EXAMINING TERRESTRIAL SILICA-CEMENTED INVERTED CHANNEL DEPOSITS AS A POTENTIAL MARTIAN ANALOG.

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Introduction: There have been numerous observations of elongated, relatively sinuous, positive relief landforms on Mars, such as the putative delta system in Eberswalde crater [1] and the sinuous ridge in Miyamoto crater [2]. These features appear morphologically similar to inverted channel deposits (ICDs) on Earth, which represent exhumed cemented fluvial deposits [e.g. 2, 3]. Terrestrial fluvial sediments may be preserved as positive relief features by cementing processes within the channel, either during evaporation or after burial during diagenesis [4, 5]. Subsequent deflation of the region by aeolian processes reveals these sediments as positive relief features. If similar features are found on Mars, this would have implications for the presence of persistent liquid water on the surface, past climate regimes, and potential diagenetic processes. Common cements for terrestrial ICDs include carbonates and amorphous silica [e.g. 6]. While carbonates appear relatively rare on Mars [7], silica has been observed at the surface [8, 9], and is consistent with the current understanding of martian weathering processes [e.g. 10].

Study goals: Our goal is to investigate the morphologic and spectroscopic characteristics of ICDs that could help to identify them from orbit as paleofluvial deposits. Specifically, the presence of cemented materials in conjunction with inverted terrain may help to identify potential ICDs on Mars. In this study, we examine silica cements in terrestrial ICDs located in the Cedar Mountain formation in Green River, Utah, U.S.A. If some martian inverted features are similarly cemented, they may not initially appear to be sedimentary features in infrared (IR) spectroscopy remote sensing data, especially if their constituent sediments are basaltic. Here, we report on the nature of the silica cement from SEM studies; additional work on thermal infrared spectroscopy measurements of the same samples are reported by [10] in this volume.

Methods: Compositional and morphological measurements were obtained on eight representative ICD samples using a JEOL 5800LV Scanning Electron Microscope (SEM) operating at an accelerating voltage of 20kV in full vacuum. Samples were prepared as carbon coated thin sections. Both backscattered electron (BSE) and cathodoluminescence (CL) data were obtained. ICD samples consisted of a range of materials including sandstone, quartzite, and a conglomerate with relatively large grains up to 1 cm present.

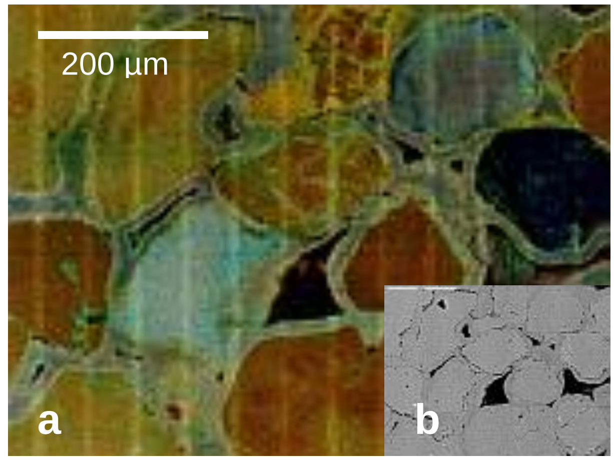

Fig.1. (a) Three color composite CL image of a quartzite ICD sample. Note that the overgrowth rims are also luminescing. (b) Inset BSE image of the same sample location. Detrital quartz grains and silica overgrowths are of the same composition.

Discussion: All eight samples were composed primarily of quartz grains cemented by amorphous silica, likely chalcedony. In some examples, significant quartz overgrowths are visible (Fig. 1). Although the presence of chalcedony suggests that this cement may be a silcrete (and thus formed near the surface), the CL observed in the overgrowths may indicate that cementation occurred at a greater depth. Additional study is required to determine the origin of the cement.

References: [1] Malin, M.C. and Edgett, K.S. (2007) *Science* 302, 1931-1934. [2] Newsom, H.E. et al. (2010) *Icarus* 205, 64-72. [3] Williams, R.M.E. et al. (2007) *LPSC XXXVIII*, Abstract #1821. [4] Glennie, K.W. (1970) in *Sedimentology* 14, Elsevier, Amsterdam. [5] McBride, E.F. (1989) *Earth Sci. Rev.* 26, 69-112. [6] Pain, C.F. and Ollier, C.D. (1995) *Geomorphology* 12, 151-165. [7] Ehlmann, B.L. et al. (2008) Science 322, 1828-1832. [8] Squyres, S.W. et al. (2008) *Science* 320, 1063-1067. [9] Milliken, R.E. et al. (2008) *Geology* 36 (11), 847-850. [10] McLennan, S.M. (2003) *Geology* 31 (4), 315-318. [11] E.B. Rampe et al. (2010), this volume.

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