



“Red or green”: magnetism, redox conditions and the true colors of Miocene marine sediments in the South China Sea (IODP Expedition 368)

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Varicolored sediments (red, green, purple, grey, . . .) occur in basins of diverse tectonic settings from Paleoproterozoic times to present. The red and green color of beds is often taken to reflect climatically-driven redox conditions at the time of deposition. However, the effect of late-diagenetic or post-depositional fluids on sediment oxidation state may have been overlooked. Here we show new data, collected in deep marine sediments from the South China Sea during IODP Expedition 368, that documents the nature and extent of these fluid-related modifications. Cores retrieved during this drilling expedition show that marine aqueous fluids extensively leached the local sulfide-rich basaltic basement underlying these Miocene sediments. As a result, these sulfur-rich, reducing fluids permeated upwards along high-permeability pathways such as coarse-grained intervals and fractures in the sedimentary rock. Rock magnetic and paleomagnetic investigations show that the original red color of beds originates from diagenetic hematite, formed in a basin-wide, climatically-driven environment. In contrast, the green beds share the same pyrite-magnetite assemblage and magnetic properties as the fracture zones and other high permeability areas in these sediments. While the absolute timing of alteration produced by reducing fluids remains to be determined, overprinting relationships between red and green zones clearly establish that the reduced assemblages found in green zones are relatively younger. Further research will address the extent and timing of post-depositional fluid flow in this sedimentary basin sequence deposited on an extended margin.