Reactive transport modelling of incongruent basalt dissolution in the Biosphere 2 hill-slope experiment

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Geochemical reactive transport modelling (CrunchFlow2007) and bench-scale experiments were conducted to help predict mineral transformations likely to occur over ten years of weathering in a synthetic hillslope experiment under construction at Biosphere 2 (B2) [1]. The modeling sought to predict the rate and extent of basalt weathering as a function of climatic drivers, and to assess the feedback effects of weathering processes on hillslope hydraulic properties. Flow through column experiements were used to verify applicability of literature-derived dissolution rates to the studied basalt and to determine effects of dissolved organic matter and organic acids on incongruent weathering of basalt.

Modeling results indicate that hydrologic flow characteristics, including velocity and saturation, strongly influence the predicted extent of incongruent mineral weathering and neo-phase precipitation in the hillslope. Results are also highly sensitive to specific surface area of the soil media, consistent with surface reaction controls on dissolution. Effects of fluid flow on weathering resulted in significant differences in the prediction of time-dependent change in soil particle size distributions, which is expected to feedback to alter hillslope hydraulic conductivities. Secondary mineral formation occurs heterogeneously in the longitudinal hillslope cross section, with the greatest accumulation of secondary mineral products in the hillslope shoulder and throughout the near surface of the profile. Column experiments supported dissolution rates derived from the literature and indicated a potentially strong effect of plant-derived organic ligands on mineral dissolution congruency and secondary phase precipitation.

[1] Huxman (2009) *EOS* **90**, 120.

Some new scientific facts on the diamond and gold-forming astropipe geostructures of Mongolia

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In this paper we present a summation of ten-year investigation of the four diamond and gold-forming geostructures of Mongolia (fig.1). These geostructures were considered on the example of the Agit Khangay, Khuree Mandal, Bayan Khuree, Tsenkher astropipes and Teel aggradation terrace along the Selenge River basin. Our detailed geological and gas-geochemical investigations of the Mongolian astropipe geostructures noticeably show diamondgenesis is the expression of the collision of the lithospheric mantle with meteor impact collaps explosion process. According to D.Dorjnamjaa et. al. [1] these diamond and gold-forming ring impact astropipe geostructures are established by us for the first time in Mongolia. All the astropipe geostructures are wonderfully preserved from erosion, active denudation, and characterized by both well natural exposures and diversity of different impact-derived and shocked magmatic rocks and minerals. We can propose that diamond is a polygenous mineral which is formed not only in conditions of the earth's bowels, but at super- velocity collision of space bodies, as well as during the processes of gas condensation in interstellar space.

New diamond and gold-forming astropipe geostructures which revealed for the first time by us in Mongolia are new scientific discovery [2].

[1] Dorjnamjaa, Selenge & Amarsaikhan Ts. (2008) *Diamond-Bearing of Some Mongolian Geostructures & Further Prospects*. Ulaanbaatar, p.172. [2] TWAS, Year Book, Italy (2007) **472**, (2008) **480.**