

EGU21-1243

<https://doi.org/10.5194/egusphere-egu21-1243>

EGU General Assembly 2021

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Variability of the atmospheric electric field in the South Atlantic marine boundary layer from the SAIL campaign

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The marine boundary layer offers a unique opportunity to investigate the electrical properties of the atmosphere, as the effect of natural radioactivity in driving near surface ionization is significantly reduced over the ocean, and the concentration of aerosols is also typically lower than over land. This work addresses the temporal variability of the atmospheric electric field in the South Atlantic marine boundary layer based on measurements from the SAIL (Space-Atmosphere-Ocean Interactions in the marine boundary Layer) project. The SAIL monitoring campaign took place on board the Portuguese navy tall ship NRP Sagres during its circumnavigation expedition in 2020. Two identical field mills (CS110, Campbell Scientific) were installed on the same mast but at different heights (about 5 and 22 meters), recording the atmospheric electric field every 1-second. Hourly averages of the atmospheric electric field are analyzed for the ship's leg from 3rd to 25th March, between Buenos Aires (South America) and Cape Town (South Africa). The median daily curve of the electric field has a shape compatible with the Carnegie curve, but significant variability is found in the daily pattern of individual days, with only about 30% of the days exhibiting a diurnal pattern consistent with the Carnegie curve.