

A STUDY OF MEAN WAVE PROPAGATION  
IN RANDOM ELASTIC MEDIA

by

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In this study, Keller's method of smooth perturbations(1) for random elastic medium with small deviation  $\epsilon$  from homogeneity is used. The non-trivial solution of the mean wave equation is obtained by equating the determinant of the coefficients to zero. The mean plane wave systems are found to be uncoupled and dispersive up to an order of  $\epsilon^2$ . These approximate dispersion relations are then analyzed for the special type of medium whose properties conform to the following conditions: The density of the medium is deterministic though Lamé's constants  $\lambda$  and  $\mu$  are random. The fluctuations are small so that one is permitted to write  $\lambda = \lambda_0 + \epsilon \lambda_1$ ,  $\mu = \mu_0 + \epsilon \mu_1$ , where  $\lambda_0$ ,  $\mu_0$  are constants while  $\lambda_1$  and  $\mu_1$  are centered random functions of the single Cartesian co-ordinate,  $z$ . Stochastically, the processes generated by  $\lambda_1$  and  $\mu_1$  are statistically homogeneous and further they are assumed to be band-limited white noise process. Under these considerations the mean waves are found to be dispersive but non-attenuated. The dependence of the phase velocities on the azimuth of the unit wave vector  $\theta$ , for both P- and S-waves are analyzed numerically. It is observed that for various models of hard and soft soil deposits, similar to that of Gürpınar et al(2), treated as random elastic media for ranges of  $\theta$  less than  $30^\circ$  and for larger values of  $\theta$  with peaks occurring near  $60^\circ$ , P- and S-waves have larger deviations from homogeneity. On the average S-waves and soft soil deposits are seen to be more affected by the random inhomogeneities.

REFERENCES

1. Keller, J.B., "Wave Propagation in Random Media," Proc. Symp. Appl. Math., 13, p. 227, American Math. Soc., Providence, Rhode Island, 1962.
2. Gürpınar, A., Özgür, D., and Ç. Soydemir, "Influence of Soil Conditions on Earthquake Acceleration Spectra," TBTAK MAG-339, Pub. No. 278, The Scientific and Technical Research Council of Turkey, 1975. (In Turkish)

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