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Selection criterion of stable magnetotelluric impedance estimation using rotational invariant analysis

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Precise and accurate determination of the magnetotelluric (MT) impedance is fundamental to valid interpretation. The standard practice of MT impedance estimation is the use of least square, robust and CWE (Egbert, 1997; Egbert&Livelybrook, 1996;) processing in conjunction with the remote referencing (Chave&Thomson, 1989; Gamble,Goubau,Clarke, 1979). These computational procedures provide qualitatively different estimations of transfer functions and current tendency to verify quality mainly consists of looking at the sounding curve smoothness, error bars and calculating parameters like coherencies, statistical errors and S/N ratio.
WAL invariant analysis has been proper developed to derive dimensional information from MT. Standing the observation that it fails (occurrence of undetermined cases) are strongly correlated to the presence of noise, in this work we propose a further criterion to ascertain transfer function quality based on WAL dimensionality assessment, taking into account experimental errors in the data (Martì et al., 2004). We will discuss the application of two main strategies developed by the above idea.
Firstly it can be used to discriminate the best one among different types of statistical approach on the same data set. Some examples are shown for which different types of statistical approach on the same data set lead to comparable quality of the estimate in terms of smoothness and errors, but some of them fail in an undetermined case in some frequency band. It will be shown that these estimates can be discarded even by independent information. Application of such analyses to a data set collected along a profile on Mt. Etna where the short sounding spacing used (50-100m) allowed us to further control quality of data by comparison with adjacent soundings.
Secondly by introducing this supplemental criterion to pre-select data windows during the estimation procedures, even least squares than robust.