

Characterization of Artificial Radionuclides and Sedimentation in Sediment Core of Crater Lake

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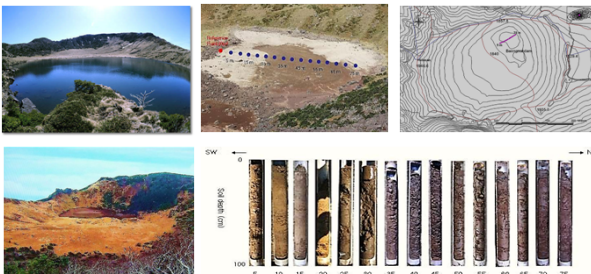
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Introduction

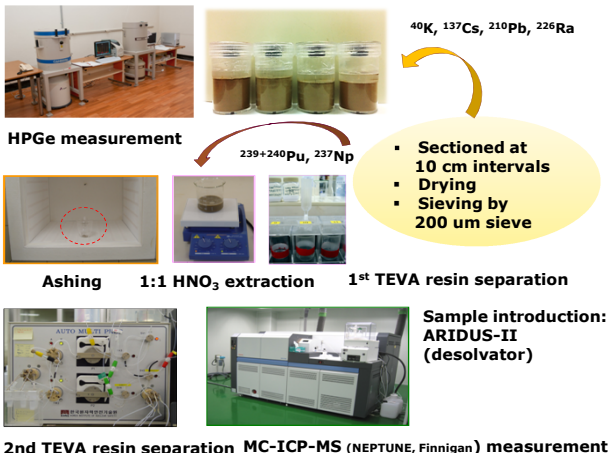
In this study, we investigated the distribution of ³⁷Cs, ²³⁷Np, ²³⁹⁺²⁴⁰Pu activities, and ²⁴⁰Pu/²³⁹Pu atomic ratio and sedimentation characteristics in sediment cores collected in crater lake, Baengnokdam of Mt. Halla, Korea from September to November 2004.

Methods

Sampling site and Crater lake core: (33N°21'32.25", 126E°32'5.69")



Measurement of radioactive isotopes



Results & Discussion

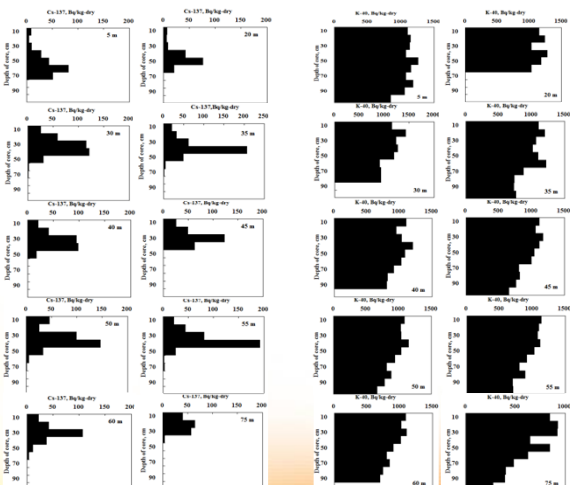


Figure 1. Vertical profiles of ¹³⁷Cs and ⁴⁰K at the sampling sites in the crater lake

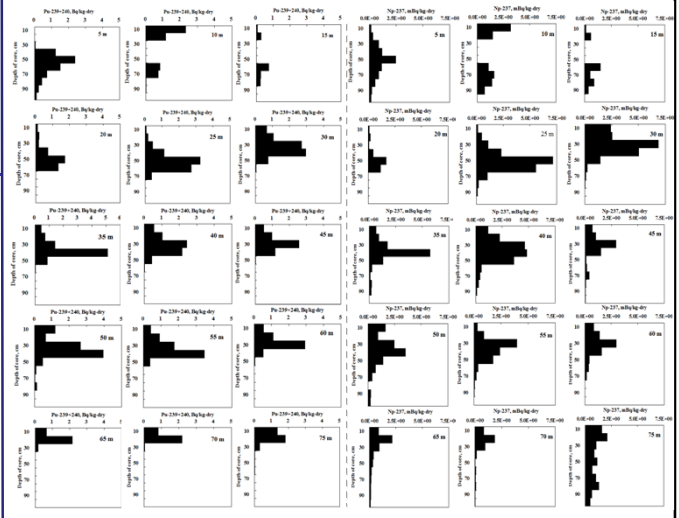


Figure 2. Vertical profiles of ²³⁹⁺²⁴⁰Pu and ²³⁷Np activities at the sampling sites in the crater lake

