Geochemical detection of alkaline cryptotephra in Lake Biwa and Lake Suigetsu cores and their eruption ages of the Ulleung Island

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This is the first report of the supersensitive and effective detection of alkaline cryptotephras by instrumental neutron activation analysis (INAA). Cryptotephra are tephra horizons that are invisible to the naked eye. The Ta/Sc elemental ratio of glass shard in a tephra known to be from an alkaline volcano is reported as ca. 15, whereas the average Ta/Sc value in typical sediments is below 0.1. We detect two unknown alkaline cryptotephras, which were not detected by susceptibility measurements, from down-core profiles of the Ta/Sc ratio in a piston core from Lake Biwa in Japan. The Th/Sc ratio is a useful indicator for verifying the absence of interference by Ta-rich heavy mineral. Two or three alkaline cryptotephras are also found from annually laminated sediment in a drilled core from Lake Suigetsu in Japan, and are correlated with those from Lake Biwa. The eruption ages of the cryptotephra are considered to be 583, 1869, and 4337 years before the fallout of a widespread alkaline tephra (9.3 14C kyr B.P.) from a Korean volcano.