



## How preindustrial-like is the Southern Ocean aerosol?

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To date, the largest uncertainty of anthropogenic radiative forcing (RF) results from aerosol radiation and aerosol cloud interactions. This is largely due to the fact that the preindustrial baseline conditions are not well defined. Hence, knowledge of preindustrial aerosol properties is necessary to understand present-day anthropogenic RF through changes in aerosol populations and their interactions with clouds.

Acquiring preindustrial aerosol knowledge is challenging because today human influence on aerosol properties is almost ubiquitous and environmental change has partly altered natural aerosol and their precursor emissions. Nevertheless, a small number of locations have been identified through modeling studies that can represent preindustrial-like aerosol and aerosol-cloud interactions. The Southern Ocean (SO) has been highlighted as the largest region that still hosts preindustrial-like aerosols under certain conditions.

In this contribution, we discuss observations from the Antarctic Circumnavigation Expedition: Study of Preindustrial-like Aerosols and their Climate Effects (ACE-SPACE) that were conducted in-situ on a research vessel travelling from South Africa via Tasmania and South America back to South Africa between December 2016 and March 2017. We present results of aerosol properties such as number concentrations, size distributions, cloud condensation nuclei number concentrations and chemical composition. In addition, we focus our discussion on how representative the present-day observations can be of preindustrial conditions. We will show how far anthropogenic influence on air masses reaches into the SO by using tracers such as black carbon. Furthermore, we discuss how a number of environmental changes, e.g., strengthening westerly winds, ocean freshening, increased sea surface temperature and changes in microbial populations might have changed natural aerosol characteristics between preindustrial times and the present-day.