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Non-linear processes in the Earth atmosphere boundary layer

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The work is connected with studying electromagnetic fields in the resonator Earth-Ionosphere. There is studied the interconnection of tide processes of geophysical and astrophysical origin with the Earth electromagnetic fields. On account of non-linear property of the resonator Earth-Ionosphere the tides (moon and astrophysical tides) in the electromagnetic Earth fields are kinds of polyharmonic nature. It is impossible to detect such non-linear processes with the help of the classical spectral analysis. Therefore to extract tide processes in the electromagnetic fields, the method of covariance matrix eigen vectors is used. Experimental investigations of electromagnetic fields in the atmosphere boundary layer are done at the distance spaced stations, situated on Vladimir State University test ground, at Main Geophysical Observatory (St. Petersburg), on Kamchatka pen., on Lake Baikal. In 2012 there was continued to operate the multichannel synchronic monitoring system of electrical and geomagnetic fields at the spaced apart stations: VSU physical experimental proving ground; the station of the Institute of Solar and Terrestrial Physics of Russian Academy of Science (RAS) at Lake Baikal; the station of the Institute of volcanology and seismology of RAS in Paratunka; the station in Obninsk on the base of the scientific and production society "Typhoon". Such investigations turned out to be possible after developing the method of scanning experimental signal of electromagnetic field into non- correlated components. There was used a method of the analysis of the eigen vectors ofthe time series covariance matrix for exposing influence of the moon tides on Ez. The method allows to distribute an experimental signal into non-correlated periodicities. The present method is effective just in the situation when energetical deposit because of possible influence of moon tides upon the electromagnetic fields is little. There have been developed and realized in program components in the form of PAS instruments of processes of geophysical and man-triggered nature; to predict the presence of the features of geophysical nature in the electromagnetic field of the atmosphere boundary surface layer; to study dynamics the analyzed signals coming from the geophysical and man-triggered sources in the electrical and magnetic fields of the atmosphere boundary surface layer; to expose changes of the investigated time series in the periods preceding the appearance of the predicted phenomena; to form clusters of the time series being the features of the predicted events. On the base of the exposed clusters of the time series there have been built the predicting rules allowing to coordinate the probability of appearing the groups of the occurred events. The work is carried out with supporting of Program FPP №14.B37.210668, FPP №5.2071.2011, RFBR №11-05-97518.