

## **Inversion of the Spectral Analysis of Surface Waves Dispersion Curves through the Particle Swarm Optimization Algorithm**

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**Abstract :** In this investigation, the particle swarm optimization (PSO) algorithm is used to perform the inversion of the dispersion curves in the spectral analysis of surface waves (SASW) method. This inverse problem usually presents complicated solution spaces with many local minima that make difficult the convergence to the correct solution. PSO is a metaheuristic method that was originally designed to simulate social behavior but has demonstrated powerful capabilities to solve inverse problems with complex space solution and a high number of variables. The dispersion curve of the synthetic soils is constructed by the vertical flexibility coefficient method, which is especially convenient for soils where the stiffness does not increase gradually with depth. The reason is that these types of soil profiles are not normally dispersive since the dominant mode of Rayleigh waves is usually not coincident with the fundamental mode. Multiple synthetic soil profiles have been tested to show the characteristics of the convergence process and assess the accuracy of the final soil profile. In addition, the inversion procedure is applied to multiple real soils and the final profile compared with the available information. The combination of the vertical flexibility coefficient method to obtain the dispersion curve and the PSO algorithm to carry out the inversion process proves to be a robust procedure that is able to provide good solutions for complex soil profiles even with scarce prior information.

**Keywords :** dispersion, inverse problem, particle swarm optimization, SASW, soil profile

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