situ-produced nuclides include studying glacial chronology, erosion and paleolake shorelines; determining tectonic uplift rates and seismic hazards; dating of landslides, volcanic lava flows, rock art and paleoearthquake events.

Types of other research applications include: radionuclide fallout and mapping over the United States; soil dynamics and chronology; cosmic ray intensity variations; digenesis of ferromanganese crusts; distribution of 129I and carbon cycling in the oceans; groundwater tracing; assessment of low level and high level radioactive waste repositories; release of radioactivity from fuel reprocessing facilities and reactors; toxicity and uptake of Al by plants and animals; determination of neutron energy spectra from atomic bombs at Hiroshima and Nagasaki; exposure histories and terrestrial ages of the meteorites and tektites.

APPLICATION OF 36Cl SURFACE EXPOSURE AGE DATING TO CENTRAL ANDEAN VOLCANOLOGY AND GLACIOLOGY

PANKAJ SHARMA,1 SHANAKA L. DE SILVA,2 DAVID ELMORE,1 STEPHAN VOGT1 and ADAM DUNNE1

The Central Andes (14°–27°S) is characterized by high altitude (~4000 m), arid climate (precipitation <20 cm a^-1), extremely low erosion rates (~1 mm ka^-1) and superb preservation of the geology. Here we describe two ongoing research projects that utilize in-situ-produced cosmogenic 36Cl as a late Pleistocene chronometer to better understand the magmatic evolution and quaternary paleoclimate of this region.

The Central Volcanic Zone of the Andes is probably one of the best preserved young volcanic regions in the world. Studying the magmatic processes of this region will help us to better understand magmatism and geodynamics at such margins globally. Our objectives are to: 1) constrain production rates of 36Cl and calibrate 36Cl exposure ages using high precision 40Ar-39Ar ages on the same lava flows; 2) estimate rates of growth and evolution of volcanoes; 3) estimate regional magma generation rates; and 4) compare radiometric ages with the remotely sensed geomorphological data. We have completed preliminary sampling of Volcan Tata Sabaya in southwest Bolivia as it is <1 Ma old and its volcanic and petrologic evolution is well known. A total of 30 samples have been collected from lava flows and debris avalanche blocks for age dating using 36Cl and 40Ar-39Ar methods. Analytical work on recently collected samples is in progress. During the coming summer we intend to complete sampling at Tata Sabaya and sample the Volcan Parinacota, another major volcano in this region.

Quantitative estimates of past climates are required to better address global climatic changes and evaluate the predictive capabilities of general circulation models. We have initiated a study of the glacial landforms in the mountains of the Western Cordillera and Altiplano of Bolivia to decipher the late Quaternary glacial record in the tropical regions. Three well preserved moraine sets have been identified on the basis of superposition and terminus elevation at Cerro Tunupa. Surface exposure ages have been determined using 36Cl. Three main periods of glacial advance are suggested. An advance during isotope stage 3 is suggested by the 43 ka age obtained from the oldest moraine set (Group III). The dates spanning from 32–15 ka for moraine set II corresponds to advance during isotope stage 2 Late Glacial Maximum. Boulders from the lateral moraine on the youngest and most extensive glacial valley yields ages of 14–12 ka corresponding to a late glacial advance. These data indicate a close correspondence between the neoglacial and paleolake history of the Altiplano and will provide constraints to central Andean paleoclimate reconstruction.