

One D case MRN065 1D Tomography with unknown origin time.

$$\delta T_0(z) + \int_0^z \delta s(\xi) d\xi = \delta T(z)$$

perturbation in origin time + integrated perturbation in slowness = perturbation in arrival time

if $\delta T_0(z)$ known (for all z)

$$\int_0^z \delta s(z) dz = \delta T(z) - \delta T_0(z)$$

and $\delta s(z) = \frac{d}{dz} [\delta T(z) - \delta T_0(z)]$

so problem has unique solution.

but when $\delta T_0(z)$ unknown, then choice

$\delta s(z) = -\frac{d}{dz} \delta T_0(z)$ is evidently a

null solution, since

$$\delta T_0(z) + \int_0^z \left[\frac{d}{d\xi} \delta T_0(\xi) \right] d\xi$$

$$= \delta T_0(z) - \delta T_0(z)$$

$$= 0$$

So in the 1D case, assumption of unknown origin time adds to the problem a nonuniqueness not present in case where origin time is specified.

