Atmospheric Boundary Layer Responses to Diurnal Variations in Sea Surface Temperature in an NWP model



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Objectives of This Study

- 1. Effect of diurnal SST (dSST) gradients on the atmospheric processes on the short-term time scales?
 - What are the changes in surface heat fluxes, moisture, and convection in the presence of diurnal warming?
- 2. Are winds and diurnal SST linked on diurnal time scales and/or similar in physical response to more stationary SST gradients?
- 3. What is the role/importance of coupled wind changes to the latter evolution of the diurnal cycle of SSTs?



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IOVWST Meeting, Sapporo, Japan



- Computed trajectory based only on surface movement by local wind at each hour
- Focus on specific trajectories moving across diurnal warming (cold to warm SST)



One-way vs Two-Way Coupling





On average, wind and/or atmospheric • feedbacks reduce the duration and amplitude of diurnal warming

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Conclusions

- Simulations with diurnal variability in SST have modified air temperature, pressure, and nearsurface winds, storm track of nearby systems
- Not necessarily restricted to boundary layer (atmospheric stability-dependent)
- Diurnal coupling of winds difficult to isolate
- See changes to wind structure in boundary layer
- Two-way coupling is important for evolution of SST and winds

Momentum Budget



- Computed trajectory based only on surface movement by local wind at each hour
- Focus on specific trajectories moving across diurnal warming (cold to warm SST)
- Compute momentum budget terms in natural coordinates (O'Neil et al., 2010; Kilpatrick et al., 2014) for the boundary layer



