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The ECCO Consortium: Analysis of intraseasonal mixed layer processes in the tropics with relevance to DYNAMO

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The Madden Julian Oscillation (MJO), the dominant feature of 35-95 day variability in the tropics, affects climate variability such as ENSO and synoptic events such as tropical cyclones. MJO activity is difficult to predict and poorly represented in most climate models. Understanding the MJO requires knowledge of ocean mixed layer (ML) heat budgets. As part of a model-data intercomparison currently underway to support the Dynamics of the MJO (DYNAMO) project (a US branch of the CINDY2011 international field program), we perform ML heat budget calculations using a heat-conserving product from the Estimating the Circulation and Climate of the Ocean (ECCO) project to study the onset and evolution of MJO-scale anomalies in different locations in tropics. For example, we find that during a 'typical' MJO-scale MLT event in the central equatorial basin, both surface heat flux and upwelling processes play vital roles, but the upwelling contribution is larger. This result conflicts with some studies based on sparse in situ data, but is qualitatively consistent with others based on models or satellite observations. It also supports the hypothesis that a 1-D/slab ocean model is insufficient for accurate MJO simulation. This work has implications for understanding MJO onset, development, associated air-sea interactions and cross-equatorial heat transport, and, it is likely to be important in constructing a predictive index for MJO onset. We present budgets in context with the atmospheric and oceanic circulations, as well as the ML and barrier layer depths.