

Triple surface snow isotopic composition records metamorphism

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Abstract

Water isotopic composition from ice core is a key proxy for past climate reconstructions. In particular, the longest climatic records from ice core are obtained from the low accumulation areas of the East Antarctic Plateau. Still, the low accumulation which enables long term records implies a longer exposure of the surface snow to the atmosphere, and thus, a more significant role of post-deposition processes. This limits the interpretation of isotopic composition from ice core records, specifically at short time scales.

Here, we compare series of surface snow isotopic composition from East Antarctica to grain index satellite observations, highlighting that during intense summer metamorphism events, the climatic signal in the surface snow isotopic composition is erased [1]. Still, we observe a signature of these events left in surface snow ^{17}O -excess. We compare the evolution of surface snow isotopic composition in between precipitation events to the first measurements of ^{17}O -excess in the vapour in Antarctica (following [2]) to estimate the mass balance and the associated fractionation. On the East Antarctic Plateau, these post-deposition processes, for instance blowing snow or sublimation/condensation, can have an impact to the local mass balance up to 10% of the accumulation [3]. These results provide new applications for ^{17}O -excess as a tracer of post-deposition processes in the interpretation of ice core records.

Key words

Water isotopes, excess, post-deposition, reconstruction

References

[1] Casado et al. (2016b), *The Cryosphere Discuss.*, 1-33

[2] Casado et al. (2016a), *Atmo. Chem. Phys.*, 16, 8521-8538

[3] Genthon et al (2017), *Atmo. Chem. Phys.*, 17, 691-704