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Comparative analysis of measurements of stratospheric aerosol by lidar and aerosol sonde above Ny-Ålesund in the winter of 1995 [Comparative analysis of lidar and OPC observations]

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Solid polar stratospheric cloud (PSC) layers observed by lidar and a balloon-borne optical particle counter (OPC) on 17 December 1995 are reexamined in a comparative analysis framework. The typical radius of solid particles in the observed PSC is determined through the comparative analysis to have been approximately 2.3 μ m. A backward trajectory analysis for the air mass in which the solid particles were observed shows that the air mass had experienced temperatures 2–3 K below the frost point of nitric acid tri-hydrate (NAT) during the 4 days preceding the observations. The back-trajectory analysis traces the air mass back to northern Greenland and Ellesmere Island on 16 December, one day before the observations. A microphysical box model is used to investigate possible mechanisms of formation for the observed solid particles. The results of this model suggest that the solid particles formed under mesoscale temperature fluctuations associated with mountain lee wave activity induced by the relatively high terrestrial elevations of northern Greenland and Ellesmere Island.

Dating of the Dome Fuji shallow ice core based on a record of volcanic eruptions from AD 1260 to AD 2001

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We measured the concentration of non-sea-salt sulfate (nssSO_4^{2-}) in the Dome Fuji shallow ice core (Antarctica) from the surface to 40 m depth with the aim of dating the core with reference to the record of volcanic eruptions. Three huge spikes related to large-scale volcanic eruptions were detected at depths of 12.5, 29.9, and 38.8 m, correlated to the eruptions of Tambora (AD 1815), Kuwae (AD 1452) and an unknown event (AD 1259), respectively. We identified another nine nssSO_4^{2-} spikes related to accurately dated eruption events. The shallow ice core was dated from AD 1260 to AD 2001 based on these 12 eruption events and

the assumption of constant annual snow accumulation in the periods between eruption events. The results yield a maximum correction of ~20 years compared with the dating proposed in a previous study. The annual accumulation varied within \pm ~15% of the average water equivalent value over the study period (25.5 mm).

Statistical analysis of seismicity in a wide region around the 1998 Mw 8.1 Balleny Islands earthquake in the Antarctic Plate

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A large earthquake (Mw 8.1) that occurred off the North Coast of the Antarctic continent near the Balleny Islands on 25 March 1998 was the largest intra-plate earthquake ever recorded in the Antarctic Plate. The earthquake hypocenter catalog for this area shows a marked change in seismicity following the main shock in a large area around the Balleny aftershock region. However, the earthquake catalog includes many aftershocks and is affected by a variable detection rate. To overcome these limitations, we applied statistical models and methods, including Gutenberg–Richter's magnitude frequency distribution, the Epidemic–Type Aftershock Sequences (ETAS) model, and the space–time ETAS model, thereby enabling calculation of the change in detection rate. The results show a change in the spatial pattern of background seismicity over a large region after the 1998 event.

Microtopographic properties of sparse moss vegetation in the Antarctic polar desert

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The effect of topography on moss vegetation is examined to clarify the processes that affect the colonization of polar deserts on continental Antarctica. Data on the presence of the mosses *Bryum pseudotriquetrum* and *Pottia heimii*, and relative altitude were recorded. The altitude measurements were used to infer the underlying topographical attributes of the substrate in the study plots. Specifically, the local distribution of moss plants was clarified using the topographical attributes to construct generalized linear mixed models (GLMMs). The models suggested that steep slopes and convex microhabitats within areas of concave general relief (at the plot scale 4 × 4 m) promoted the establishment of moss. This correspondence to general relief was more apparent for *B. pseudotriquetrum* than for *P. heimii*. Among the study plots, general relief was found to be an important determinant of the precise spatial distribution of *B. pseudotriquetrum*. The standard surface estimated using the robust methods presented in this study is shown to be more accurate for describing moss distribution than the prevailing least-squares method.