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Occurrence rate estimation of explosive volcanic events as recorded in the EPICA Dome C ice core over the last 170 ka based on high-resolution electrolytic conductivity measurements

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Explosive volcanic eruptions can emit large amounts of ash particles and gases into the atmosphere which have a significant influence on global climate. Depending on the location of the eruption and prevailing atmospheric conditions some of these events are recorded in Antarctic snow. Ice cores provide therefore useful time series of explosive volcanic events. Here we present an occurrence rate estimation based on the EPICA Dome C ice core over the last 170 ka. For that we used high-resolution electrolytic conductivity (σ) measurements obtained from continuous flow analysis (CFA) on continuously melted ice samples. These measurements represent an overall signal of the ionic content in the ice and show distinct peaks overlaying the time-depended background. To account for σ peaks caused by marine aerosol or mineral dust input we calculated nssσ (non-sea-salt-conductivity) and exσ (excess-conductivity) by subtracting the contribution of sodium and calcium to σ. We further homogenized our time series to an equal time-resolution over the whole investigated time period by filtering appropriately. Considering the predominant dry deposition regime at Dome C, we scaled σ with the accumulation rate. Thereafter, we examined the effect of the data homogenisation step, the difference of using σ, nssσ or exσ, and the use of different peak selection algorithms to the final occurrence rate estimation. Furthermore we compared our results with previously published findings obtained by using sul-

phate measurements on the same ice core to asses the suitability of σ measurements to detect explosive volcanic events recorded in Antarctic ice cores. We found a fairly constant occurrence rate over the last 170 ka with a slightly lower number of events during glacial maximum conditions, e.g. when the ice sheets were largest, despite the fact that atmospheric transport is considered to be similar or even more efficient at that time compared to the remaining glacial and interglacial periods. Additionally, our results do not support findings stating enhanced volcanic activity during the last 2000 years compared to the rest of the Holocene.