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# Monitoring of the ULF Electrotelluric Noise at the Active Krupnik Fault System (Bulgaria)

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Since 25 July 2003 an apparatus for electrotelluric field measurements has been installed at the Krupnik seismic station (South-West Bulgaria) and put in operation [Boytchev and Nenovski,2003]. The apparatus is complemented with ULF electrotelluric field measurements conducted with sampling rate 5 measurements per second. The Krupnik seismic station is placed at the well-known active Krupnik fault system. Along this active long fault ($>$100 km length) 10 weak earthquakes (of magnitude M $<$ 3.5) in average are monthly observed. The goals of the conducted electrotelluric measurements are regular control of the Earth electric potential (EEP) variations and analysis of the reliability of ULF electrotelluric field variation data for an identification of pre-earthquake electromagnetic processes. The quasi-static EEP variation was measured in the interval 0-0.02 Hz. The ULF electrotelluric field variations are studied in the interval 0.002 to 2.5 Hz. Using the Hertz's vector approach it was concluded that the ULF electrotelluric field measurements have the advantage of recording weak signals of the earth electric potential (EEP) while their own magnetic field could not be discernible (below 0.1 nT)[Boytchev and Nenovski, 2003]. It has been shown that this method is viable at points whose underlining geological basis consists of low-conductivity rocky materials below 10-4 S/m). Analyzed are: i) the night-hour dispersion, and ii) the ULF noise activity in three frequency ranges: 0.001-0.003 Hz, 0.003-0.008, and 0.008-0.02 Hz. The dispersion was evaluated for every hour data set. As a rule, the obtained data dispersion usually exceeds one standart deviation niveau plus the mean data value evaluated for the chosen monthly interval in the following cases: i) in day-hours, and ii) in night hours and moderate and high geomagnetic activity. The measurements are illustrated with data analysis for several monthly intervals. The first month interval was 25 July-21 August 2003 and the others are in 2004. In these

intervals the geomagnetic activity was low to moderate with one exception- a recurrent geomagnetic storm occurred on 17 August 2003. We have used data set gathered in night hours only. A row of local weak earthquakes of 3.5 magnitude has been registered during these monthly intervals. Most of them struck however at distances ˜ 50 and more km from Krupnik. Among them one earthquake of magnitude 3.2 occurred at distance as close as 10 km from the Krupnik station on 15 August 2003. In this interval (on 14 August 2003) a great earthquake of Mw 6.3 struck during the Balkan peninsula. It occurred in Greece. The epicenter of this earthquake was at the Lefkada island ˜ 380 km away from Krupnik. Besides the geomagnetic activity-related ULF noise enhancements the data revealed a number of pulse-rate peaks which could not be correlated with the ULF magnetospheric, ionospheric, atmospheric events occurred in August 2003 at our latitudes. Simultaneous ULF magnetic field measurements at the Panagyurishte and L'Aquila magnetic observatories confirmed a geophysical activity quietness. The Krupnik electrotelluric field mesurements indicated however that the ULF noise activity shows anomalous behavior on day 225 (13.08.2003). This day precedes the great Lefkada earthquake and the local one on 15 August 2003. In all night hours just before the Lefkada earthquake occurred at 05:14:55 UT the dispersion was above the mean dispersion. This unusual behavior was preceded by very low dispersion conditions on days 11 and 12 August 2003.