Liquid cell TEM: new frontiers for studying mineral-fluid interactions *in situ* and in real time

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Probing chemical weathering mechanisms of minerals and glasses has relied in large part on solid-state investigations of the fluid-solid interface at post-alteration conditions. Moreover, state-of-the-art analytical tools generally rely on high vacuum conditions, which may be deleterious to the study of surface altered layers that form on mineral and glass surfaces, as they are no longer in contact with their native aqueous environment. Liquid cell TEM (LC TEM) represents a new frontier for the *in situ*, real time study of both dissolution and precipitation processes. Using LC TEM, we have measured surface dynamic processes on wollastonite in deionized water at ambient temperature. Our preliminary results indicate that step edge and terrace movement are not constant with time, but rather show complex behavior. There is also evidence for ephemeral precipitation processes occurring, even though the liquid cell volume was completely undersaturated with respect to secondary phases, such as amorphous silica.

[1] Leonard & Hellmann (2017) *J. Microscopy,* **265**, 358-371.