

EGU21-6314

<https://doi.org/10.5194/egusphere-egu21-6314>

EGU General Assembly 2021

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## Remotely-controlled ice-nucleating particle measurements from the Eastern North Atlantic during autumn and winter

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Ice-nucleating particles (INPs) are aerosol particles that catalyze the heterogeneous formation of ice crystals under ice supersaturation conditions. These INPs can change cloud characteristics on wide spatiotemporal scales, including albedo and radiative effects, as well as precipitation types and amounts, thus affecting both weather and climate. However, INP measurements with reasonable temporal resolution have been challenging in terms of both technology and logistics in our research community. Here we present preliminary results of our recent six-month effort from the Eastern North Atlantic (ENA) field campaign to advance the research and explore remote operation of the plug-and-play Portable Ice Nucleation Experiment (PINE) chamber to semi-autonomously measure marine boundary layer INP concentrations. In this campaign we deployed our PINE chamber at the U.S. Department of Energy Atmospheric Radiation Measurement (DOE ARM) ENA site on Graciosa Island, Azores (39° 5' 29.76" N, 28° 1' 32.52" W). The PINE chamber has been continuously operated since October 2020 with supervision and periodic remote maintenance by scientists in West Texas. The INP measurements were conducted at mixed-phase cloud conditions at temperatures between -14°C and -33°C. These measurements, along with other aerosol particle and meteorological measurements made by a suite of instruments collocated at the DOE ARM site, give unique insights on the response of INP concentrations to local and mesoscale dynamics and thermodynamic processes. This study provides the first remote and continuous INP measurements over two meteorological seasons made in the ENA region within the marine boundary layer, giving insights into an area with prominent marine influences on aerosol populations. Graciosa Island is a small island (only 61 km<sup>2</sup>) surrounded by oligotrophic oceans, and these measurements were made during the most biologically productive time of year for phytoplankton in the surrounding ocean waters. The long-term and continuous nature of these measurements allows a unique comparison of marine biological productivity, using satellite-derived chlorophyll a as a proxy for biomass, and INP concentrations. The median INP concentrations at -25 °C and -30 °C were around 4 INP L<sup>-1</sup> and 27 INP L<sup>-1</sup> respectively. Our preliminary data suggest that INP concentrations measured by the PINE chamber at the ENA site are comparable to other studies at locations with primarily marine INPs. More details will be offered in our presentation.