A DETRITAL SOURCE FOR THE PHYLLOSILICATES AT EBERSWALDE CRATER N. K. McKeown[1], M. S. Rice[2], N. H. Warner[3], S. Gupta[4] [1]MacEwan University (Physical Sciences, Edmonton, AB, T5J 4S2, mckeownn@macewan, [2]CalTech (Pasadena, CA), [3]JPL (Pasadena, CA), [4]Imperial College London (London, UK)

Introduction: Eberswalde crater has been the subject of intense study due to the presence of a possible deltaic sedimentary body within [1, 2], indicating persistent fluvial processes and a standing body of water on the surface of Mars [Wood 2008 [3-5]. There have been five other fluvio-deltaic systems identified withing Eberswalde crater in addition to the main deltaic feature [6, 7] and the geology [8] and mineralogy [9] have been described in detail. Further studies have traced and modeled the source region for the fluvial features within Eberswalde crater [10].

Of particular interest is the mineralogy and morphology of the large deltaic feature due to the potential for biosignature preservation [11][11]. One of the remaining questions is whether the Fe/Mg phyllosilicates within the delta are authigenic or allochthonous. In this study we perform a detailed analysis of the source regions of the fluvio-deltaic sediments to determine the possible source of the phyllosilicates.

Data and Methods: TRR3 data from CRISM were used in this study to identify Fe/Mg phyllosilicates in source regions. Atmospheric and cos-i corrections were performed [12]. Spectra of interest are ratioed to a spectrally unremarkable region in the same column to reduce systematic noise [12, 13]. Spectral ratios are either 3x3 pixel averages or ROI averages depending on the morphology of outcrops in the images. Parameter maps [14] were generated to aid identification of regions of interest.

HiRISE RED images were analysed in upstream regions to determine the morphology of the source rocks of the Eberswalde delta. The HiRISE data are delivered as I/F (ratio of measured radiance to incoming solar flux), already processed for instrument artefacts, noise-reduced using a high-pass filter, and map-projected [15].

CTX images were analysed in source regions where no HiRISE data was available. CTX data [16] were radiometrically calibrated and projected using ISIS [17].

Results: Examining the upstream source region for the main deltaic feature, Fe/Mg phyllosilicates were identified in only a single CRISM image (FRT0000B2D4). In HiRISE and CTX data, this exposure is a fan-shaped deposit containing phyllosilicates similar to those found within Eberswalde itself. This deposit occurs in a local low in MOLA data.

Examining the surrounding region, a more resistant subsurface layer is oberserved whose spectra are consistent with Fe/Mg phyllosilicates, high-calcium pyroxene (HCP), and olivine. This layer is best observed in the walls of craters that occur near or on the Holden continuous ejecta blanket. It is likely this layer was sampled by the Holden impact and therefore phyllosilicates are present in the Holden ejecta (see below).

Discussion: *Regional phyllosilicates.* A subsurface layer containing Fe/Mg phyllosilciates has been obersved in Nirgal Vallis [18] and throughout Noachis Terra [19] within Noachian-aged terrains, suggesting that this is a widespread regional deposit. It is possible that the layer observed near Holden crater is part of the same unit; therefore, it was likely sampled by the younger Holden impact, which is estimated to be ~3.5 Ga [10]. Material from this layer would have been redeposited within the Holden ejecta which drapes Eberswalde crater and was eroded by the channels that fed the delta [10].

Source of fluvio-deltaic sediment. Not only do the channels feeding the main deltaic feature sample Holden crater ejecta, but they also likely sample Eberswalde crater ejecta (which in turn may have sampled the phyllosilicate-bearing subsurface layer: there is an exposure on the north rim of Eberswalde that is similar in character), and both of these impacts are likely sampling material re-worked by the Holden Basin and Ladon Basin events (fig. 1). Furthermore, the fan-like deposit of phyllosilicates that occurs in the delta source region occurs in a local depression, suggesting these phyllosilicates were possibly transported and deposited in a similar manner to those within Eberswalde itself. The channel base is at a similar elevation to this deposit which suggests that some of these phyllosilicates were remobilized and deposited in Eberswalde.

Conclusions: The material that was eroded, transported, and deposited into Eberswalde crater was reworked many times by the Holden and Eberswalde impacts, both of which likely sampled Holden basin and Ladon basin material. The Holden impact and possibly the Eberswalde impact sampled a regional subsurface layer containing Fe/Mg phyllosilicates and other minerals that are found within the Eberswalde main delta and other fluvio-deltaic deposits. Therefore, it seems likely that the phyllosilicates within Eberswalde crater are allochthonous (detrital) rather than having been altered *in-situ*. This supports the hypothesis that sorting and concentration of these phyllosilicates and, similarly, any biosignatures has occurred within the Eberswalde delta [11].

