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ANOMALOUS EM SIGNALS AND CHANGES IN ELECTRICAL RESISTIVITY AT PARKFIELD: COLLABORATIVE RESEARCH BETWEEN THE UNIVERSITIES OF CALIFORNIA AT BERKELEY AND RIVERSIDE AND OREGON STATE UNIVERSITY

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Abstract

This project is part of a search for possible electromagnetic (EM) earthquake precursors on the San Andreas Fault near Parkfield and Hollister, California. There have been a number of reports of anomalous EM signals preceding large earthquakes, and it has been suggested that such signals could be useful predictors of seismic activity. However the majority of these reports are speculative at best because they involve single observations associated with small, distant earthquakes, do not perform a thorough analysis for possible alternative sources of EM noise, and do not record any complementary geophysical signals such as strain or velocity changes. Our monitoring experiment attempts to address these deficiencies by making redundant measurements of both electric and magnetic field variations at multiple physical scales, over a period of years so that background signal and noise amplitudes are thoroughly characterized. The work at Oregon State University supports field efforts, with a focus on development and application of data processing methods. Our goal is to remove ionospheric and cultural EM noise, thus improving chances of detecting and better understanding the nature of any EM signals originating in the earth that might be associated with earthquakes. During most of this project period the focus of our efforts was on continued development and maintenance of a user friendly data processing system, which has been used both for data quality control, and for routine automated analysis of data with multivariate EM time series processing programs. Results from daily processing are archived for subsequent examination in the search for trends or anomalous events that might be correlated with earthquakes at Parkfield or Hollister. In September of 2004, near the end of the extended project period, the expected magnitude 6 Parkfield earthquake occurred, and our focus shifted to a search for evidence of EM precursors in the data. In our initial examination, we have found no clear evidence for changes in resistivity, or anomalous EM signals that can clearly be identified as precursors to the earthquake. More detailed and complete analysis of the full data set are currently underway.