^{230}Th ages of brucite-carbonate chimneys at the Shinkai Seep Field, southern Mariana forearc

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Serpentinite-hosted fluid vent systems have attracted interest as analogues for the place of birth of life on the Earth as well of extraterrestrial life expected on Mars and Enceladus. During the past five-years expeditions, brucite-carbonate chimneys were discovered from the deepest known (~5700 m depth) serpentinite-hosted ecosystem, the Shinkai Seep Field (SSF) in the southern Mariana forearc [1]. Previous study for the chimney textures and mineralogies recognized two types (type I and II) of active chimneys formed under compensation of the precipitation and dissolution of constituent minerals [2]. Type I chimneys are mainly consist of brucite; these formed as a result of rapid precipitation under high discharge of alkaline fluid. In this type of chimneys, filamentous microbial cells were often mineralized by brucite. Type II chimneys are characterized by inner brucite-rich and outer carbonate rich zones and were likely formed under lower fluid discharge than the type I chimneys. Type II chimneys are covered with non-lithified grayish microbial mats and colonies of *Phyllochaetorterus*. In this study, we applied uranium-thorium disequilibrium dating for the two types of chimneys to elucidate the history of the chimney growth.
Ages of the type I chimneys ranged from modern to 14,000 yrs and its median age was 350 yrs. The type II chimneys showed older age than that of type I, which ranged from 1,600 to 18,000 yrs with 6,000 yrs median age. These results indicated that the intensity of fluid discharges also controlled growth rate of the brucite-carbonate chimneys. The broad age ranges likely resulted from the compensation of mineral precipitation and dissolution occurring below the local carbonate compensation depth. Such conditions provides a habitat for microbes and animals for >10,000 yrs on deepsea floor, which are encased in mineral precipitates.

References
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Keywords: serpentinization, alkaline fluid, brucite-carbonate chimney

