SURFACE WAVE STUDIES ACROSS THE EASTERN INDIAN OCEAN WITH APPLICATION OF NEURAL COMPUTING TECHNIQUES

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A Digest Presented to the Faculty of the Graduate School of Saint Louis University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

1990

DIGEST

Single station fundamental-mode Rayleigh and Love wave group and phase velocities collected across the eastern Indian Ocean were used to divide the area into four regions corresponding to ocean floor age of 22.5, 55.5, and 75.0 million years. The Love wave phase and group velocities showed the clearest regional separation. Azimuthal anisotropy could not be detected with the data set, possibly because of the restricted azimuthal coverage. Regionalized inversion produced shear velocities in the lithosphere similar to velocities found for the Pacific lithosphere for regions having similar ages.

A separate geographic regionalization was carried out for the study area based upon available great-circle dispersion paths. Simultaneous inversion of these data requires polarization anisotropy if both Love and Rayleigh waves are to be explained by a single shear velocity model.

In the second part of this dissertation, a technique based upon neural network learning was applied to the estimation of earthquake focal depths from observed amplitude spectral ratios of surface waves. The network learning utilized mapping relationships between the spectral ratios of fundamental-mode synthetic Love to Rayleigh wave spectra and corresponding source depths. Focal depths estimated for the New Brunswick earthquake of 09 Jan 1982 and three of its aftershocks were consistent with those reported by others.

Two southern Indian Ocean events were also chosen for depth estimation. The depth of one of the events agreed within ±2.5 km of the reported centroid depth and the ISC reported depth from body wave phases. The estimated depth of the other event also agreed with the depths assumed for that region by the NEIS. A noise tolerance test conducted on the networks implied that it might even be possible to use observed spectral ratios with low signal-to-noise ratio for depth estimation.