OPAL-BEARING MINERAL ASSEMBLAGES, ACIDIC OXIDATIVE WEATHERING AND THE MARS CONNECTION

Although precious opal is rare, common opal is a frequent form of hydrated amorphous silica often associated with near-surface acidic weathering of feldspar-rich lithologies. The recent discovery on the surface of Mars of hydrated secondary minerals (e.g., Squyres *et al.* 2004; Bibring *et al.* 2005; Poulet *et al.* 2005) including opal-bearing mineral assemblages (Squyres *et al.* 2008; Milliken *et al.* 2008) and their implication for the presence of liquid water, offers a new perspective on the link between the formation of opal in the GAB and the dehydration of its surface in the Late Cretaceous. Not unlike the GAB, the surface of Mars is largely covered by sedimentary volcaniclastic rocks derived from erosion of Mars basaltic crust. Not unlike the GAB, the surface of Mars is remarkable for the lack of significant amounts of carbonate (e.g., Chevrier & Mathe´ 2007). Not unlike the GAB, the surface of Mars went through a major and final period of dehydration. Not unlike the GAB, the reddish colour of Mars suggests that oxidative weathering played an important role during and after the dehydration of Mars' surface (e.g., Hartman & McKay 1995). The visible- near infrared spectrometers on board ESA's Mars Express and NASA's Mars Reconnaissance Orbiter detected GAB-like hydrated mineralogical assemblages including amorphous silica, kaolinite, smectite, jarosite, ferrihydrite, goethite and gypsum (Poulet et al. 2005; Bibring *et al.* 2005; Milliken *et al.* 2008; McAdam *et al.* 2007, 2008). Geochemical modelling shows that these assemblages can be obtained through aqueous weathering of basaltic lithologies by sulfate-rich acidic groundwater, and/or via interaction with an atmospheric acid-fog (e.g., Burns 1993; Banin *et al.* 1997, Hurowitz *et al.* 2006; McAdam *et al.* 2007, 2008). The dehydration of the Mars' surface sometime during the Hesperian (*ca* 3.7 to 2 Ga) is often proposed as one of the main drivers for the acidic oxidative weathering of the Mars surface (e.g., Burns 1988, 1993; Bibring *et al.* 2005; Poulet *et al.* 2005; Chevrier & Mathe´ 2007; Davila *et al.* 2008). Hence, it is possible that on Mars and on the GAB, opal-bearing assemblages developed via the acidic oxidative weathering of volcanic and volcaniclastic rocks, under evaporitic conditions during the drying out of their respective surface. If this hypothesis were correct, then the GAB would be one of the best terrestrial analogues of the Martian surface.