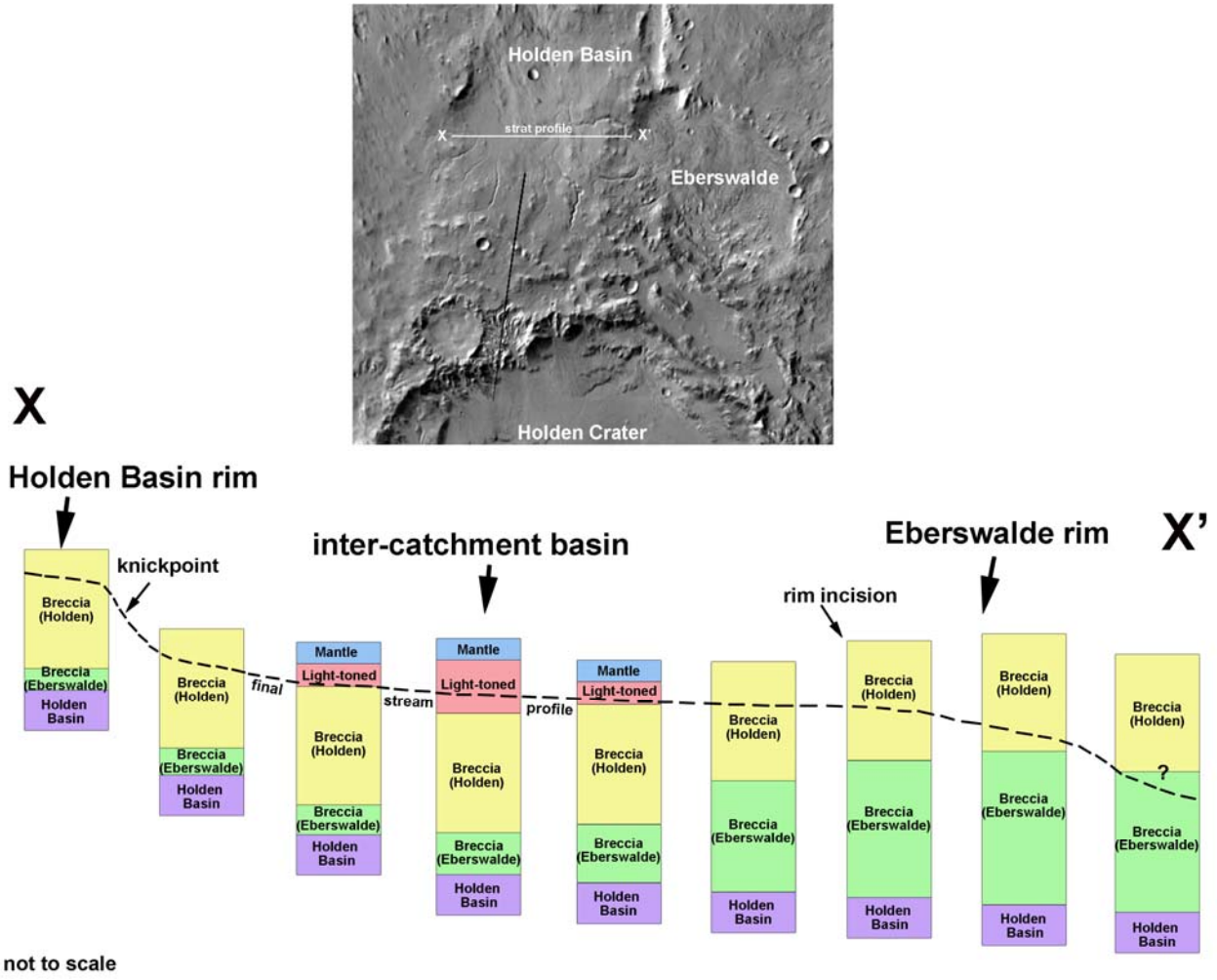

Fig. 1 A stratigraphic profile roughly along the main channel feeding the large deltaic feature in Eberswalde crater and passing through the one identified deposit of phyllosilicates in the source region. The stream channel samples this phyllosilicate deposit but also Holden and (probably) Eberswalde ejecta. Note: this diagram is a schematic based on the relative stratigraphy observed in the available HiRISE images and is not to scale.

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