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Fast-Turnoff Transient Electro-Magnetic (TEM) geophysical survey in the Peña de Hierro ("Berg of Iron") field area of the Mars Analog Research and Technology Experiment (MARTE)

*** Jernsletten, J A**

joern@jernsletten.name

University of Bergen, 1917 Florida Dr., Seabrook, TX 77586-2985 United States

This report describes the outcome of a Fast-Turnoff Transient Electro-Magnetic (TEM) geophysical survey carried out in the Peña de Hierro ("Berg of Iron") field area of the Mars Analog Research and Technology Experiment (MARTE), during May and June of 2003. The MARTE Peña de Hierro field area is located between the towns of Rio Tinto and Nerva in the Andalucia region of Spain. It is about one hour drive West of the city of Sevilla, and also about one hour drive North of Huelva. The high concentration of dissolved iron (and smaller amounts of other metals) in the very acidic water in the Rio Tinto area gives the water its characteristic wine red color, and also means that the water is highly conductive, and such an acidic and conductive fluid is highly suited for exploration by electromagnetic methods. This naturally acidic environment is maintained by bacteria in the groundwater and it is these bacteria that are the main focus of the MARTE project overall, and of this supporting geophysical work. It is the goal of this study to be able to map the subsurface extent of the high conductivity (low resistivity) levels, and thus by proxy the subsurface extent of the acidic groundwater and the bacteria populations. In so doing, the viability of using electromagnetic methods for mapping these subsurface metal-rich water bodies is also examined and demonstrated, and the geophysical data will serve to support drilling efforts. The purpose of this field survey was an initial effort to map certain conductive features in the field area, in support of the drilling operations that are central to the MARTE project. These conductive features include the primary target of exploration for MARTE, the very conductive acidic groundwater in the area (which is extremely rich in metals). Other conductive features include the pyretic ore bodies in the area, as well as extensive mine tailings piles.

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