Expendable Bathythermograph Fall Rate Equation

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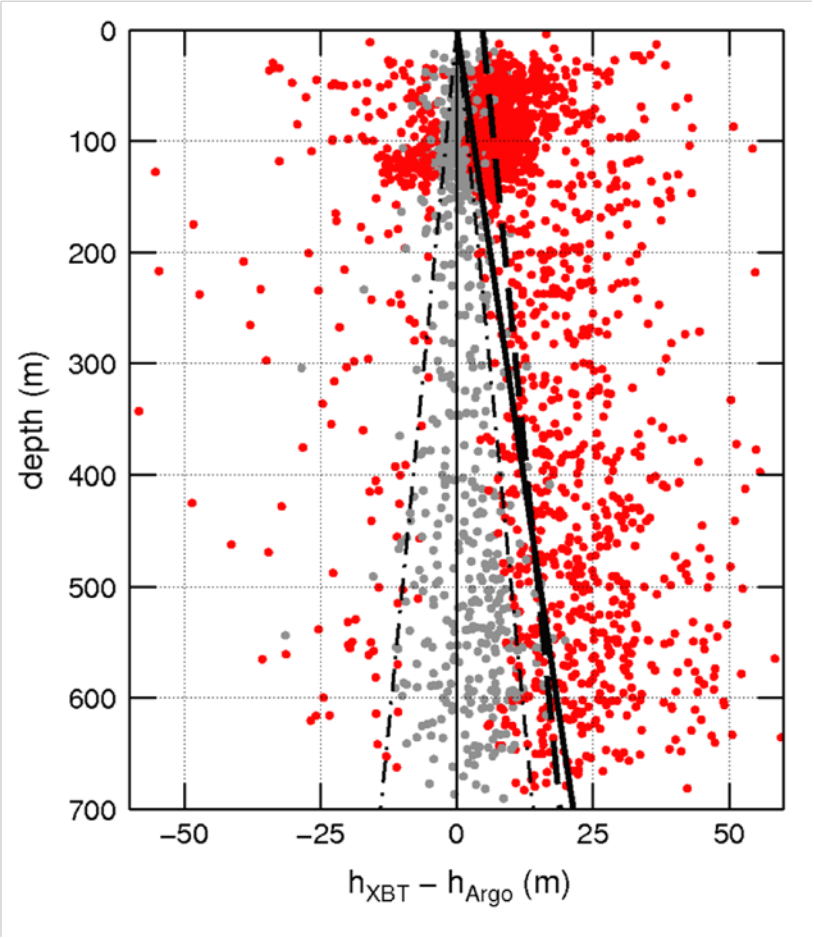
Analyses of concurrent Expendable Bathythermograph (XBT), Conductivity, Temperature, and Depth (CTD) and Argo float observations are being carried out, to systematic differences in temperature to assess profiles, which is likely due to an error in the XBT fall-rate equation. This error has introduced a warm bias in the global XBT data base. AOML is participating with the international community to evaluate these biases. Results obtained from this and other studies indicated that new coefficients the XBT fall rate equation may need to be used. A methodology was developed at AOML to identify and estimate systematic biases between XBT and Argo observations using satellite altimetry. Pseudo-climatological fields of isotherm depths are computed by least squares adjustment of in–situ XBT and Argo data to altimetry–derived sea height anomaly (SHA) data. In regions where the correlations between isotherm depth and SHA are high, this method reduces sampling biases in the *in-situ* observations by taking advantage of the high temporal and spatial resolution of satellite observations. The increase in XBT minus Argo differences with depth is consistent with known problems in the XBT fall rate equation. Least-squares fit of the depth-dependent XBT minus Argo differences suggests a global 3% bias in the XBT depths with respect to Argo. The depth-dependent 3% error is robust among the different ocean basins confirming that the terminal velocity is a problem in the XBT instruments.



Scatter plot of the differences between the pseudo-climatological isotherm depth estimates as a function of depth for the global ocean. The depth axis corresponds to the pseudo-climatological isotherm depth derived from Argo. Positive $h_{XBT} - h_{Argo}$ differences indicate that the XBT estimates result in deeper isotherms for the period 2000–2007. Red dots correspond to significant biases, while gray dots to not significant biases.