1. Record Nr. TD18048002

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| Autore | POLVERARI, FEDERICA |
| Titolo | Theoretical modeling of dual-frequency scatterometer response: improving ocean wind and rainfall effects [Tesi di dottorato] |
| Lingua di pubblicazione | Inglese |
| Formato | Tesi di dottorato |
| Livello bibliografico | Monografia |
| Note | diritti: info:eu-repo/semantics/openAccess<br>In relazione con info:eu-repo/semantics/altIdentifier/hdl/11573/950031 |
| Sommario | Ocean surface wind is a key parameter of the Earth's climate system. Occurring at the interface between the ocean and the atmosphere, ocean winds modulate fluxes of heat, moisture and gas exchanges. They reflect the lower branch of the atmospheric circulation and represent a major driver of the ocean circulation. Studying the long-term trends and variability of the ocean surface winds is of key importance in our effort to understand the Earth's climate system and the causes of its changes. More than three decades of surface wind data are available from spaceborne scatterometer/radiometer missions and there is an ongoing effort to inter-calibrate all these measurements with the aim of building a complete and continuous picture of the ocean wind variability. Currently, spaceborne scatterometer wind retrievals are obtained by inversion algorithms of empirical Geophysical Model Functions (GMFs), which represent the relationship between ocean surface backscattering coefficient and the wind parameters. However, by being measurement-dependent, the GMFs are sensor-specific and, in addition, they may be not properly defined in all weather conditions. This may reduce the accuracy of the wind retrievals in presence of rain and it may also lead to inconsistencies amongst winds retrieved by different sensors. Theoretical models of ocean backscatter have the big potential of |

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| | providing a more general and understandable relation between the measured microwave backscatter and the surface wind field than empirical models. Therefore, the goal of our research is to understand and address the limitations of the theoretical modeling, in order to propose a new strategy towards the definition of a unified theoretical model able to account for the effects of both wind and rain. In this work, it is described our approach to improve the theoretical modeling of the ocean response, starting from the Ku-band (13.4 GHz) frequency and then broadening the analysis at C-band (5.3 GHz) frequency. This research has revealed the need for new understanding of the frequency-dependent modeling of the surface backscatter in response to the wind-forced surface wave spectrum. Moreover, our ocean wave spectrum modification introduced to include the influences of the surface rain, allows the interpretation/investigation of the scatterometer observations in terms not only of the surface winds but also of the surface rain, defining an additional step needed to improve the wind retrievals algorithms as well as the possibility to jointly estimate wind and rain from scatterometer observations. |
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