Geophysical Research Abstracts
Vol. 18, EGU2016-9314-1, 2016
EGU General Assembly 2016

Cosmogenic Nuclides 10Be–21Ne Burial Dating of Middle Miocene Sedimentary Formation of the Hongliu Valley in Southern Ningxia Basin: A Case of Isotopic Geochronology Study for the Cenozoic Sedimentary Strata

Yan Ma, Huiping Zhang, Weitao Wang, Jianzhang Pang, and Dewen Zheng
State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing, China

Chronology studies for the Cenozoic sedimentary strata based on the magnetostratigraphy cannot afford the unique chronological sequences in the absence of absolute ages from biostratigraphy or volcanic ash chronology. In situ-produced cosmogenic nuclides provide a powerful tool for the sediment dating based on the time-dependent concentration ratio of two nuclides, which are produced in the same mineral but with different half-lives. Thereinto,^{10}Be–^{26}Al is the most widely used nuclide pairs, of which the available dating range spans the Plio-Pleistocene. But the coupling of 10Be with the stable nuclide ^{21}Ne would significantly improve the burial dating range up to the middle Miocene, which is promising in revolutionizing the chronology study for the Late Cenozoic terrestrial sedimentary sequences. We have applied ^{10}Be–^{21}Ne pair for dating the middle Miocene sediments of the Hongliu Valley in southern Ningxia basin. Two major features of the sediments are involved in our study: (1) sediments originated from the steady erosion of the source area, and (2) the burial depth of our sample after deposition is time dependent due to the gradual accumulation of sediments into basin. The post-burial nuclide production is estimated to be less than 3%, including the contribution by muon interactions, of the total nuclide concentrations measured in our sample. Our ^{10}Be–^{21}Ne analysis demonstrates the age of the burial sample is 12.4(+0.6/-0.4) Ma, and the erosion rate at the source area is 0.26$\pm$0.01 cm ka^{-1}. The sample's burial age is consistent with the age constraint set by the Hongliugou Formation (16.7–5.4 Ma) which we collected the sample in. Vertebrate fossils of Platybelodon tongxinensis with an age between 12 and 15 Ma exhumated along with our sample further verifies the reliability of our dating results for the middle Miocene sediments.This study has shown the improved age range of cosmogenic-nuclide burial dating method by incorporating the stable nuclide ^{21}Ne, and has established the feasibility of ^{10}Be–^{21}Ne pair in chronology studies for the Cenozoic sedimentary strata.