

Clear-Sky Turbulence and Shallow Convection: New Insights Combining SAR Images, Satellite Brightness Temperature and In-Situ Measurements

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Studying the marine atmospheric boundary layer (MABL) processes at play to organize cloudiness through satellite products is challenging. Here, we propose an innovative approach to investigate the MABL dynamical structures by combining spaceborne Synthetic Aperture Radar (SAR) images, and brightness temperature measurements from the Geostationary Operational Environmental Satellite (GOES).

The intensive EUREC4A field campaign that took place over the Western Tropical Atlantic Ocean, in Jan-Feb 2020, provides a relevant context with reference in situ measurements co-localized with the spaceborne measurements. Focusing on February 13th, 2020. Two types of atmospheric processes are investigated : convective rolls in clear sky regions and cold pools characterizing the convective activity areas.

In a first step, the hypothesis of a sea surface roughness signature of atmospheric coherent structures in the SAR images has been validated with respect to the turbulence measurements of the ATR-42 aircraft. In a second step, the cold pools have been detected within the SAR image using object identification method. Cold pool characteristics such the size, the gust front intensity can be directly derived from the SAR image while the age or the spreading rate can then be estimated with respect to the cloud field temporal evolution provided by the GOES data.

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