Constraints on chemical weathering processes in the Taiwan orogen from short- and long-term time series of river water samples

D. CALMELS*, A. GALY, M. BICKLE, N. HOVIUS, M.J. HORNG AND H. CHEN

Dept. of Earth Sciences, University of Cambridge, Downing Street, Cambridge, CB2 3EQ, UK
(*correspondence: dcal07@esc.cam.ac.uk)

Chemical weathering and physical erosion play a major role in the transfer of dissolved and solid materials between Earth reservoirs. Chemical weathering of silicate rocks regulates global climate by conveying CO_2 from the atmosphere to carbonate rocks. Identification of weathering sources, quantification of secondary processes modifying the weathering signature, and constraints on the parameters controlling weathering reactions and rates as well as the longer-term evolution of river chemistry are key requirements for progress in this field. Since 2004, we have collected water samples and suspended sediment at gauging stations on 15 Rivers draining the active Taiwan orogen. The island has a subtropical climate with frequent cyclonic storms, and a large range of well known physical erosion rates, making it highly suitable for a study of the links between erosion and chemical weathering. We will present results from representative sets of river water samples collected on four-hourly to daily basis during cyclonic storms and on a bi-weekly basis at other times. We have found important variations of the chemical weathering signature coupled to changes in the hydrological regime and/or physical erosion, even over short intervals. Notably, we have observed clear hysteresis loops, which make possible to differentiate between contributions from different weathering sources and processes.

Growth of an intrusive complex beneath Mt. Veniaminof, Alaska

A.T. CALVERT[1], C.R. BACON[1], T.W. SISSON[1] AND C.J. NYE[2]

[1]USGS, 345 Middlefield Rd., Menlo Park, CA 94025 USA (acalvert@usgs.gov, cbacon@usgs.gov, tsisson@usgs.gov)
[2]Alaska Volcano Observatory/ADDGS, 903 Koyukuk Dr., Fairbanks, AK 99775 USA (cnye@giseis.alaska.edu)

Mt. Veniaminof, lower Alaska Peninsula, is one of the largest (~350 km^3) and most frequently active volcanoes in the Aleutian arc. This broad volcano is capped by an 8-km-diameter ice-filled caldera. Eruptive products are as primitive as 9.4% MgO and 130 ppm Ni at 50% SiO_2 and as evolved as 69.5% SiO_2, and define a tholeiitic trend dominated by crystallization differentiation. Geologic mapping, major and trace element geochemistry, and detailed Ar geochronology document a compositional shift from eruption of basalt and basaltic andesite early in its 260 kyr history to andesite and dacite (+ basaltic andesite and minor basalt) 130 ka to present.

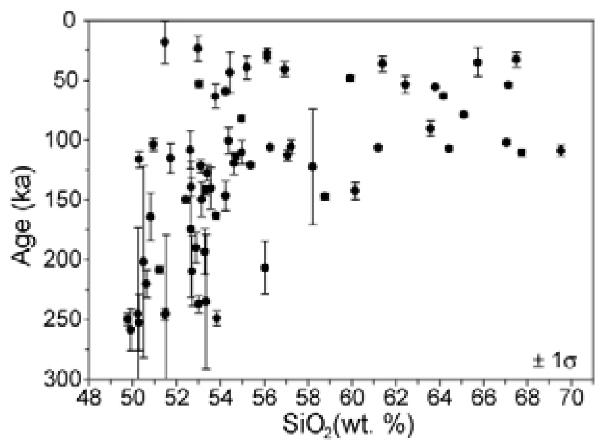

Figure 1: Silica contents and argon ages of volcanic rocks.

Deposits from a 3.7-ka caldera-forming eruption contain abundant lithic plutonic (gabbro, diorite, and granodiorite) clasts torn from the crystallizing pluton beneath the volcano. Plutonic clasts are genetically related to lavas and yield ca. 10–40-ka zircons [1]. We infer that Veniaminof's progressive geochemical shift from basalt-dominated to andesite/dacite-dominated products and the presence of juvenile plutonic clasts result from growth of a gabbroic to granodioritic intrusive complex beneath the active volcano that processes most of the mantle-derived basalt into more silicic products.

[1] Bacon, Sisson & Mazdab (2007) *Geology*.