Geophysical Research Abstracts
Vol. 20, EGU2018-18673, 2018
EGU General Assembly 2018

Validation of Air-Sea Coupling Through Physics Remote Sensing

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The parameterization of surface stress in two-way coupled models, where changes in the ocean impact the atmosphere and vice versa, has been extremely difficult to verify. Prior to this work, it has been unclear what physical considerations where required in an ocean surface stress parameterization. We also show that the model's relationship between ocean surface stress and the sea surface temperature (SST) gradient in western boundary currents is highly sensitive to the physics considered in this parameterization and to the surface current. This coupling of SSTs and winds has been observed and can be used to assess the model's stress parameterization. Considering ocean currents in simple stress parameterizations has been found to cause unrealistically low production of oceanic eddy kinetic energy. Relative to observations, our diagnostic for the model shows an unrealistically weak coupling between winds and SST. We show that also considering the dependency on sea state appears to resolve this problem, producing realistic eddy kinetic energy input and coupling of SST and winds that is much more consistent with observations. Interestingly, the surface current plays a very large role in this coupling. Therefore, it is possible to utilize remotely sensed winds and sea surface temperature evaluate the realism of the surface stress and currents in the coupled model.