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Chemical characterization of peculiar ice layers at the bottom of the EPICA-DC ice core.

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The EPICA ice core (EDC96) drilled at Dome C (75°06' S; 123°23' E; 3233 m a.s.l.), 3260 m long (logging depth), allows the reconstruction of the climatic and environmental changes for the last 9 glacial cycles. The first 3139 m of the EDC96 ice core has been analysed for a wide range of chemical, isotopic and physical parameters. In the bottom part of the ice core, some evidences recently questioned the record integrity, showing unusual peaks of some components (mainly sulphate), potentially coming from the bedrock scraping off. However, many of these spikes show also high concentration of other components, such as ^{10}Be, improbably attributable to bedrock. To clarify the nature and the source of the sulphate spikes, a detailed chemical analysis was carried out to reconstruct their ionic balance. Several sulphate spikes were chosen above and below the depth of 2800 m, when unusually sharp sulphate peaks become evident, in spite of the continuous smoothing, by diffusional processes, of apparently similar sulphate spikes originated from volcanic depositions. The selected spikes were belonging to interglacial periods at depths $<$ 2800 m, glacial periods at depths $<$ 2800 m and depths $>$ 2800 m. The profiles of the mainly probable counter-ions (H^+, Na^+, Ca^{2+}, Mg^{2+} and NH_4^+) of sulphate were plotted vs. depths, in order to point out trends in compositional differences. δD profile was also plotted to show possible climate links. Ionic balances of sulphate spikes, the different composition of ice layers containing the spikes (higher free acidity during interglacials or higher load of neutralising species - dust or sea spray particles - during glacials), the correlations between

some components in the surroundings of the spikes (unusual good correlation of sulphate with Mg and MSA), and the observed trends in the sulphate counter-ions with depth revealed a probable mechanism involving post-depositional re-arrangement of impurity via migration in the ice-crystal veins (favoured by sulphuric acidity) and precipitation at the triple junction, when concentrations reach the saturation limit. Such experimental evidences seem to exclude a bedrock scraping off contribution.