

## **HIGH FREQUENCY SOLAR AND GEOPHYSICAL CYCLES IN VARVED, BIOSILICEOUS SEDIMENTS OF THE LATE EOCENE YUMAQUE FORMATION, PERU**

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### **ABSTRACT**

Detailed field and laboratory analyses of finely laminated, biosiliceous sediments from the late Eocene Yumaque Formation reveal high frequency cycles with bundles of periodicities common to meteorological and geophysical phenomena recognized today. Varved marine and lacustrine sediments, which are recognized around the world, consist of annually deposited light and dark laminae couplets. These unique sediments have been recognized as a valuable tool in cyclostratigraphy, offering an incredibly detailed snapshot of past climates as well as excellent time control for lower frequency sediment cycles. Light biosiliceous-rich and dark detrital-rich alternations visible in the Yumaque Formation occur at scales ranging from millimeters to meters. The millimeter-scale laminae couplets are interpreted as varves. Spectral analysis of laminae thickness, using a varve calibrated time scale, reveals significant variance at periods of 5-6 and 8 years, within the El Niño (ENSO) frequency band, and at 11 years, possibly linked to the 10-12 year solar cycle. Centimeter to meter-scale cyclicity representing between a few hundred to a few thousand years, correlates to solar and geomagnetic phenomena. The cycles recognized in the Yumaque Formation are not only correlative to periodicities recognized in recent sediment records, such as the Gulf of California, but also strongly correlate to periodicities reported in a similar study of the Middle Eocene Green River Formation.