



Human Activity and Pollution in Antarctica

H.-F. Graf (1), S.V. Shirsat (), and R. Podzun (2)

(1) University Cambridge, Geography, Cambridge, United Kingdom (hfg21@cam.ac.uk), (2) Max-Planck-Institute for Meteorology, Hamburg, Germany

A regional climate chemistry model is used to determine the level of pollution of the Antarctic continent due to anthropogenic and natural emission of sulphur species. Based on an emission inventory for the year 2004/2005 including emissions from energy use and ground traffic at and between Antarctic research stations, flight activity, tourist and scientific ship operations, and emissions from the Mt. Erebus volcano, atmospheric concentration and deposition rates of sulphur species and black carbon were simulated at 0.5 degree resolution for the whole Antarctic continent. The biggest anthropogenic source of pollution is ship operations. These concentrate near the Antarctic Peninsula and close to the big scientific stations at Queen Maud Land and in the Ross sea area. The prevailing winds guarantee that most of the anthropogenic emissions from sources near the coast will be blown to lower latitudes and do not affect the continent. While atmospheric concentrations over vast areas remain extremely low, in some places locally concentrations and deposition rates are reached that may be detectable by in-situ measurements and give rise to concern. Especially at the Peninsula atmospheric concentrations and surface deposition of sulphur and soot are dominated by ship emissions. The largest part of shipping activity in this region is from tourist ships, a strongly increasing business. The by far biggest source of sulphur species in Antarctica is the Mt. Erebus volcano. It is also the only source that remains equally strong in polar winter. However, due to its high altitude and the long life time of SO₂, especially in winter resulting in long range transport and dilution, Erebus emissions contribute relatively little to deposition of sulphur in the most anthropogenic polluted areas while they dominate the sulphur deposition in central Antarctica.