Theory of complex seismic and electromagnetic active methods for mapping and monitoring

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The problem of development complex geophysical methods become more and more actual because the deriving of geological problems solution becomes more complicated. By using simultaneously some geophysical methods it is needed the space matching of the systems of observation and developing joined interpretation algorithms. In the Institute of geophysics UD RAS it is elaborated a joined 3-D method of observation with use of electromagnetic and seismic fields (in dynamical frequency-space variant), which is based on the joined conception of three staged interpretation, A.Yu.Khachay,2006 c, O.A.Hachay, 2000 a,b, 2001,2003, which includes the joined system of vector observation of seismic and electromagnetic fields. There are used locale controlled sources of excitation, for which are satisfied such conditions: a) the common geometry of the normal field, b) the absence of one or some components in the measured field for the case of quasi-layered medium. We had realized the variant of electromagnetic field excitation by a vertical magnetic dipole and seismic field by the vertical force. The unique approach in the interpretation is realized for previously processed data as such: seismic data are transformed from the time space to the frequency space using the Laplace (for the real transformation parameter), and the electromagnetic data using the Fourier transformation (for the real frequency) O.A.Hachay 2000 b. Using that common method by providing natural experiments we become an opportunity to make a quantitative estimation of the information comparability of different fields about the structure and physical features, which follows from the criterion of similarity of the observation systems. In the papers A.Yu.Khachay,2005, O.A.Hachay,2006 is written the idea of the construction of the criterion of similarity for seismic and electromagnetic fields from the singular sources, which are equivalent to the local object event in the observed fields. By the way the object in the seismic field is approximated by a plunged horizontal point force in the n-layered elastic isotropic half-space, for the electromagnetic field-that is a plunged horizontal magnetic dipole in to the n-layered isotropic conductive half-space. The choice of the singular sources is defined by the similarity of the morphology of created by them fields with perpendicular directed moments of the electromagnetic and seismic singular sources. It is elaborated an iteration algorithm of calculation of the electromagnetic and seismic field by the arbitrary location of the anomaly sources in the n-layered medium A.Yu.Khachay, 2006 a-c. In that paper are derived integral equations and integral differential equations of 2-D direct problem for the seismic field in the dynamical variant, using the approach from the papers V.I.Dmitriev,1965, V.D.Kupradze,1959 and had been provided the joint analysis of the integral equations for 2-D problems for electromagnetic and seismic fields. The received results can be used for definition of the complex criterions of achievement the research of high complicated medium both with seismic and electromagnetic methods.