REGIONS OF INVALIDITY OF RAY-CENTRED COORDINATES

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Ray-centred coordinates, which are discussed in detail by Červený (2001), are used in seismology for both theoretical arguments and raytracing computations. Investigations of their regions of validy/invalidity allow us to avoid computational problems and to ensure the correctness of theoretical statements. The improper use for theoretical conclusions can easily pass unnoticed. Notably, in their seminal paper, Dahlen et al. (2000) argue that ray theory is a reduction of the recently introduced, and commonly used, Fréchet-kernel formulation. Their argument requires integration over the entire space and, consequently, over entire normal planes in ray-centred coordinates. Dahlen et al. (2000) suggest that the infinite limits of integration are purely formal, since the support of the integrand is limited to the proximity of the ray. However, as we show, the region of invalidity may even be adjacent to the ray itself.

In this presentation, we question the validity of the aforementioned reduction, not the validity of the Fréchet-kernel formulation, which allows for proper description in the regions for which ray-centred coordinates are not valid.

References

Červený, V., 2001. Seismic Ray Theory, Cambridge University Press.

Dahlen, F.A. and Hung, S.-H. and Nolet, G., 2000. Fréchet kernels for finite-frequency traveltimes - I. Theory, *Geophys. J. Int.*, **141**, 157-174