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Aerosol characterization in an oceanic context around Reunion island (AEROMARINE field campaign)

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We present the results of the AEROMARINE field campaign which took place in the boreal spring 2019 off the coast of Reunion island in the South West Indian Ocean basin. The southern Indian Ocean is of major interest for the study of marine aerosols, their distribution and variability [1]. Nine instrumented light plane flights and a ground-based microwave radiometer were used during the AEROMARINE field campaign. These measurements were compared with the long-term measurements of the AERONET sun-photometer (based in Saint Denis, Reunion Island) and various instruments of the high altitude Maito Observatory (2200m above sea level, Reunion island). These results were analyzed using different model outputs: (i) the AROME mesoscale weather forecast model to work on the thermodynamics of the boundary layer, (ii) the FLEXPART-AROME Lagrangian particle dispersion model to assess the geographical and vertical origin of air masses, and (iii) the chemical transport model CAMS (Copernicus Atmosphere Monitoring Service) to work on the aerosol chemical composition of air masses. These measurements allowed us to determine the background concentration of natural marine aerosols and to highlight that (1) the atmospheric layers above 1500m are in the free troposphere and are mainly composed of aerosols from the regional background and (2) that the local environment (ocean or island) has little impact on the measured concentrations. Marine aerosols emitted locally are mostly measured in the lower atmospheric layers (below 500m). The daytime marine aerosol distributions in the free troposphere measured by the aircraft were compared to the aerosol distribution measured at the high altitude Maito observatory at night when the observatory is located in the free troposphere. We also found that the CAMS reanalyses overestimated the aerosol optical depth in this region. Finally, our study confirms, with no ambiguity, that the AERONET station in Saint Denis (Reunion island) can be considered as a representative marine station in the tropics [2].

References

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