Coupling between dissolution and precipitation during chemical weathering of albite

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The main goal of the present study is to enhance our understanding of dissolution and precipitation kinetics under weathering conditions. Following Zhu *et al*,[1], we suggest that the coupled dissolution and precipitation is the rule rather than the exception in natural systems. These effects have been found at high temerpatures[2]. However, to establish these realtionships at ambient conditions is a challenge. In this study, single point batch experiment (SPBE) of albite dissolution in a spiked solution was conducted under conditions that enable kaolinite to precipitate. The novel method that uses Si isotopes enables to detect rates that otherwise can't be detected using conventional methods and allow measuring both dissolution of the primary mineral and precipitation of secondary mineral.

Here we present preliminary results of the SPBE that show evidence of kaolinite formation using mineral analysis (SEM and EDS) and solution isotopic and elemental composition. Furthermore, the experiment follows initially fast stage kaolinite precipitation and a decrease in the precipitation rate as the degree of saturation with respect to kaolinite decreases. After 8 hours the dissolution rate of the albite and the precipitation rate of the kaolinite become coupled and the ratio between the dissolution rate and the precipitation rate become 2 as is expected theoretically [3]. Forward model based on literature data successfully predicts the change of elemental and isotopic composition of the experimental solution during the experiment.

[1] Zhu, C., A.E. Blum, and D.R. Veblen, in *Water-Rock Interaction*, R.B. Wanty and R.R.I. Seal, Editors. 2004, A.A. Balkema: Saratoga Springs, New York. p. 895-899. [2] Fu, Q., *et al*, Chemical Geology., 2009. **91**(3): p. 955-964. [3] Zhu, C., *et al Geochimica et Cosmochimica Acta,* 2010. **74** (14): p. 3963-3983.