REGIONAL VARIATION
OF
CRUST AND UPPER MANTLE STRUCTURE
BENEATH
NORTHERN CANADA AND THE ARCTIC OCEAN
FROM
SURFACE WAVE INVERSION

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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 Master of Science (Reasearch)

1986

DIGEST

Rayleigh-and Love-wave group velocities have been determined for several paths across northern Canada as well as a portion of the Arctic ocean. The shield and platform regions, eastern Sverdrup basin, and western Sverdrup basin are characterized by progressively lower velocities. Inversion of the regionalized group velocity data lead to three distinct shear-velocity models. The shield and platform model is similar to earlier models obtained for the Canadian shield. The Sverdrup basin models have low near-surface velocities which may correspond to thick accumulations of sediment. A sediment thickness not greater than 12 km is thus inferred for the eastern basin. An even thicker zone of near-surface low velocities occurs in the upper crust of the western basin. This zone may either represent the true thickness of a very deep basin or slow velocities in basement rock may underlie the shallower sediments. A third alternative is that low apparent velocities for the western Sverdrup basin result from systematic errors in group velocity determinations produced by epicentral mislocation or origin time error of the earthquake used, but such mislocations or origin time errors would have to be quite large to explain the observations. It is not possible to explain the group velocities across the basin areas by simply adding sediments to the shield and platform model. The resulting discrepancies with the observed data suggest an altogether different crustal structure beneath the basin than that beneath the shield and platform areas.

Surface-wave paths used to study the Arctic ocean travel through several different structures, which are continental, oceanic, or transitional in character. After the effects due to the portions of path through

northern Canada and the Fram basin have been removed, the corrected group velocities still show large scatter in their values. This forced us to arbitrarily separate the available paths into three groups and a shear-velocity model was obtained from inversion of the corrected Rayleigh-wave group velocities of each group. Two of the resulting models, which cover a region that is mostly within the Arctic ocean, are similar and the other model, which covers a region close to and including the Canadian shelf, is characterized by thick low-velocity sediments.