

Report for the Joint Use/Research of the Institute for Planetary Materials, Okayama University for FY2024

6/04/2025

Category: ☐ International Joint Research ☒ General Joint Research ☐ Joint Use of Facility
☐ Workshop

Name of the research project: Geochemical and clay mineral signature of provenance, chemical weathering, and erosion in Chemoga watershed and flood plain sediments, Upper Blue Nile, Ethiopia

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Collaborator

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Research report:

- 1) Please write the research report with free format, but include followings: research purpose, actually conducted research, and research outcomes. If necessary, you can add another page.

This study aims to evaluate the impact of lithology on weathering, erosion, sedimentation, and the paleoenvironment within the Chemoga watershed, situated in the Upper Blue Nile Basin (UBNB), Ethiopia. To accomplish this, we employed geochemical elemental analysis alongside clay mineralogy assessments. The samples analyzed primarily consisted of basaltic rocks from various geological periods, core and surficial sediments, and soil samples. Major-element analyses of volcanic rocks, sediments, and soils were performed utilizing X-ray fluorescence (XRF) at the Misasa Institution of Planetary Materials. Furthermore, X-ray diffraction (XRD) was employed to characterize the clay minerals in the sediments and soils. Currently, we are engaged in laboratory

investigations of trace elements using an inductively coupled plasma mass spectrometry (ICP-MS) apparatus. These analytical methods have yielded significant insights into the fundamental properties of the samples, including lithologic features and the extent of weathering and alteration processes. Based on the major oxide elemental analysis and clay mineralogy findings, the study area has been classified according to the intensity of chemical weathering, as indicated by the alteration gradient of clay minerals formation across latitude. Subsequent analyses have indicated that the region is experiencing moderate to intense chemical weathering, which is likely a substantial contributor to the erosion observed in the area. These results imply that significant chemical alteration has occurred across different lithological and climate settings of the watershed, influenced by various factors including lithology, provenance, climate, tectonics, and transportation processes. The general enrichment and depilation of major elements and formation of clay minerals assemblage were mapped and classified in both surficial and core samples.

I have submitted a manuscript to **the Science of Total Environment journal**, which is currently under review, and I have prepared a second draft. The first manuscript focuses on the intensity of chemical weathering across contrasting lithological and climatic settings of the watershed, and the 2nd manuscript focuses on the temporal changes in chemical weathering observed in sediment core samples from the floodplain deposits. The **second manuscript will be submitted by the end of this month.**