EMS Annual Meeting Abstracts
Vol. 13, EMS2016-34-1, 2016
16th EMS / 11th ECAC

Assessing the quality of Synthetic Aperture Radar (SAR) wind retrieval in coastal zones using multiple Lidars

Tobias Ahsbahs, Ioanna Karagali, Xiaoli Guo Larsén, and Merete Badger
Wind Energy, Technical University of Denmark (DTU)

Remote sensing methods are promising towards understanding horizontal coastal wind profiles. They compensate scarce measurement and expensive met mast data by introducing higher spatial resolution and thereby help understanding the transition between the ABL over land and water.

DTU continuously retrieves offshore wind data from SAR over Europe using standardized products. An advantage of SAR is the increasing publically available database from the European Space Agency without need for deployment of expensive equipment.

The performance of Geophysical Model Functions (GMF) used for wind retrieval in the coastal zone is unknown because they are validated in offshore conditions and therefore exclude influences from e.g. shallow water or developing MBL during offshore wind. We retrieved wind speeds from more than 90 SAR images from Sentinel-1 and TerraSAR-X and compared them to ground truth measurements from multiple Lidar systems on the Danish West Coast. The Lidar data includes coordinated sector scans, profilers onshore and offshore, and a virtual met mast measuring the wind with high temporal and spatial resolution up to 8 km offshore.

We investigate the performance of SAR winds in the coastal zone using single cases to map parameters influencing the accuracy. We assess the quality of routine SAR wind maps in the coastal zone by comparing results using routine wind direction inputs as well as high resolution WRF runs and Lidar measurements for the GMF. Further, we expect the wind direction itself (e.g. onshore and offshore) to be of major importance for the SAR wind retrieval because: 1) The sea state is related to the fetch. 2) Coastal winds are influenced by changes of land/sea thermal conditions.

We will conclude on the validity of SAR wind retrievals in coastal zones and indicate major sources for uncertainty.