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Identification of Pleistocene tephra layers in marine sediment core C9001C, offshore Shimokita Peninsula, NE Japan

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Correlations for Pleistocene tephra layers in marine sediment core C9001C was investigated. The core was obtained from near the Shimokita Peninsula, Japan by the CK06-06 D/V CHIKYU Shakedown Cruise in 2006. The stratigraphy of the Hole C9001C (365 m long) has been well established based on the correlation of the benthic d18O curve with the LR04 stack (Domitsu et al., 2011). Tephra layers, a few millimeters to centimeters in thickness, can be often recognized in this sediment core that is mainly composed of dark olive-gray, diatomaceous silty clay. Two tephra layers at 30.3 mbsf and 54.3 mbsf were already correlated with the Spfa-1 and Aso-4, respectively. In this study, we focus on relatively thick and coarse tephra samples from 20 mbsf to 150 mbsf (30 - 240 ka, LR04 age). As the result, seven tephra layers were newly identified on the basis of tephro-stratigraphy and petrology, such as glass chemistry and mineralogy.

We identified the To-Of (BP1) at 19.6 mbsf, To-GP at 24.8 mbsf, Ko-i at 25.5 mbsf, Toya at 61.4 mbsf, Aso-3 at 73.9 mbsf, Mb-1 at 115.6 mbsf and Tn-C at 145.9 mbsf based on tephra databases (e.g. Okumura, 1991; Machida and Arai, 2003; Aoki and Machida, 2005). Descriptions of each tephra layer are as follows: The tephra layer at 19.6 mbsf is 6 cm thick, medium-sand sized, crystal vitric ash, including Cpx and Opx crystals. Chemical composition of glass shards is SiO_2=77.5%, K_2O=1.2% (100% normalized). The tephra layer at 24.6 mbsf is 3 cm thick, medium-sand sized, vitric crystal (Cpx, Opx) ash, showing Low-K glass composition (SiO_2=75.4%, K_2O=1.1%). The tephra at 25.5 mbsf is patchy (5 mm in maximum thickness), fine-sand sized, vitric ash, showing the Medium-K composition (SiO_2=76.2%, K_2O=2.1%). The tephra at 61.4 mbsf is 1.5 m thick, fine-sand sized, vitric ash, containing trace amount of Opx. Glass shards have Medium-K composition (SiO_2=79.0%, K_2O=2.7%). The tephra layer at 73.9 mbsf is 2 cm thick, medium-sand sized, vitric crystal (Cpx, Opx) ash, characteristically showing High-K glass composition (SiO_2=70.3%, K_2O=4.6%). The tephra layer at 115.6 mbsf is 4 cm thick, medium-sand sized, vitric crystal ash, characteristically including Bt, Hb crystals in addition to pyroxenes. The glass chemistry is: SiO_2=78.1%, K_2O=3.9%. The tephra layer at 145.9 mbsf is 20 cm thick, medium to coarse-sand sized, vitric crystal (Cpx, Opx) ash, showing relatively Low-K glass composition (SiO_2=78.4%, K_2O=1.5%).

We can re-examine the correlations for tephras with marine isotope stages (MIS) based on LR04 age. The To-Of tephra from Towada volcano can be newly correlated with early MIS 2 (<29 ka). The Aso-3 can be correlated with late MIS 6. It is also needed to revise the estimations of eruption volume and distribution of Aso-3. The Tn-C tephra from Osore volcano can be correlated with MIS 7 (<240 ka). Detailed identification of these seven tephras and further correlations for other tephra samples are now in progress, and will be presented elsewhere.

Keywords: Shimokita Peninsula, marine sediment core, Pleistocene, tephra, CHIKYU, glass chemistry