

# 14-month isolation in Antarctica: research experience in a space-analogue environment

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## Abstract

The German research station Neumayer III is located at 70° 40' S, 8° 16' W on Ekström ice shelf in Antarctica. Analogue to the space the station's environment is very hostile with temperatures below -50°C and wind speeds above 150 km/h. As natural space-analogue environment it is used to test and perform space applications. Neumayer III is operated year-round by scientists and engineers who stay for 14 month at the station, in particular nine months in complete isolation and three months in darkness.

In this paper a review of the first author as an atmosphere scientist and crew member during the latest mission that ended in February 2019 is presented.

Focuses are:

- the personal experience as scientist in 14 month isolation

- scientific field results of atmospheric long-term measurements.

As a part of the 10-member overwintering crew the first author was facing not only the safety procedure and social issue of a space-analogue isolation, but also deep medical and psychological studies with space application (e.g. neurophysiological, psychological and human factors space research medical programme).

As a physicist he investigates the variability of the atmosphere. The time series of the surface air temperature from 1982 to 2018 is presented. A trend analysis reveals neither a significant cooling nor a significant warming at Neumayer station. Since 1992 upper air ozone soundings with weather balloons are conducted on a regular basis with electrochemical concentration cells. For the year 2018 the temporal evolution of the ozone partial pressure from the surface up to an height of 35 km is shown, additionally to the time series of total ozone column during the yearly ozone hole from 1992 to 2018. The whole meteorological observatory of Neumayer Station is integrated in many international networks like the Global Climate Observing System by the World Meteorological Organization and the Network for the Detection of Atmospheric Composition Change. The meteorological observatory has current ambitions to also become part of the GCOS Reference Upper Air Network (GRUAN). In specific the meteorological observatory contributes important data sets of several essential climate variables for satellite validations.