



Possibility of resonant amplification of VLF electromagnetic radiation, near Tskaltsminda-Ureki area, associated with seismic activity

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A retrospective analysis was done for spectral characteristics of VLF (Very Low Frequency) electromagnetic radiation during earthquake swarm with low and medium magnitude earthquakes ($M = 4.1 - 5.7$), that occurred in December 21-27 2012 in the Black Sea near the coast of Republic of Georgia (center at $N42.40^\circ$, $E41.00^\circ$). VLF observation antenna system frequency range at Tbilisi State University Ionosphere Observatory in Tabakhmela (near Tbilisi, $N41.655^\circ$, $E44.754^\circ$) is 16-23 kHz. For example, at 18 kHz channel, during earthquakes signal intensity increased by about an order of magnitude (about 20 db). However, propagation of VLF electromagnetic radiation through a well-conducting salt water environment of considerable thickness is unlikely. In such a case, attention should be paid to the contact of fault system with sea coast existing in earthquake zone. It is also necessary to have another agent providing inductive communication with the shore. In our opinion, the telluric currents generated in the hypocentral area of earthquakes can serve as such an agent. This assumption is supported by existence of local magnetic anomaly at coastal zone in Tskaltsminda-Ureki ($N42.031^\circ$, $E41.741^\circ$) curort, the physical qualities of which can contribute to the resonant emission of VLF electromagnetic waves generated in the hypocentral zone. The specific geophysical characteristics of this place probably add up due to interrelated factors: magnetite-rich sands from western part of the Adjara-Trialeti fold and thrust belt, carried by the Supsa river; seepage of seawater to the coastal area; the polarization effect arising from the movement of a conducting fluid in a magnetized porous rock. As a result, the accumulation of free and associated polarization charges and their relaxation through telluric currents and VLF electromagnetic radiation is possible.

In this work we also present VLF electromagnetic signal data acquisition system at Ionosphere Observatory and used data analysis method.

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