石英個別粒子のカソードルミネッセンス分析に基づく，カナダ雪氷コア中のアジアダストの供給源推定とその季節変化

Seasonal change of the Asian dust provenance within the Canadian ice core estimated from cathodoluminescence spectra of single quartz grains

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Mineral dust is considered to have a great effect on the natural environment of the Earth by altering the global radiative balance, cloud properties (Intergovernmental Panel on Climate Change (IPCC) AR5, 2014) and ocean primary productivity (Maher et al., 2010). At present, a large amount of aeolian dust is emitted from the huge dry areas of East Asia, typically the Taklimakan Desert in western China and Gobi in southern Mongolia and northern China (Sun et al., 2001). The dust particles derived from such deserts are transported to China, Korea, Japan, and the northwestern North Pacific by the westerlies and is sometimes transported more than one full circuit around the globe through the westerly jet (Uno et al., 2009). Hence, the Asian dust affects climate/environments throughout the northern hemisphere. For the further investigation and evaluation of Asian dust impacts on global environment, it is critical to determine the amount and main sources of Asian dust transported over long distances.
Ice cores from Mt. Logan (60N, 141E), Canada, are the ideal recorder of seasonal to decadal-scale changes in dust transport over a long distance (Zdanowicz et al., 2006). Hence here we examine the past seasonal change of dust provenance using an ice core from King col (4135m above sea level) at Mt. Logan by utilizing a new provenance-tracing method, cathodoluminescence (CL) spectral analysis of “single” quartz grains (Nagashima et al., 2017). CL spectroscopy can detect crystal-chemical features in quartz such as impurities and intrinsic imperfections that depend on the conditions affecting quartz from its formation onward, which are useful to identify the quartz from two major Asian deserts, the Taklimakan Desert and Mongolian Gobi. The CL analysis was performed on quartz grains within ice core samples corresponding to 1941, 1951, 1967, 1983, and 1986 A.D. (6–7 samples/year). We found most quartz grains from ice core samples show two CL emission bands in red and blue regions, which were deconvolved to at most five emission components, each of which represents a specific defect due to an impurity or imperfection. The statistical analysis using the ratios of emission components exhibits ratios of clusters of each sample, which are mostly between those of quartz from Taklimakan Desert and Mongolian Gobi, suggesting the mixing of quartz from the two deserts. Furthermore, the cluster compositions of ice core samples suggest seasonal and possible decadal-scale changes of the dust provenance transported over a long distance, of which detail will discuss in the presentation.

キーワード：黄砂、供給源、雪氷コア
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