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# Alternative theory to overcome drawbacks of the standard inversion of seismic data

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Standard least squares method gives the possibility to cope with overdetermined inconsistent systems of linear equations. It is accepted that the more measurements will participate in the general inversion,the better solution will be obtained. However seismic data is special case of geophysical observations, which in practice have a large range of values of measurements for similar seismic traces. The processing of such contradictory observations together can lead to the lost of the adequate solution. In order to avoid the problem we use the differentiated approach that subdivides measurements into sets (sub-systems), which are formed by means of clusters of seismic activity and the different registration stations. This means that the initial matrix is divided into cells, each of which is non-sparse matrix and it has the lower order. The inversion of the subsystem is performed by using the methods, which are distinctive from the least-square technique. In the case of the sufficient number of independent observations we use the traditional algebraic method to build the basic minor of matrix, which provides the consistency of the sub-system. In the case when the seismic observations repeat each other (the sub-system becomes underdetermined) we apply the CSSA technique, previously developed. The stable solution is found on the base of the comparing outcomes of sub-systems for a given block. Testing results show that the differentiated approach is more reliable when overdetermined inconsistent system is solved. When we have deal with underdetermined system and consequently with the problem of the nonuniqueness of solutions, we can obtain the solution, which differs from the standard. However our solution accurately satisfies to the observation data and thus it also becomes the candidate for the correct inversion result. The effectiveness of new approach compared with the standard methods had been confirmed by applications both approaches to the synthetic and the real data of local earthquakes in the Western Nagano main fault area (Central Japan) and to the seismic data of the Grimsey Lineament and the Husavík-Flatey fault in the Tjörnes Fracture Zone (north of Iceland).