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Spectral and phase analyses of selected chemical markers stratigraphy along the last 900 kyr in the EPICA Dome C ice core

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Before one million years ago, the repeated cooling and warming of the Earth over periods of about 41 kyr was symmetric following changes in Northern Hemisphere high latitude insolation caused by variation in obliquity. Around one million years ago (Mid-Pleistocene Revolution - MPR) the frequency of climatic change switched to 100 kyr, the pattern became asymmetric, with slow, usually step-like cooling followed by rapid warming. The mid-Brunhes event (MBE), roughly corresponding to the transition between stage 12 (MIS 12) and stage 11 (MIS 11) about 430 kyr ago, can be considered another boundary step characterized by a further increase of ice-volume variation showing 4 large-amplitude 100-kyr-dominated glacial-interglacial cycles. Understanding the cause of climate variability during this period requires consideration of all the components that take part in forcing and feedback. Ice cores have a particular role in this task because many of these components are represented in a single core.

Spectral power analysis was performed on stratigraphies of selected chemical markers along the last 900 kyr from the Dome C ice core in order to find a relationship with climate forcing factors.

Singles, cross spectrograms and phase diagrams were computed for concentrations and fluxes in order to point out similar frequencies, coherences and oscillation phase between components. The data set (concentrations and fluxes) were averaged every 100 yr for spectrograms calculation. Such an interval was chosen as a compromise between the necessity of removing the noise due to sudden fluctuations and a resolution able to point out periodicities comparable to orbital parameters cycling.