INTERPRETING DELTAIC STRATIGRAPHY ON EARTH AND MARS: HOW EASY IS IT AND HOW VALID ARE OUR INTERPRETATIONS? S. Gupta[1], K. Goddard[1], J-R. Kim[2], S-Y. Lin[2], J.-P. Muller[2], E. Mortimer[3], O. Jordan[5], K.J. Amos[5]. [1]Dept. Earth Science & Engineering, Imperial College London, South Kensington Campus, SW7 2AZ, UK, [2]Mullard Space Science Laboratory, University College London, Holmbury St. Mary, Surrey, RH5 6NT, UK. [3]University of Leeds, UK, [4]Statoil, Bergen, Norway, [5]Australian School of Petroleum, University of Adelaide, Australia,

Reconstructing ancient sedimentary environments on Earth is not a trivial task. Sedimentologists typically use detailed analysis of sedimentary features in rocks together with geometrical stratigraphic relationships and couple this with models of modern systems to reconstruct palaeo-deltaic landform features and environments. However, the fidelity of these reconstructions is dependent on good outcrop control and an understanding of how geomorphic elements become frozen in the stratigraphic record.

On Mars reconstruction of ancient deltas is even more difficult. Whilst we can observe point-sourced sedimentary bodies within craters typically emanating from channels that enter the crater, interpreting these as deltaic and determining the type of delta is hazardous. Prior studies have largely focused on establishing geomorphic relations from the large-scale planform bedrock morphology, however, this is dependent on the preservation state. It is not always clear what is actual geomorphology or an erosional remnant.

On Earth, we reconstruct ancient deltas by careful analysis of sedimentary bedding patterns as observed in vertical sections. By lateral tracing of bedding we constrain the morphostratigraphy of depositional elements and the surfaces that bound them. The stratigraphy preserved however is not a static state of the ‘delta’, but instead is a complex of surfaces and sediment bodies that records lateral migration and vertical accumulation of landscape elements.

The integration of HiRISE imagery with HiRISE digital terrain models enables Mars sedimentologists and stratigraphers to explore bedding patterns exposed in martian canyons. Whilst we cannot get a handle on the internal sedimentology of these deposits, the analysis of architectural elements and their geometrical disposition enables us to reconstruct the large-scale architecture of the putative martian deltas. Understanding this architecture is crucial to informed interpretation of such sedimentary deposits.

In this presentation, I will review the sedimentary architecture of a variety of Earth deltas that we have worked on for the past 10 years, including examples from the Suez Rift, Gulf of California, Greece and the Cretaceous Western Interior Seaway of North America. We will examine large scale bedding geometries of the sort visible in spacecraft imagery, and consider how best one can make interpretations.

These examples will be compared with martian examples where we can investigate in detail bedding architecture. We consider how these bedding panels might be interpreted in the light of our examples of Earth delta architecture.