LW negative at night, low thermal mass of land surface
  - Winds <1 m/s 60% of time, <2 m/s 89% of time
  - Stronger inversions associated with weaker wind speed
- 3) As surface temperatures drop, RH increases and haze forms
  - Night RH > 80% over 80% of the time
  - Above deliquescence point for salt aerosols
- 4) The haze formation decreases the near surface water vapor amount
- 5) Because the ocean surface has greater thermal mass than land, and is fluid so there is overturning, it is most likely that these inversions do not occur over the nearby ocean area
- 6) These shallow night inversions sometimes do occur on Gan, but are observed far less frequently (not shown) likely due to stronger nighttime wind speeds (i.e., more vertical mixing)

## Manus Inversion Occurrence



Significant shallow inversions occur in 66% of the night and early morning (09-21Z sondes) at Manus during AMIE. On average, temperature increases 0.25° C/mb (StdDev = 0.12° C/mb) (a), and the inversions cover the lowest 6 mb (StdDev = 2 mb) of the atmosphere on average (b).

## Manus Conditions Favoring Inversion Formation



(a) Solar radiation drives surface heating during day, which in turn drives heating of the near surface air and lowering of RH. But at night, IR loss cools the surface and near surface air, raising RH above the deliquescence point. (b) At night, light winds (89% < 2 m/s) contribute to the formation of near surface inversions caused by the radiational cooling. (c) Night RH greater than 80% occurs about 84% of the time, which promotes haze formation. (d) As the haze forms it removes water vapor from the air, especially in the latter half of the night, reaching minimum vapor pressure on average just before dawn.