Basin patterns of the upper ocean warming for 1993-2008

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Previous studies (Lyman et al., 2010) showed the robust warming signal of the global upper ocean (0-700m). They examined several sources of uncertainty that contribute to differences among heat content estimations focusing on the XBT correction. However, their focus is only limited in the globally averaged estimation. Here we present the spatial pattern of the global heat content change. We also revisit the remaining issues for the global heat content patterns (e.g., sudden jump during the data transition periods from XBT to Argo observation and the contribution of deep ocean warming to the upper ocean heat contents). In addition, we present the preliminary results regarding the impact of XBTs on the GFDL's ensemble coupled data assimilation system.