THE EFFECT OF A DIPPING LAYER ON P WAVE TRANSMISSION

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A ray theory for the multiple reflection solution of plane waves propagating in a wedge overlying a half space is developed and evaluated as the parameters velocity contrast, crustal thickness, angle of emergence, angle of dip, and spectral resolution are varied individually.

An objective method for determining the "best fit" is developed using the correlation coefficient. This technique is employed to determine the theoretical error in the depth determination that might be expected if one applies the Haskell-Thomson one layer model to an earth with a dipping one layer crust. The errors are evaluated for two representative angles of emergence as the dip varies and are found to be less than ±7% in all cases. However, there are a number of cases of "no fit".

A series of model experiments are conducted as a test of the ray theory, and to measure the accuracy attainable in the crustal thickness determinations by fitting transfer functions. It is demonstrated that the theory adequately describes the physical processes in the model within the approximations of the experiments themselves. The accuracy

of the thickness determination for the experiments is about ±1%.

The ray theory is also applied to crustal transfer functions obtained from South American stations. The crustal thickness at Antofagasta, Chile is found to be 46.1 km dipping 5°E, and at Naña, Peru a fit is found for a crust 74.7 km thick dipping 15°SE.