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Investigation of the Type of Radio Emissions from Sources of Radio Emissions Such as: Seismo-Ionospheric Communications, Galactic Background, "Swan-A" and "Cassiopeia-A" By Vertical Ionospheric Sounding at a Wavelength of 4.2 M

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Abstract

Vertical ionosphere sounding of seismic hazard assessment has carried out. The structure and system specifications of the vertical sounding of the ionosphere studied at a wavelength λ= 4,2 *m*. Opportunities were done to improve the sensitivity of the interference of the radio telescope with digital data observations for studing the seismic hazard assessment symptoms and the nature of change of flux density of the radio sources Swan-A and Cassiopeia-A. Earthquake in time-series have been studied using ionosphere tools which are aimed at earthquake precursors apportionment displays and preparation of Nakhichevan (Azerbaijan, 02.09.08, M = 5.1). There were received some results, allowing to make out the difference of seismogenic anomalies of ionosphere between the longer anomalies connected to magnetic activity of ionosphere by the method of vertical reconnaissance of ionosphere. Results of the analysis observation have confirmed communication between earthquakes magnitude M ≥ 3.5 and absorption of a radio-emission of discrete radiation sources radio atmospheric observations dependence between.

Keywords: Ionosphere, Radio Telescope, the Interference Harmonica, Digital Analysis

Introduction

Seismic hazard assessment is carried out by continuous recording of various (electromagnetic, geomagnetic, ionospheric, etc.) symptoms in the hazard zone. In a number of works [Barsukov,1991], models of the excited ionosphere are proposed in connection with the anomalous growth of the lithospheric-ionospheric interaction. The radio astronomical method of vertical sounding of the ionosphere unambiguously embraces the earthquake preparation zone is highly informative thanks to a sensitive radio telescope. Below are the structure and technical parameters of the radio telescope, as well as an analysis of the results of observations.

The ionosphere is called the upper ionized layers of the Earth's atmosphere D (60-90), E (100-120), F1 (160-180), F (300-450) *km*. Compared to oblique ionospheric sounding, its vertical sounding method has the following main advantages [Martirosyan1 et.al.,2006].

- The radio astronomical method of vertical sounding evenly covers the zone of preparation of a seismic event in contrast inclined sounding, where the receiving device is located - a radio telescope.
- Vertical sounding of the ionosphere mainly includes the image of complete changes in all its layers during the preparation of a seismic event, and oblique sounding - changes that are reflected only in its lower parts.
- In contrast to the methods of radio reception used in radar and communication technology, significantly different requirements are imposed on receiving systems for

radio astronomy observations, due to the nature of the received useful signal and its typical characteristics associated with its intensity.

- This radiation has a noise character: the spectral composition of the internal noise of such receivers does not differ from the noise of the receivers themselves, the radiation spectrum is constant in the receiver bandwidth.
- The power of the useful signal, due to the radio emission of a cosmic source, in the antenna output of the telescope is much less than the power of the intrinsic internal noise of the receiver, even in the case of antennas with a very large collecting surface.
- In addition to the low intensity and noise nature of the radiation of a radio source, it is often necessary to take into account its spatial distribution, the nature of polarization, etc. The choice of appropriate sources of cosmic radio emission is very important for conducting radio astronomy studies of vertical sounding of the ionosphere.

The main requirements for the selected radio sources are as follows:

- A radio source in a given geographical area of radio observation should be visible in the sky during the day, for as long as possible, and it should have an angular height close to the zenith of the given place (a mandatory condition for vertical sounding).
- The equatorial coordinates of the radio source (α, δ) must be known with sufficient accuracy for a given time.
- The radiation spectrum of the source must be well studied over a wide frequency range. It is desirable that its radiation flux density (S) be constant over time.
- The apparent angular dimensions of the radio source must be at least one order of magnitude smaller than the antenna system beamwidth for the radio source to be considered a point source

It is desirable that the radiation from the radio source be unpolarized.

Program and methodology of observations

Observations were made daily, nine hours long enough for both sources to pass through the radiation pattern of a fixed radio telescope in the interval $17h\ 30m \leq \alpha \leq 26h\ 30m$ of the right ascension of the source. Joint Registration radio emission from the Galactic background and discrete radio sources is carried out both in analog form - on a tape recorder and in the form of a digital series - in computer memory.

Filtering

The power digital filter amplifies the variable component of the cosmic radio source signal recorded after the detector, in this case, its spatial harmonic. Moreover, the greater its amplitude, the more it is amplified, and the selectivity of the system improves accordingly.

On Figure 1 shows the observations of the radio emission from discrete radio sources Swan-A and Cassiopea-A before the Nakhichevan (Azerbaijan, 02.09.08, M = 5.1) earthquake (Saravand station). On September 02, 2008, a decrease in the power value of Cassiopea-A discrete radio sources was registered, which may be associated with seismic activity.

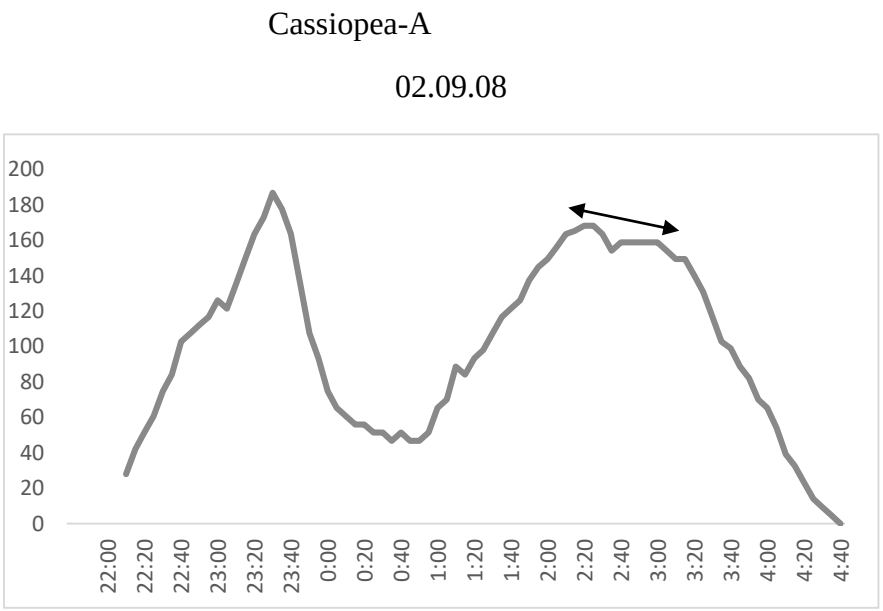

Fig 1. Radio astronomical observation of radio emission from discrete radio sources Swan-A and Cassiopea-A to Nakhichevan (Azerbaijan, 02.09.08, M = 5.1) earthquake (Saravand station).

Conclusion

The results of everyday, long - term observations presented in fig1. confirm the fact of the preparation of an earthquake with a magnitude $M \geq 5.1$ and the absorption of radio emission in the excited ionosphere, which can be explained by the deterioration of the radio transparency of the ionosphere due to the electromagnetic radiation of the deformed soil in the earthquake zone.

The encouraging results obtained substantiate the need for further studies of the seismo-ionospheric relationships of the vertical sounding method.

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