Impacts of Pilot balloon (Pibal) Soundings on NAME Analyses

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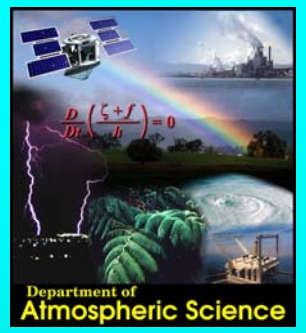
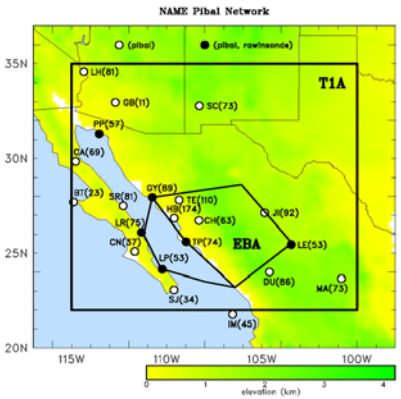
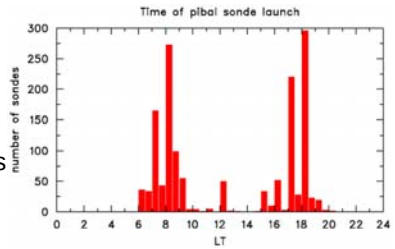


Introduction: Nested within the larger NAME observing network were 21 sites where pilot balloon observations (pibals) were made. Most sites were established temporarily for NAME. During the enhanced observing period from 1 July to 15 August 2004, ~1500 pibals (winds vs. height) were made from these sites.



Location of pibal sites during NAME (number of soundings in parentheses). Sites that are located within a few km of GPS rawinsonde sites are indicated by black dots. T1A and EBA refer to the Tier 1 and Enhanced Budgets Arrays of NAME.

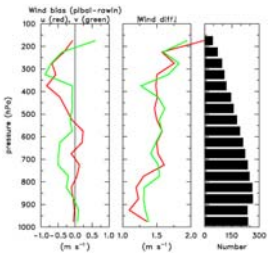
All pibals were made during daylight hours typically around 0800LT and 1800LT. Only TE and HB sites launched sondes at other daylight hours.



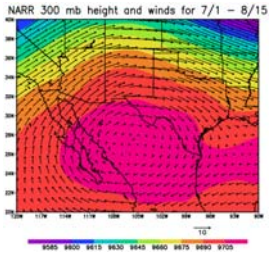
Procedure for using pibal data

The pibals were quality controlled and each pibal observation was assigned a pressure level using the height/pressure relationships from the special North American Regional Reanalysis (NARR) for NAME. This allows us to incorporate the pibal data into the CSU objective analyses which are computed on pressure levels.

Intercomparison statistics for 280 contemporaneous (within 2 h) pibal and rawinsonde launches at six sites (see map to left). Wind biases are < 0.5 m/s below 400 hPa. Negative biases at upper levels are due primarily to pibals reporting southwesterlies too weak in the northwest quadrant of upper-level anticyclone (see figure below and GY wind differences above 7 km to right). Wind differences increase slightly with height from ~1.25 m/s at low levels to ~2 m/s at upper-level.

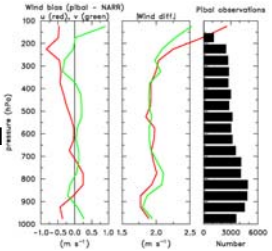


•Small wind biases and differences indicate general reliability of pibal winds.



NARR 300 hPa height and wind analysis for 1 July to 15 August 2004 showing upper-level anticyclone over northern Mexico with southwesterly flow in its northwest quadrant.

Intercomparison statistics for all 1510 pibals and interpolated (in space and time) NARR wind profiles. While wind biases are similar to comparison above, wind differences (~2 m/s at most levels) are larger, suggesting potential for impact of pibal data on analyses.



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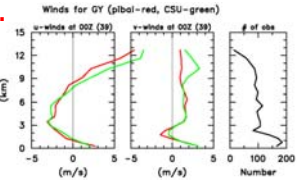
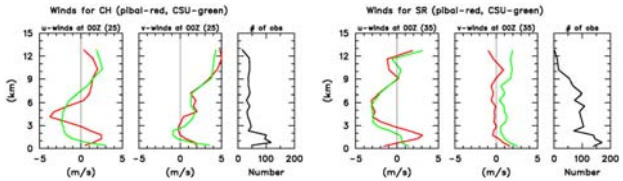
Comparison of late afternoon (*00Z*-mean) pibal *u* and *v*-component winds to interpolated (in space and time) CSU objectively analyzed winds based solely on rawinsonde data.

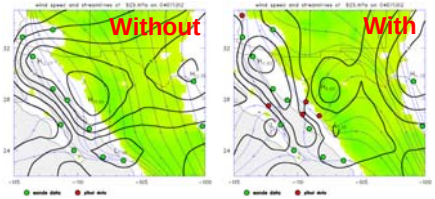


At GY differences are small (especially below 7 km) since CSU analysis incorporated GY radiosondes.

At sites with no rawinsonde data, winds differences are substantially larger, indicating positive impact that pibal data will have on the analyses . For example **at CH (left panel below),** CSU analysis is unable to resolve westerly flow below 3 km and easterly jet near 4 km, and **at SR (right panel below),** CSU analysis does not capture low-level sea-breeze circulation.



Example of analyzed 925 hPa flow without and with pibal data for 13 July 2004 surge event.



Streamlines (blue lines) and wind speed (black contours); area below ground is shaded green.

With pibal data, analysis shows that the low-level jet is confined to over the gulf and adjacent coastal plains with weak westerly flow in the lee of the SMO.

Conclusions: Use of pibal winds will provide an improved analysis of the complex circulation patterns over the NAME domain.