ADVANCES IN COSMOGENIC DATING OF PALEOSEISMIC EVENTS

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Historical references are the best sources of data for reconstructing the seismic activity along specific faults. However, historical records are usually much shorter than the time scales of geological processes. Historical records extend several thousand years in China and other regions of the Old World, and only about 500 years in the New World. But the recurrence interval of earthquakes at the same location on a fault can be measured in tens to hundreds of years along highly active faults, to tens or hundreds of thousands of years along less active fault zones. While the lower limit of the recurrence interval is within the range of historical records, the upper limit is certainly not. Thus, archives other than those based on historical information must be utilized for studies of prehistoric seismic activity. Such archives include any deformed geological unit, if the age of the deformation can be determined.

Here, I discuss landforms and features that carry information about prehistoric earthquakes and that can be dated by the accumulation of in-situ produced cosmogenic nuclides. Applications of cosmogenic nuclides to dating seismogenic deposits and features are few at this early stage of development, but in addition to already-published accounts, several new and potential applications have been appearing. Two geological settings that have received considerable attention during the last decade are deformed abandoned alluvial fans and bedrock fault scarps. In addition, I will discuss dating of fault scarps developed in sediments, landslides, shorelines and precarious rocks. Finally, I will explore geochronological potential of colluvial wedges and fissures filled with rubble. Three important aspects of cosmogenic dating of paleoseismic record will be discussed: (1) conceptual models of nuclide accumulation in evolving landforms and features; (2) field and laboratory techniques; and (3) the forward and inverse modeling of nuclide accumulation and determination of ages of paleoseismic events.

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