The retrieval of the NRCS dependence on the wind speed and other parameters of the atmospheric boundary layer is an important problem of remote sensing. Such dependencies are used to construct geophysical model functions (GMF), allowing to restore the wind speed $U_{10}$ from remote sensing data. However, there is a problem associated with the saturation of the scattered co-polarized microwave signal at high wind speeds, which is solved by using cross-polarized signal receiver. To construct these dependences, it is necessary to calibrate satellite data for field measurements. However, the collocation of remote sensing data and sub-satellite measurements is difficult due to the small amount of data. In this work, we use SFMR data, the main advantage of which is a large data set and its compatibility with the measurement from GPS-dropsondes.

**Calibration of emissivity on wind friction velocity obtained from GPS-dropsondes**

It can be seen that the shape of the hurricane changes only slightly during the day, which means that the correct combination of satellite data and data from SFMR can be carried out. The preservation of the shape of the hurricane while strictly controlled. Optical images were made by geostationary satellite GOES-13.

**Example of the wind speed profile, measured by GPS-dropsonde**

**SFMR provides surface wind speed at a height of 10 m**

**Obtaining wind friction velocity and $U_{10}$**

- Logarithmic part
- "wake" part
- Boundary layer parameters in a hurricane derived from approximation

**Sentinel-1 acquisition modes**

- **IWS mode**
  - Polarization: VH, HV
  - Resolution: 10 m
  - Incidence angle range: 20° - 40°
  - Central frequency: 5.405 GHz

**Examples of hurricane eye images for which a combination SAR and SFMR data was performed:**

(a) Hurricane Irma 2017/09/06 18:15UTC
(b) Hurricane Irma 2017/09/06 16:15UTC

**Conclusion**

In our recent studies, SAR images from the Sentinel-1 satellite were combined with field data from NOAA GPS-dropsondes in hurricane conditions. Dependencies of NRCS on wind speed and wind friction velocity were constructed. However, in 2016-2017, only 3 SAR images were found, which became the motivation to supplement the data ensemble using SFMR measurements. The radiometric measurements of the emissivity were calibrated to the wind friction velocity estimated from vertical wind speed profiles. Using the assumption that the hurricane is quasistationary during the day, the SFMR data and SAR data of the Sentinel-1 satellite were combined.