



M-Split: A Graphical User Interface to Analyze Multilayered Anisotropy from Shear Wave Splitting

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Shear wave splitting analysis are commonly used to infer deep anisotropic structure. For simple cases, obtained delay times and fast-axis orientations are averaged from reliable results to define anisotropy beneath recording seismic stations. However, splitting parameters show systematic variations with back azimuth in the presence of complex anisotropy and cannot be represented by average time delay and fast axis orientation. Previous researchers had identified anisotropic complexities at different tectonic settings and applied various approaches to model them. Most commonly, such complexities are modeled by using multiple anisotropic layers with priori constraints from geologic data. In this study, a graphical user interface called M-Split is developed to easily process and model multilayered anisotropy with capabilities to properly address the inherited non-uniqueness. M-Split program runs user defined grid searches through the model parameter space for two-layer anisotropy using formulation of Silver and Savage (1994) and creates sensitivity contour plots to locate local maximas and analyze all possible models with parameter tradeoffs. In order to minimize model ambiguity and identify the robust model parameters, various misfit calculation procedures are also developed and embedded to M-Split which can be used depending on the quality of the observations and their back-azimuthal coverage. Case studies carried out to evaluate the reliability of the program using real noisy data and for this purpose stations from two different networks are utilized. First seismic network is the Kandilli Observatory and Earthquake research institute (KOERI) which includes long term running permanent stations and second network comprises seismic stations deployed temporary as part of the “Continental Dynamics-Central Anatolian Tectonics (CD-CAT)” project funded by NSF. It is also worth to note that M-Split is designed as open source program which can be modified by users for additional capabilities or for other applications.