SEDIMENTARY HISTORY OF THE SOUTHERN MID-LATITUDES NEAR 180° LONGITUDE. A. D. Howard[1], J. M Moore[2], J. A. Grant[3], R. P. Irwin III[3,4], [1]Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22904-4123, ah6p@virginia.edu, [2]NASA Ames Research Center, Moffett Field, CA 94035, [3]Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, Washington, DC 20560, [4]Planetary Science Institute, Tucson, AZ 85719.

Introduction: The region approximately bounded by 30–50°S and 150–210°E contains a wealth of sedimentary deposits spanning the earliest Noachian to the Amazonian Periods. The earliest deposits, probably of airfall origin, are exposed in deformed and eroded structures and are related to extensively degraded large craters (also called quasi-circular depressions (QCDs). Mid-Noachian to Hesperian deposits include extensive lacustrine deposits, the Electris deposits of probable airfall origin, and the enigmatic knobby chaos of the major basins. Gorgonum basin was occupied by an ice-covered lake at about the Hesperian-Amazonian transition.

Early Noachian: Highly degraded Early Noachian craters 200+ km in diameter are widespread on Mars [*1, 2*]. The relief of these basins is much smaller than expected for fresh basin-scale impacts [*3, 4*] due to infilling by ejecta from large impacts [*5*], viscous relaxation [*3*], infilling with volcanic deposits [*6*], and extensive mantling. The muted and rounded form of QCD rims in this region suggests degradation by mantling [e.g., *7, 8*] is more important than volcanic infilling or relaxation. A thick series of weakly layered and eroded deposits is exposed on an anticlinal, possibly diapiric structure in Atlantis basin at 36.5°S, 182°E and as inward-dipping, eroded beds flanking Atlantis and Gorgonum basins. The form and occurrence of these deposits imply they are eroded Early Noachian mantles and are largely responsible for QCD degradation.

Late Noachian & Early Hesperian Activity: A putative airfall mantle (the Electris deposits [*7, 8*]) covered most of the region and has been differentially eroded by fluvial erosion and scarp retreat. This deposit dips beneath later sediments in the major basin centers. Prominent 1–4-km knobs up to 500 m tall occupy portions of the Ariadnes, Atlantis and Gorgonum basin centers as well as other smaller knob clusters [*9*]. These light-toned knobs locally exhibit spectra of hydrated and phyllosilicate minerals [*10*], and are often capped by a blocky, more resistant layer. Among the uncertainties about the knob deposits are their bulk composition, the depositional environment, their original extent, whether they were preferentially deposited or preferentially preserved in the basin centers, and the processes of erosion of the deposit to form knobs. Their age relative to the Electris deposit is also uncertain, but probably younger. Basin centers in the region are mantled with smooth deposits of probable lacustrine origin that overlie and onlap against knob and Electris deposits. Extensive lakes occupied the region during the late Noachian, overflowing to erode Ma'adim Valles [*11, 12*]. Evidence for lakes of various depths during this time interval includes the undissected convex-to-concave profiles of smooth mantling deposits in basin centers, possible shoreline features, scour features at divides between basins, and a channel and fan-delta formed by basin overflow.

Hesperian & Amazonian: Lakes evaporated, sublimated, or infiltrated after the Noachian-Hesperian transition. At about the Hesperian-Amazonian boundary, shallow fluvial channels formed on the interior slopes of Newton and Gorgonum basins [*13*], probably by melting of snow/ice deposits on the basin rims. At the same time, an ice-covered lake appears to have occupied the lowest parts of Gorgonum basin [*14*]. The ice cover was up to 300 m thick, and convoluted benches formed at the base of the ice. Ejecta of craters straddling the shoreline were preferentially eroded on the basinward side, and distinctive deposits and topography mark the former lake [*13, 14*].

Conclusions: The region discussed here contains one of the most complete sedimentary records on Mars, spanning the earliest Noachian to Amazonian. During much of this time lakes occupied basin centers.

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