The role of wind gusts in upper ocean diurnal variability.

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Upper ocean processes play a key role in air-sea coupling, with variability on both short and long timescales. The diurnal cycle associated with diurnal solar insolation and night-time cooling, may act, along with stochastic wind variability, on upper ocean temperatures and stratification resulting in a diurnal warm layer and a nonlinear rectified effect on longer timescales.

This study describes diurnal changes in temperature in the upper 10 m of the water column for a location in the equatorial Indian Ocean, using observations from the Dynamics of the Madden-Julian Oscillation field campaign, a high vertical resolution 1-D process model, and a diurnal cycling scheme *[Large and Caron, 2015]*. Solar forcing is the main driver of diurnal variability in ocean temperature and stratification. Yet wind gusts regulate how fast the solar radiation warmed water is mixed to greater depths in time. Wind gusts are much stronger than diurnal winds. Even using no diurnal winds and stochastic wind gusts as input in a 1-D process model yields an estimate of diurnal temperature that compares well with observations.

A new version of the *Large and Caron [2015]* parameterization scheme (LC2015) provides an estimate of upper ocean diurnal temperature that is consistent with observations. LC2015 has the advantage of being suitable for implementation in a climate model, with the goal to improve SST estimates, hence the simulated heat flux at the air-sea interface. Yet LC2015 is not very sensitive to the inclusion or omission of the high-frequency component of the wind.

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