

MARS ON EARTH? PRE-VEGETATION ALLUVIUM AS AN ANALOGUE FOR EXTRA-TERRESTRIAL SEDIMENTARY STRATA. W. J. McMahon¹ and N. S. Davies², ¹Faculty of Geosciences, Utrecht University, Princetonlaan 8A, 3584 CB, Utrecht, The Netherlands, w.j.mcmahon@uu.nl, ²Department of Earth Sciences, University of Cambridge, Downing Street, CB2 3EQ, Cambridge, United Kingdom, nsd27@cam.ac.uk

Abstract: Earth's sedimentary-stratigraphic record (SSR) has long been read as an archive of signatures for ancient climates, tectonic conditions and life. Now, acquired orbital [1] and rover mission [2] imagery from Mars are, for the first time, enabling sedimentological analyses of strata beyond Earth, and outcrops of the Martian SSR are increasingly considered exploration mission targets for seeking signs of ancient habitable conditions [3]. Yet a limitation on our interpretation of the Martian SSR is that any investigation must utilize Earth analogues in the first instance. Earth provides the only SSR that we can tangibly interact with: visualizing and studying its composition and structure from perspectives and angles that are beyond current rover capacity. The terrestrial SSR, and Earth's active sedimentary environments, provide the primary reference frame for conceptual facies models and an understanding of the significance of sedimentary architecture and bed-forms. However, some fundamental and unavoidable differences exist in the parameters that control sedimentary processes and products on Earth and Mars (gravity, bed roughness, a biosphere), which together mean that the SSRs can never be fully comparable. These constraints can impede our explanation of Martian sedimentary signatures, so it is necessary to maximize the applicability of Earth analogues. A way in which this can be achieved involves comparing Martian strata only with terrestrial strata deposited on ancient 'alternative Earth's' [4] that were holistically *less* different to Mars. Under the null hypothesis that Mars has always lacked complex biotic-sediment interactions, the most prominent ancient Earths to consider are those on which sedimentary strata were deposited prior to the evolution of life (in instances where life is a key player in the operation of modern sedimentary processes).

In this presentation we consider the differences between lithified alluvium (river-deposited sediment) on Mars and Earth to demonstrate how the alluvial record of the 'pre-vegetation' Earth provides the prime comparable archive against which to understand ancient fluvial deposition on vegetation-free Mars. Relationships between fluvial landforms and vegetation are one of the few life-sediment interactions that are well-studied in both modern [5] and ancient [6-7] environments, so provide a springboard from which to launch ideas on how sedimentation may have differed on an entirely abiotic planet. This contribution aims to en-

courage future researchers to consider the importance of all life-forms as a control on the character of sedimentary deposits across a wider-range of environments because such an approach can inform future landing site selections and broaden the searchable parameters that might provide indirect evidence of ancient life on Mars.

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