

Title: Statistical analysis of ELF/VLF magnetic data from the DEMETER/IMSC instrument for large Earthquakes

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Using the triaxial search-coil magnetometer data in the ~1 Hz – 18 kHz frequency range from the low altitude (~710 km), high-inclination (~82°), DEMETER satellite, we perform a statistical search for magnetic signals that precede, coincide with, and succeed large earthquakes. We identify DEMETER passes that have occurred in a spatial region of radius ~3000 km around the epicenter, and -30 to +10 days around the time of large ( $M > 5$ ) earthquakes, and perform a superposed epoch analysis of the signal amplitude in various frequency bands as a function of distance and time. We then subdivide the superposed epoch analysis plane into a “near” (0-1000 km) and “far” (2000-3000 km) regions relative to each earthquake, and compute the ratio  $R = \text{near/far}$  signals to test for any proximity effects. Finally, we subdivide all our data into a number of time periods, and perform the above analysis in each period, finally checking for repeatability amongst each of the separate periods. The above analysis is repeated under a variety of conditions, for example, only testing for shallow earthquakes, dividing the earthquakes into 3 types (normal/reverse/strike-slip), or only considering intense ( $M > 6, 6.5$ , etc.) earthquakes. We present the results of our analysis with an extensive discussion of our methods.