Antarctic volcanoes: A remote but significant hazard

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1. Introduction and objectives

4. 1 Meteorological conditions

A persistent large-scale clock-wise circulation around an upper-level low-pressure zone located close to the Pole is clearly visible at any time. The polar vortex extends up to the stratosphere, with a global-scale circulation covering latitudes from 30°N up to 90° depending on the period. At these stratospheric levels, the resulting polar jet stream is very intense (wind speeds > 50 m/s), widening notably during the winter (Figs. 3, 6) and narrowing during the summer (Fig. 3b).

At mid-tropospheric levels, the meteorological situations are characterised by a breaking of the jet stream and a pronouncement of the meanders reaching much lower latitudes.

4. Results

4.2 Long-range ash dispersal

Highest column mass load values (1-50 g/m²) are linked to the first 4h after the eruption start (Fig. 4b).

Residual small amounts of ash (1-0.1 g/m²) is still present in the atmosphere up to 8 days after the eruption event (Fig. 4b).

Ash concentrations above the flight safety threshold (0.2-2 mg/m³) can be observed south over South Africa, eastern Australia or even over Australia.

Some ash clouds re-enter the Arctic Sector. However, in most cases, ash cloud circles around the North Pole (NP) and away (CSP) the continent, i.e. leaving no substantial fallout mark on the land.

5. Discussion and Implications

Ash from lower-latitude Antarctic volcanoes is likely to encircle the globe, resulting in significant consequences for global aviation safety.

There is a need to perform a complete hazard assessment for other active Antarctic volcanoes located in West Antarctica and along the Antarctic Peninsula.

Ash fall out may also lead to important regional problems for the scientific research stations and summer field camps in the area and also to tourism-related operations in the region.

References
