Evidence for a Manus Persistent Near Surface Night Inversion

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Abstract:

During the AMIE-Manus campaign period, some near-surface temperature and moisture "oddities" were brought to light and investigated. The results are documented in an ARM Technical Report by Long and Holdridge (2012). While some minor improvements in sonde launch procedures were recommended and implemented, and other factors which have some minor effect on the surface temperature and humidity values were found, the sonde profiles themselves are shown to be within the uncertainty of the instruments used. It turns out the perceived "oddities" are the result of using unforced air ventilated surface data at Manus, in combination with the brief "GTS" sonde messages along with some of the methodology used for monitoring and evaluating sonde data during the campaign. With this intense scrutiny of the Manus sondes and the availability of 8/day sonde profiles, the investigation did turn up strong evidence that a near surface layer at the Manus ARM site persistently developed temperature inversions during the night time.

We will present an analysis of the AMIE-Manus low level sonde and surface met data showing that the inversions form most nights, with a contributing factor being the prevalent calm conditions with wind speeds only rarely greater than 4 m/s, and less than 2 m/s occurring 80% of the time. Comparison with equivalent analyses from AMIE-Gan exhibit infrequent night inversions that only occur with surface wind speeds less than 4 m/s. The inversions have an average pressure depth of about 7 mb, or the lowest 40-60 m of the column, and an average slope of temperature decreasing 0.2 degrees C per mb. Finally, evidence of near surface cooling is manifested not only in the surface met temperature record, but also in the nightly increase of relative humidity to an average near 90%.

Reference:

Long, C. N. and D. J. Holdridge. 2012. "Investigations of Possible Low-Level Temperature and Moisture Anomalies During the AMIE Field Campaign on Manus Island." ARM Technical Report, DOE/SC-ARM/TR-119, available at http:\\www.arm.gov.

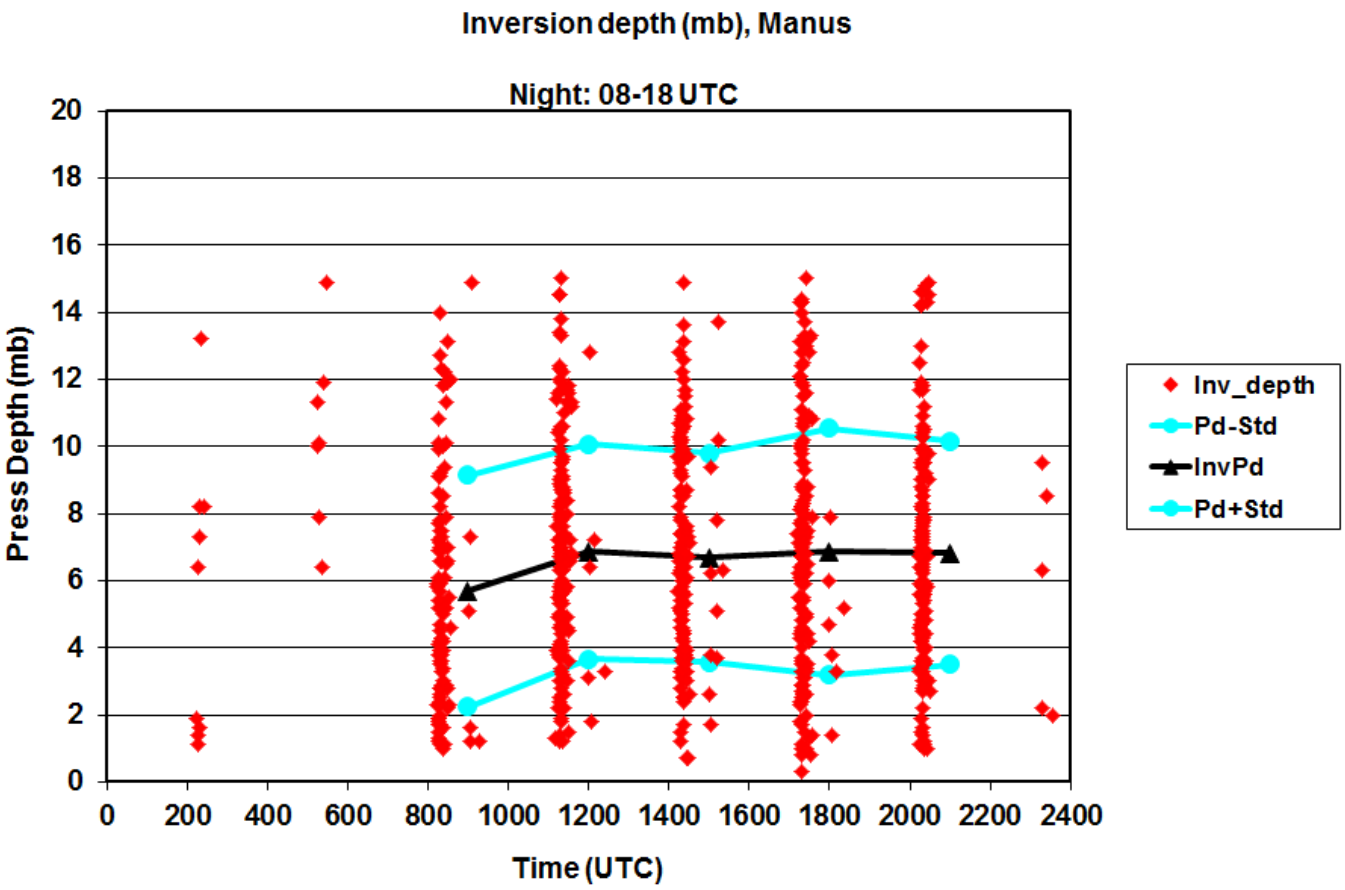

Figure caption: Plot of pressure depth at Manus when a temperature inversion was detected during AMIE-Manus. Red are detected inversions depth, black line is average depth, light blue represents +/- 1 standard deviation from average.