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Development of GMF for wind speed and wind stress retrieval in hurricanes basing on collocated date from Sentinel-1 satellite and NOAA GPS dropsondes

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Active remote sensing with the instruments placed on board of the spacecraft is the most important modern method of obtaining operational information about the geophysical parameters of the ocean and atmosphere. Basing on preliminary data processing, the dependencies of the cross-polarized NRCS on the wind speed and wind friction velocity were obtained for constructing the GMFs.In traditional GMFs, the microwave NRCS of the water surface is expressed by the wind velocity and they are designed for retrieval U10. However, the correlation between the NRCS of the water surface with the the wind turbulent tangential stress (or friction velocity u*) is stronger than with the wind speed. It is quite natural, because the return signal is formed by scattering at the rough sea surface determined principally by tangential stress. The problem of increasing the accuracy of hurricane wind speed retrieval was recently solved on the basis of methods using the technology of the scattered de-pol signal registration, which under these conditions has a high sensitivity to wind speed. There are no similar ground-based measurements of NRSC and turbulent surface tension. This work is the first attempt to fill this gap.
Using the field measurements, we were able to collocate the date from the dropsondes and the cross-polarized SAR images of hurricanes from the Sentinel-1.The analysis of data from the satellite Sentinel-1 revealed that the eye of a hurricane was registered for several hurricanes of this season in the Atlantic basin.Wind speed profiles for hurricanes Irma 2017/09/07, Maria 2017/09/21 and 2017/09/23, measured at a time close to the time of receiving satellite SAR images were used to calibrate both the wind speed and dynamic speed. This made it possible to construct a geophysical model function, which is the dependence of NRCS on the dynamic velocity of the wind flow.

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