

Constraint on paleo hydrological activities from deltas on Mars

Abstract

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Deltas record fluvial and sedimentary activities on the early Mars. However, the water activities and sedimentary process related with the formation of the Martian deltas is not well constrained yet. To fill up this gap, we quantitative the fluvial and sedimentary process of seven deltas with various morphologies in different locations on Mars. Paleo discharge, sedimentary rate, timescale and amount of water needed to construct the deltas are estimated. The volume between deltas and carved valleys are compared, and the absolute age of the delta/valley relation is approximated by crater counting. The influence of the variation of Martian obliquity and water supply in rivers and the duration of the paleo water activity is considered. The seven deltas were divided into three types based on their supplying valleys and water source. We assume that the formation of the deltas can be associated with various scenarios, including retreating erosion, groundwater sapping, ice melting, impact events and variations of the Martian obliquity. Based on mass balances the formation timescale of the deltas can range from days to thousands of Martian years. The results suggest that a warm climate is not fundamental required for the formation of the seven deltas we studied.

Keywords: Mars, deltas, discharge