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星载SAR遥感图像反演海洋大气边界层高度

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Marine atmospheric boundary layer depth retrieval by SAR in China Sea

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摘要

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摘要 本研究将边界层相似理论与对流理论应用到具有海洋大气边界层(Marine Atmospheric Boundary Layer, MABL)对流特征的星载合成孔径雷达(Synthetic Aperture Radar, SAR)遥感图像,探讨了星载SAR遥感图像描述海气应力作用下水平扰动尺度变化的潜在可能性.针对具有三维对流涡旋Cell和二维水平滚轴涡旋Roll特征的星载SAR遥感图像,反演了中国海海域MABL高度,并与同步实验获取的MABL高度结果进行对比.结果表明,利用具有对流特征的星载SAR遥感图像反演MABL高度是可行的,展示了以高分辨率、大面积观测为特点的星载SAR遥感图像探测MABL的广阔前景.

关键词 SAR, 海洋大气边界层, 相似理论, 对流理论

Abstract: The marine atmospheric boundary layer is the part of the atmospheric that has direct contact and, hence, is directly influenced by the ocean. Thus, at the marine atmospheric boundary layer is where the ocean and atmospheric exchange primarily via convective turbulent transport. Associated with these convective atmospheric phenomena is a varying sea surface wind field which modulated the short-scale sea surface roughness, and thus the kilometer-scale convective atmospheric phenomena, such as the three dimensional atmospheric convective cells and two dimensional convective rolls over the ocean, affect the sea surface roughness and thus become detectable by Synthetic Aperture Radar (SAR). In this study, the boundary layer similarity theories and the convective theories are applied to the SAR images with the convective characteristic of the marine atmospheric boundary layer, and the probability of getting the turbulent-scale horizontal variability in air-sea stress by SAR image is discussed. The depths of the marine atmospheric boundary layer could be retrieved by SAR image with three dimensional convective cells and two dimensional convective rolls, and both were compared to the depth retrieved by Lidar and potential temperature result from weather station. The results show that the method of marine atmospheric boundary layer depth retrieved by SAR image is feasible, and SAR image combining with Lidar and weather information will have bright future in the area of detecting the marine atmospheric boundary layer.

Keywords SAR, MABL, Similarity theory, Convective theory

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