**A New Technique for Simultaneous Observations of Observations of Winds and Stress for Mesoscale and Larger Observations**

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| The air-sea interface is a critical link in the Earth’s climate system; incomplete knowledge of the dynamics at this interface causes significant errors in the representation of horizontal and vertical mass and heat transports in the upper ocean, and limits the accuracy of climate and seasonal forecast models. Global surface currents are the most important and least directly observed ocean currents. The global relation between the surface wind and the speed and direction of wind-driven surface currents is unknown and unobserved.Errors in near-surface currents have important implications for vertical and horizontal transports of upper-ocean heat. The lack of understanding of surface currents and their relation to surface winds limits our ability to predict phenomena and processes as: meridional and zonal tropical heat transport; equatorial currents and upwelling; ENSO and MJO dynamics; tropical eastern Pacific and Atlantic sea-surface temperature and air-sea interaction, as well as dispersal of pollutants and floating marine debris. Both ENSO and the MJO influence the likelihood of hurricanes forming. Hurricanes can have a large impact on property and infrastructure. ENSO has a large impact on interannual shifts in weather and hence large impacts on agriculture as well as aquaculture. Variability in ocean currents impacts fisheries, pollutant transport, and the transport of ice and melt water in high latitudes. These Arctic wind and currents strongly influence the vertical and horizontal heat transport in the Arctic Seas, and have been hypothesized to influence similar transports in the North Atlantic Ocean. While satellite altimetry offers global estimates of geostrophic current, surface currents include a large ageostrophic component (especially in climatically important equatorial oceans), and have never been observed globally from space. New technology exists (space-based microwave Doppler radar scatterometry) to address this fundamental gap in the global ocean-atmosphere observing system. This new technology offers the first opportunity to obtain the contemporaneous collocated global observations of surface winds (or stress) and surface currents that are required to address these basic Earth science questions. |