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VII.3 Lateral Variation in the Structure of the Upper Mantle beneath Eurasia

In a previous study, King and Calcagnile (1976) constructed a detailed, extensive and exceptionally clear record section from recordings at NORSAR of presumed explosions in continental Russia. This section exhibits two distinct (T, Δ) triplications of which the more noteworthy is the extension of the first arrival branch for $\Delta \lesssim 21^\circ$ as a secondary arrival to a distance of about 33° .

A similar study of NORSAR records augmented by some 80 records from the Eskdalemuir array, has been completed for rays bottoming beneath southern and central Europe. The results of this study differ markedly from those of King and Calcagnile (1976) in two respects: not only is there a pronounced difference in the uppermost mantle between the two regions (down to ~ 200 km) which is reflected in the difference between first arrival travel time curves for Europe and Russia (England and Worthington, 1976), but there also exist differences in the secondary arrivals at distances $\gtrsim 21^\circ$ which indicate lateral heterogeneity to considerable depths below Eurasia.

In particular, there is no trace of the very clear A-B branch of King and Calcagnile in the European data and the only arrivals which could be interpreted as lying on such a branch are weak and laterally discontinuous. This result is interpreted as evidence for a lateral variation in the velocity structure at least to the depth of 500 km beneath the two regions. Figs. VII.3.1 and VII.3.2 show the difference between the model of King and Calcagnile (1976) (KCA) and the preferred model of this study (EKW), and the extremal bounds on the two models based on the first arrival travel times of England and Worthington (1976).

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References

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England, P.C.*, and M. Worthington (1976): The travel time of P seismic waves in Europe and Western Russia, Submitted to Geophys. J.R. astr. Soc.

King, D.W.**, and G. Calcagnile (1976): P-wave velocities in the upper mantle beneath Fennoscandia and Western Russia, Geophys. J.R. astr. Soc., in press.

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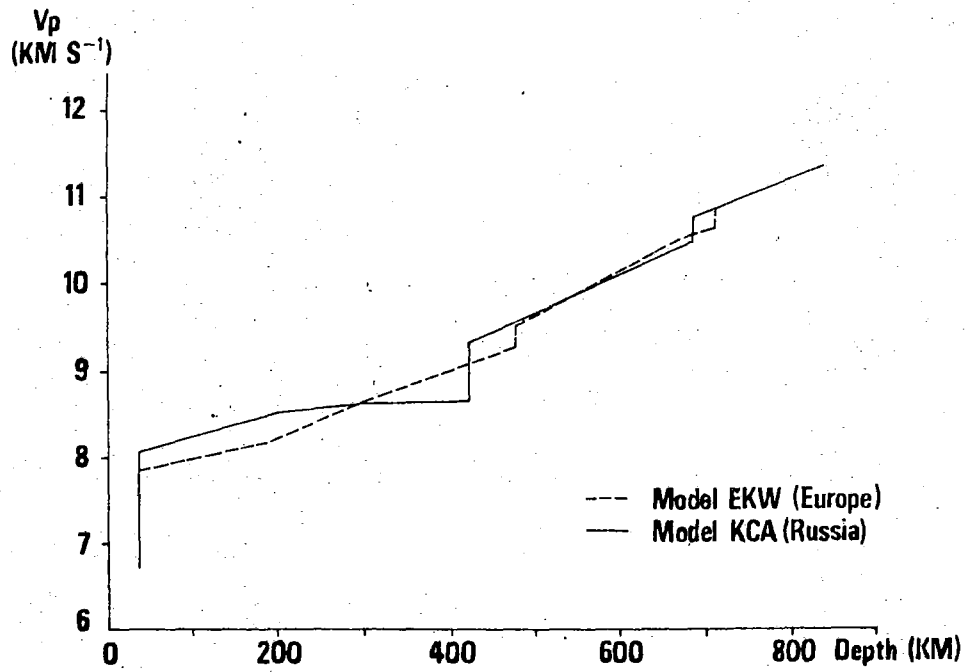


Fig. VII.3.1 Models resulting from the inversion of the travel time data of the two studies mentioned above.

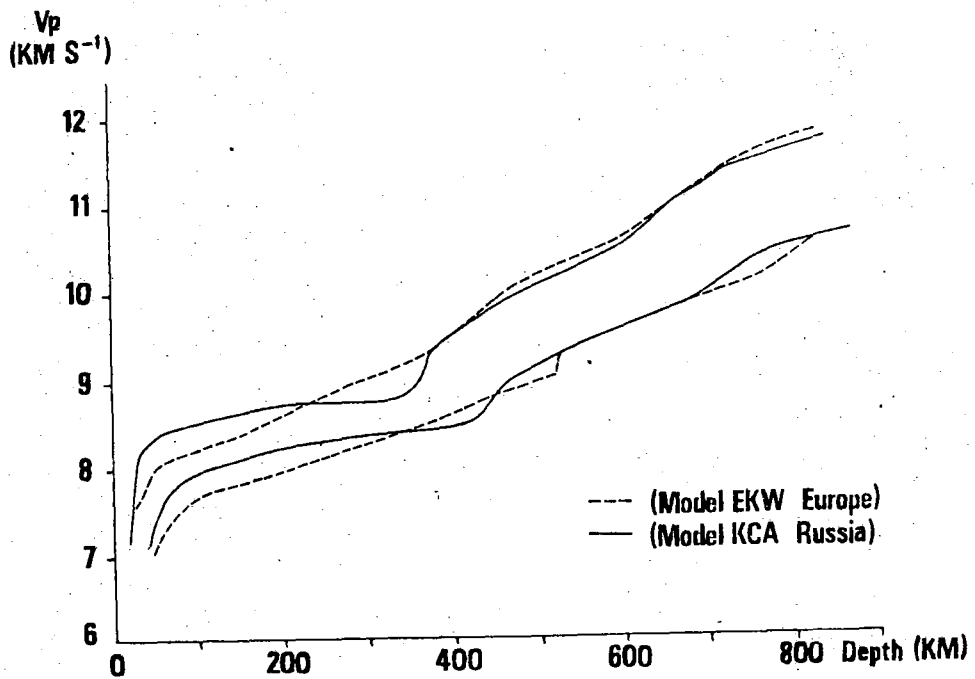


Fig. VII.3.2 Extremal bounds for the models EKW and KCA shown in Fig. VII.3.1.