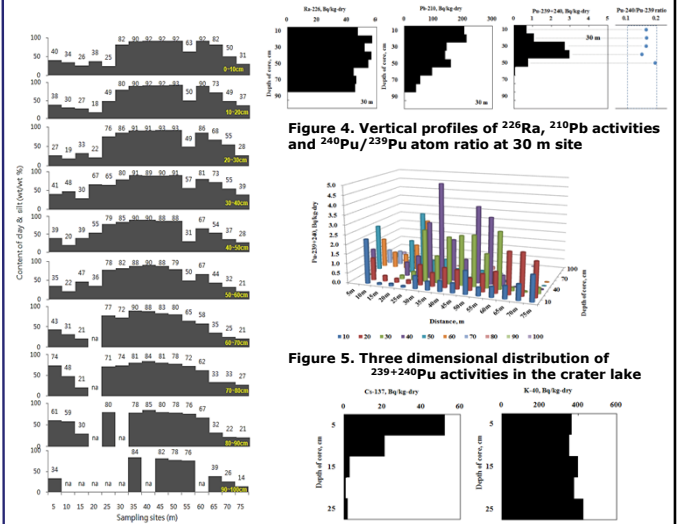


Figure 3. Horizontal variation of sum of clay and silt contents in soil sediments

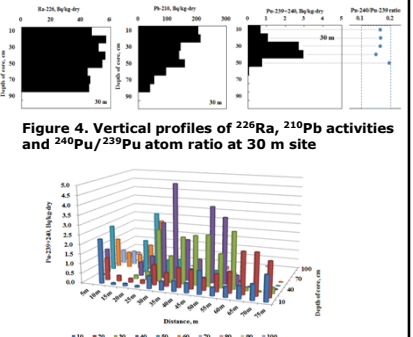


Figure 4. Vertical profiles of ²²⁶Ra, ²¹⁰Pb activities and ²⁴⁰Pu/²³⁹Pu atom ratio at 30 m site

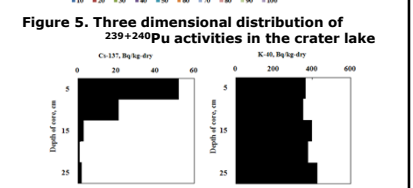


Figure 5. Three dimensional distribution of ²³⁹⁺²⁴⁰Pu activities in the crater lake

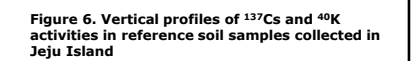


Figure 6. Vertical profiles of ¹³⁷Cs and ⁴⁰K activities in reference soil samples collected in Jeju Island

Evaluation of Sedimentation rate

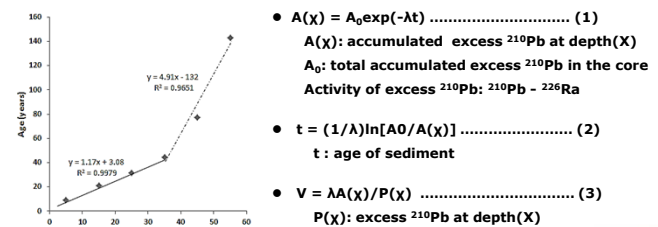


Figure 7. The age of soil sediment using Constant Flux Model (Robbins, J. A., 1978) †
 ★ Sedimentation rate : 0.86 cm/y (0 ~ 35cm), 0.20 cm/y (35 ~ 55cm)

Conclusion

The maximum ¹³⁷Cs per unit sediment by the site varied from 19.0 to 214 Bqkg⁻¹. For all sediment cores except for 10m distance station from the zero station, the results on ²³⁷Np, ²³⁹⁺²⁴⁰Pu activities ranged from 0.0518 to 7.15 mBq/kg-dry, and from 0.00686 to 5.128Bq/kg-dry, respectively. ²⁴⁰Pu/²³⁹Pu atomic ratios averaged 0.159 less than the global fallout ratio (0.176). ²³⁹⁺²⁴⁰Pu/¹³⁷Cs and ²³⁷Np/²³⁹⁺²⁴⁰Pu activity ratios averaged in 0.033 and 0.0086, respectively. Using Constant Flux Model, the sedimentation rates of core at 30 m were estimated as 0.86 cm/y (0~35cm) and 0.20 cm/y (35~55cm).

† Reference: Robbins, J. A., 1978, Geochemical and geophysical applications of radioactive lead isotopes. In Nriagoo, J. P. (Ed.). Biogeochemistry of Lead, p. 285-393. North-Holland: Elsevier