Geophysical Research Abstracts
Vol. 19, EGU2017-6911-1, 2017
EGU General Assembly 2017


# Rayleigh wave dispersion curve inversion by using particle swarm optimization and genetic algorithm

Ersin Buyuk (1), Ekrem Zor (2), Abdullah Karaman (1,2)

(1) Istanbul Technical University, Department of Geophysics, Maslak 34469, Istanbul, Turkey (ebuyuk@itu.edu.tr) (karaman@itu.edu.tr), (2) Earth and Marine Science Institute, TUBİTAK, Marmara Research Center, Gebze-Kocaeli Turkey (ekrem.zor@tubitak.gov.tr) (abdullah.karaman@tubitak.gov.tr)

Inversion of surface wave dispersion curves with its highly nonlinear nature has some difficulties using traditional linear inverse methods due to the need and strong dependence to the initial model, possibility of trapping in local minima and evaluation of partial derivatives. There are some modern global optimization methods to overcome of these difficulties in surface wave analysis such as Genetic algorithm (GA) and Particle Swarm Optimization (PSO). GA is based on biologic evolution consisting reproduction, crossover and mutation operations, while PSO algorithm developed after GA is inspired from the social behaviour of birds or fish of swarms. Utility of these methods require plausible convergence rate, acceptable relative error and optimum computation cost that are important for modelling studies. Even though PSO and GA processes are similar in appearence, the cross-over operation in GA is not used in PSO and the mutation operation is a stochastic process for changing the genes within chromosomes in GA. Unlike GA, the particles in PSO algorithm changes their position with logical velocities according to particle's own experience and swarm's experience. In this study, we applied PSO algorithm to estimate S wave velocities and thicknesses of the layered earth model by using Rayleigh wave dispersion curve and also compared these results with GA and we emphasize on the advantage of using PSO algorithm for geophysical modelling studies considering its rapid convergence, low misfit error and computation cost.