Late Quaternary tephrostratigraphy of Baegdusan and Ulleung volcanoes using marine sediments in the Japan Sea/East Sea

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Only two volcanoes have produced alkaline tephra deposits in the Japan Sea/East Sea region during the Quaternary (Ulleung volcano and Baegdusan volcano), but little is known about their detailed tephrostratigraphy, except for the extensive U-Oki and B-Tm tephras. The differences in chemical composition between alkaline tephras and hemipelagic sediments are usually so large that trace element analysis of bulk sediments can be used to identify alkaline cryptotephra. An INAA scanning method was used to detect alkaline cryptotephra layers in five marine sediment cores from the Japan Sea/East Sea in the stratigraphic interval between the widespread rhyolitic AT (29.4 ka) and Aso-4 (87 ka) tephras. EDS/SEM major element analyses of glass shards hand-picked from individual cryptotephra horizons allowed the source volcano to be determined. A total of five alkaline cryptotephra layers were detected: two from Ulleung volcano (U-Ym tephra, and the newly identified U-Sado tephra), and three from Baegdusan volcano (B-J tephra, and the newly identified B-Sado and B-Ym tephra). The eruption ages of these tephra layers were estimated from correlations with the regional-scale TL (thinly laminated) layer stratigraphy (produced by basin-wide changes in bottom-water oxygen levels in response to millennium-scale paleoclimate variations). The ages of the U-Ym, U-Sado, B-J, B-Sado, and B-Ym tephras are estimated to be 38 ka, 61 ka, 51 ka, 68-69 ka, 86 ka, respectively. This study has allowed the construction of an alkaline tephrostratigraphical framework for the late Quaternary linked to the global environmental changes in the Japan Sea/East Sea as recorded in the TL light/dark sediment color changes, and improves our knowledge of the eruptive histories of the Ulleung and Baegdusan volcanoes.