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On the First Observed Wave-induced Stress over the Global Ocean

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Despite many investigations/studies on the surface wave-induced stress, the global feature of the wave-induced stress has not been obtained previously as that requires a simultaneous observation of wave spectra and wind on a global scale. The China France Oceanography Satellite (CFOSAT) provided an opportunity for the first time to evaluate the global wave-induced stress and its contribution to the total wind stress. In this study, the global spatial distributions of wave-induced stress and its correlated index for August to November in 2019 are presented using the simultaneous ocean surface winds and wave spectra from the CFOSAT. The main results show that the wave-induced stress is fundamentally dependent on the wind and wave fields on a global scale and shows significant temporal and spatial variations. Further analyses indicate that there is an upward momentum flux under strong swells and low wind speeds (below approximately 5 m/s), and an anti-correlation between the dimensionless wave-induced stress and the proportion of swell energy to the total. Finally, the variations of the surface wave induced wind stress are clear asymmetric between northern and southern hemispheres in late summer but symmetric in late fall, which are closely associated with the seasonal changes in large-scale atmospheric circulation.