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An independently dated 4200-yr paleomagnetic secular variation record from the Chukchi Sea, Arctic Ocean

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Developing highly-tuned and accurate age models for Arctic Ocean sediments has been a long-standing problem in marine geosciences. This problem stems from the often microfossil poor content of these sediments and low sedimentation rates away from continental margins. The absence of reliable chronologies limits our ability to interpret increasingly sophisticated proxies for past environmental changes in this sensitive ocean basin, and prevents the integration of Arctic paleoceanographic time series with terrestrial, lacustrine and ice core records. While paleomagnetism has the potential to help resolve this problem, there is a scarcity of independently dated records from the Arctic and an incomplete understanding of mechanisms by which sediments become magnetized. Recently published results from a few western Arctic Ocean sediments illustrate that patterns and variability in Holocene paleosecular variation appear consistent with low latitude North American records and output from spherical harmonic geomagnetic field models. However, these marine records are constrained by only a few, and in some cases no, independent age data. Here we present a detailed paleo- and environmental magnetic record from an 8.24 m long sediment core (SWERUS-L2-2-PC1) collected at 57 m water depth in the Herald Canyon, Chukchi Sea of the Arctic Ocean (72.52°N 175.32°W). An independent age model for the core, which covers the last $\sim$ 4200 years, was derived from 14 AMS 14C dates and the identification of a tephra layer associated with the 3.6 cal ka BP Aniakchak eruption. The age model indicates average sedimentation rates of $\sim$ 200 cm/kyr. Variability in the paleomagnetic declination and inclination conform well to predictions made by time-varying geomagnetic field models (CALS10k.1b and CALS3K.4e) and can be readily correlated to other published PSV records from the Western Arctic that lack independent age control. The Late Holocene PSV record from SWERUS-L2-2-PC1 has the potential to be one of the best and most northerly reference curves for high latitude geomagnetic variability, and provide critical insights into the nature of geomagnetic field behavior in the Arctic.