BEAM DISPLACEMENT AND THE DEVELOPMENT OF RAY MODELS

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Beam displacement arises when waves are reflected from an interface for which the phase of the reflection coefficient is a function of angle. The inclusion of beam displacement was important in reconciling ray and normal mode results for low frequency underwater sound propagation and showed that ray theory was more versatile than was initially thought. The ray approach emerges from asymptotic evaluation of integrals and is necessarily approximate. The approximations can be avoided by full evaluation of the integrals in the complex plane and this led to an important solution of the benchmark wedge which confirmed that backscatter in the wedge was negligible. Further work on ray theory has led to wavefront modelling which is fast and handles head waves, range dependence and reflection from surface waves. The development of ray theory with beam displacement will be reviewed and its connection with recent results in wavefront modelling will be discussed.