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The Colorado Plateau (USA) Coring Project (CPCP): Preliminary Magnetic Polarity Stratigraphy and Rock Magnetic Data From the Continuous Cored Record of Triassic Continental Environmental Change

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The Triassic Period (ca. 251.9-201.3 Ma) is bound by two of Earth's largest mass extinctions, suffered several giant bolide impacts and eruption of three large igneous provinces, and witnessed evolution of the main components of modern tetrapod communities, and yet has sparse geochronologic calibration. To bridge this gap, the US NSF- and ICDP-funded coring of Phase 1 of the CPCP was completed in late 2013, with the recovery of two major cores (6.35 cm diameter: 1A, 518m length and 2B, 253m; 31km apart) from the north and south ends of Petrified Forest National Park spanning nearly the entire Triassic sequence (Chinle & Moenkopi fms.) For core orientation, drilling using a azimuth-tracking device and the holes deviated 30° from vertical to the SE (1A) and 15° from vertical to the S (2B), and CT-scanned. The cores are expected to provide U-Pb zircon geochronologic and magnetic polarity exportable time scale, along with sedimentary and geochemical proxies with unambiguous superposition to test motivating hypotheses concerning evolution of Triassic environments and biota in western Pangea. Core 1A, now at the Rutgers University Core Repository, has been sampled for magnetic polarity data, with specimens obtained either by drilling (yielding right cylinders) or by careful extraction of core fragments for less indurated material. We attempted to extract several specimens from each core segment to test for internal consistency. Specimens have been subjected to progressive thermal demagnetization or a combination of alternating field (AF) followed by thermal treatment. For hematitic mudstones and siltstones of the Chinle Fm, NRM intensities are highly variable and range from 130 to 0.5 mA/m and bulk susceptibilities range from ~ 2×10^{-2} to ~ 5×10^{-5} SI units; for indurated hematitic siltstones to medium sandstones of the Moenkopi Fm, typical NRM intensities are less variable and range from ~9.0 to ~1.2 mA/m and bulk susceptibilities are far less variable, with typical values between ~3.0×10^{-4} and ~0.5×10^{-5} SI units. Progressive demagnetization typically isolates magnetizations of north declination and shallow inclination (interpreted as normal polarity) and antipodes (reverse polarity) (Figure 1) thus there is promise that a polarity stratigraphy will be able to be obtained for much of the section. For some core segments, well-resolved magnetizations do not resemble directions consistent with a Triassic field and we suspect the explanation is occasional difficulties with accurate core orientation. To date, demagnetization response is typically more interpretable for very hematitic mudstone intervals of the Chinle Fm and the most of the Moenkopi Fm. Coarser grained, less hematitic intervals of the Chinle Fm rarely yield interpretable demagnetization results, likely because of the presence of coarse-grained detrital magnetite. For those core segments yielding magnetizations resembling a Triassic magnetic field, anisotropy of magnetic susceptibility data show a well-developed depositional fabric. IRM acquisition and backfield demagnetization data demonstrate both hematite and magnetite as magnetic phases.

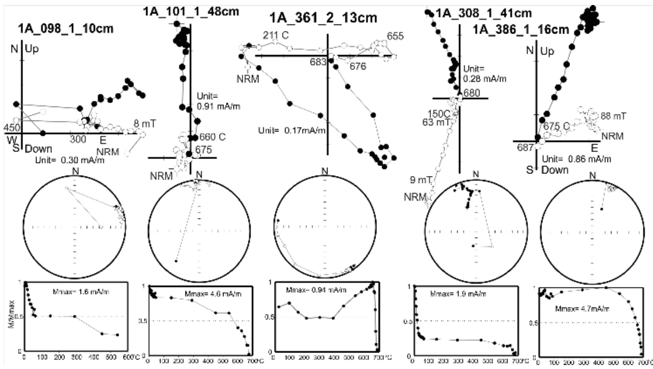

Figure 1. Examples of progressive demagnetization behaviour in Chinle Moenkopi specimens. Orthogonal demagnetization plots (open symbols on vertical projection, closed on horizontal), stereographic projections, and normalized (with respect to maximum intensity) decay plots.