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Paleomagnetic results from IODP Expedition 344 Site U1381 and implications for the initial subduction of the Cocos Ridge

Yong-Xiang Li (1), Xixi Zhao (2,3), Luigi Jovane (4), Katerina Petronotis (5), Zheng Gong (1), and Siyi Xie (1)

(1) Nanjing University, Nanjing, China (yxli@nju.edu.cn), (2) Tongji University, Shanghai, China (xzhao@tongji.edu.cn), (3) University of California, Santa Cruz, USA, (4) Instituto Oceanográfico, Universidade de São Paulo, Brazil (luigijovane@gmail.com), (5) International Ocean Discovery Program, Texas A&M University, USA (petronotis@iodp.tamu.edu)

Understanding the processes that govern the strength, nature, and distribution of slip along subduction zones is a fundamental and societally relevant goal of modern earth science. The Costa Rica Seismogenesis Project (CRISP) is specially designed to understand the processes that control nucleation and seismic rupture of large earthquakes at erosional subduction zones. Drilling directly on the Cocos Ridge (CR) during International Ocean Drilling Program (IODP) Expedition 344 discovered a sedimentary hiatus in Site U1381 cores. In this study, we conducted a magnetostratigraphic and rock magnetic study on the Cenozoic sedimentary sequences of site U1381. Anisotropy of magnetic susceptibility data from sediments above and below the hiatus show oblate fabrcis, but the Kmin axes of the AMS data from sediments below the hiatus are more dispersed than those from sediments above the hiatus, implying that formation of hiatus may have affected AMS. Paleomagnetic results of the U1381 core, together with available Ar-Ar dates of ash layers from sediments below the hiatus, allow us to establish a geomagnetic polarity timescale that brackets the hiatus between ca. 9.61 and 1.52 Ma. Analyses of sedimentary records from ODP/IODP cores in the vicinity reveal that the hiatus appears to be regional, spanning the northeastern end of the CR. Also, the hiatus appears to occur only at certain locations. Its regional occurrence at unique locations implies a link to the initial shallow subduction of the Cocos Ridge. The hiatus was probably produced by either bottom current erosion or the CR buckling upon its initial collision with the Middle American trench (MAT). Thus, the initial subduction of the CR must have taken place on or before 1.52 Ma.