Geophysical Research Abstracts
Vol. 20, EGU2018-8035, 2018
EGU General Assembly 2018

Pulsating dissolution of crystalline matter

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Fluid-solid reactions result in dissolution or precipitation reactions. The prediction of the related material flux from or to the reacting surface, its variations and changes with time are of interest to a wide array of disciplines. Reaction rate maps that are derived from sequences of topography maps illustrate the spatial distribution of reaction rates across the crystal surface [1]. Here we present dissolution rate maps that reveal the existence of rhythmic pulses of the material flux from the crystal surface. This observation leads to a change in our understanding of the way crystalline matter dissolves. Rhythmic fluctuations of the reactive surface site density and potentially concomitant oscillations in the fluid saturation imply spatial and temporal variability in surface reaction rates. Knowledge of such variability could aid attempts to upscale microscopic rates and predict reactive transport through changing porous media.
[1] Fischer, C., Luttge, A., 2017. Beyond the conventional understanding of water–rock reactivity. Earth and Planetary Science Letters 457, 100-105.