Weathering as controlled by shock processes

Conference or Workshop Item

Weathering as Controlled by Shock Processes

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Shock processes affect all bodies in the solar system and the effect on rocky targets is profound on both the scale of hundreds of km and on the microscopic scale, as evidenced by mineral textures [1, 2]. We examine the micro-environments of weathering in L6 chondrites, both in terms of textural and chemical alteration; and we relate them to shock created features. Weathering, when mediated by fluid, is sped up or slowed down by the presence of fractures [3]. The most profound difference seen in more shocked samples is the formation of compositionally heterogeneous, polycrystalline sulphides (similar to those found in ALH 84001 by [4]). The shocked sulphides contain micro-fractures, which allow enhanced retention of fluid throughout the crystal. The sulphides also have significant compositional heterogeneity which makes the minerals more vulnerable to weathering [4]. This in turn modifies the altering fluid to a more acidic form. The acid then attacks surrounding silicates. The effect of the acidic fluid is seen through the trace elements of the affected olivine and pyroxene, and a decrease in Mn, Fe and Mg can be seen relative to Si adjacent to weathering sulphides. The estimated pressures needed to create polycrystalline sulphides is 35-60 GPa [5], well within the limits of martian crater formation [6], and therefore is likely to play a part in fluid based crater alteration processes.

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