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Earthquake precursors' detection from space – Possible mission analysis

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The ionospheric precursors of earthquakes (EQ) are now the recent challenge in this hazard evaluation. The future space missions optimized for the study of these precursors are under wide discussion nowadays. There is necessary to answer two important questions before to plan any experiment to study ionospheric precursors of EQ. First one – whether the variations in the ionosphere definitely connected with the EQ preparation process do exist, and the second one – if they do, whether using these signals, the precursors of EQ can be reliably identified and used for, if not prediction, for the warning that the EQ in the given area approaches. To answer these questions, the available information about the EQ-connected signals collected in former spatial experiments, mainly in DEMETER, is analyzed. Possible mechanisms of energy transfer from EQ preparation area to the ionosphere are reviewed and the mostly supported ones - FWC and AGW – are discussed. Most probable, real lithosphere-atmosphere-ionosphere coupling includes several mechanisms and in dependence of momentary factors one or other prevails. The main physical values are proposed which would be advisable to monitor in the planned spatial mission in order to try to increase the EQ precursors' detection rate. The instrumentation composition for such study is discussed and it is stressed that the monitoring of such parameters has to be made minimum in two, better in three points. The very low price multi-points space experiment realization possibility is discussed.

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WDR-based bandpass filters and an intelligent system for their optimal design

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Bandpass filters in send/receive systems, protect the receivers from spurious emissions, split broadband signals to separate channels for better handling, stabilize local oscillator frequencies, etc. Among the known filter designs, the original filters based on partially-filled WDRs are distinguished for their high quality and sparse spectrum of spurious modes; they can be a basis for creation of ultra-wideband, millimeter and sub-millimeter devices. Being constructed with superconducting materials in combination with quartz and leucosapphire, they have no competitors in terms of overall quality indices. We show that the advantage of WDR filters consist in selective properties and discuss the ways of their adaptation to planar technologies. It was demonstrated that electrodynamic properties of WDR filters allow creating devices ranging from narrow to ultra wide passbands. But development of high quality filters largely depends on how much the CAD systems are able to optimize the filter construction basing on such criteria as steepness of the frequency response curve, out-of-band suppression value and maximum achievable bandwidth. Since the known CAD systems lack such functions, we propose an original knowledge-based CAD program implementing the strict electrodynamic models of coupled resonators obtained using generalized scattering matrix method.

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