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*Presentation Time: 8:35 AM*

# QUATERNARY COSMOGENIC GEOCHRONOLOGY - RATES AND DATES - PAST, PRESENT, AND FUTURE

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Over the last half a century, Quaternary geochronology, because it provides rates of surface processes and dates of landforms, has revolutionized Geomorphology and Quaternary Geology. We can now test long-standing hypotheses quantitatively and look back into the history of landscapes with far more than informed speculation. This talk will primarily review the application of cosmogenic methods but when appropriate, will consider other Quaternary geochronometers that help us to understand the speed at which Earth's surface changes and the age of landforms.

Just over 6 decades ago, Libby's work with $^{14}C$ marked the start of numerical Quaternary geochronology. Within 20 years, the first *in situ* produced cosmogenic nuclides were measured although it took the development of accelerator mass spectrometry in the 1970s before widespread application of the method. The 1980s and 90s saw the measurement of dates and rates around the world but it was not until the new millennium that the field began to mature – with widespread acceptance and adoption of the method, practitioners began to develop more sophisticated approaches to sampling and data analysis including the measurement of multiple isotope systems in single samples, the measurement of cosmogenic nuclides in detrital sediments and soils, and the use of $^{10}Be$ as a sediment tracer and the basis for sediment budgets.

The last decade has witnessed the field maturing. There are now enough cosmogenic age and erosion rate data to allow for compilations that elucidate regional and global patterns of landscape response to climate, tectonics, lithology, and structure. On-line data reduction approaches such as CRONUS, provide uniform platforms for comparison.

All cosmogenic results depend on interpretive models, the accuracy of which is limited by our lack of knowledge of both initial conditions and sample history. Recent development of multiple isotope methods, including isochron approaches and the measurement of in situ $^{14}C$, suggest that it is possible to avoid some of the assumptions inherent to single nuclide methods. The development of new intellectual tools, analytical refinements, and better-informed approaches to collecting and interpreting data all allow practitioners to reduce the uncertainty related to this fundamental limitation of cosmogenic methods.

Session No. 196

**P4. 125 Anniversary Pardee Symposium: Quaternary Geology and Geomorphology: Past, Present, and Future**
*Tuesday, 29 October 2013: 8:00 AM-12:00 PM*

*Mile High Ballroom 4AB (Colorado Convention Center)*

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