

SEA SURFACE WAKES OBSERVED BY SPACEBORNE SAR IN THE OFFSHORE WIND FARMS

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ABSTRACT:

The fast development of offshore wind farms have drawn increasing attention to monitoring the offshore wind turbine wakes, which are of significant importance on improving layout of large offshore wind farms, prediction of accurate output power, and safety operation of wind turbines. Spaceborne synthetic aperture radar shows its unique advantages of observing the offshore wind turbine wakes due to high spatial resolution and large coverage. Since the launch of RADARSAT-2, TerraSAR-X and Cosmo-SkyMed in 2007, the new generation spaceborne SAR in high spatial resolution up to 1 m offers a unique advantage to investigate the fine structures of oceanic and atmospheric phenomena occurred in the air-sea interface. In the paper, we present some TerraSAR-X images acquired at the offshore wind farms in the North Sea and the East China Sea. The high spatial resolution SAR images show different sea surface wake patterns downstream of the offshore wind turbines. The analysis suggests that there are major two types of wakes among the observed cases. The wind turbine wakes generated by movement of wind around wind turbines are the most often observed cases. In contrast, due to the strong local tidal currents in the near shore wind farm sites, the tidal current wakes induced by tidal current impinging on the wind turbine piles are also observed in the high spatial resolution TS-X images. The discrimination of the two types of wakes observed in the offshore wind farms is also described in the paper.

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