

# Comparison of SLBM and TauP

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To assess the calculation accuracy of the SLBM travel time calculator, I populated a slbm model file with a radial 1D model that had crustal structure and velocity of the top of the mantle similar to those of the IASP91 model but with variable mantle gradients ranging from  $-0.001$  to  $0.005 \text{ sec}^{-1}$ . I also constructed similar models that were compatible with the TauP Toolkit software of Crotwell et. al.

First, I specified a fixed receiver location and a series of source locations located at zero depth and distances ranging from zero to 20 degrees from the receiver. Figure 1 shows plots of SLBM travel time minus TauP travel time for a range of mantle gradients ranging from zero to  $0.005 \text{ sec}^{-1}$ .

Next, I specified a single fixed receiver location and a grid of source locations that ranged from 0 to 20 degrees in distance and from 0 to 400 km in depth. Figures 2 through 8 show a comparison the SLBM and TauP calculations. The color contours are the difference SLBM travel time minus TauP travel time, in seconds. The black lines are contours of equal  $C * H$  where  $C$  is the value whose product with the mantle velocity gives the mantle velocity gradient (see Zhao for details).  $C$  has units of  $\text{km}^{-1}$ .  $H$  is the depth of the turning point of the ray below the Moho. Zhao indicates that his method is valid for  $C * H \ll 1$ . The plots are truncated where  $C * H > 0.2$ .

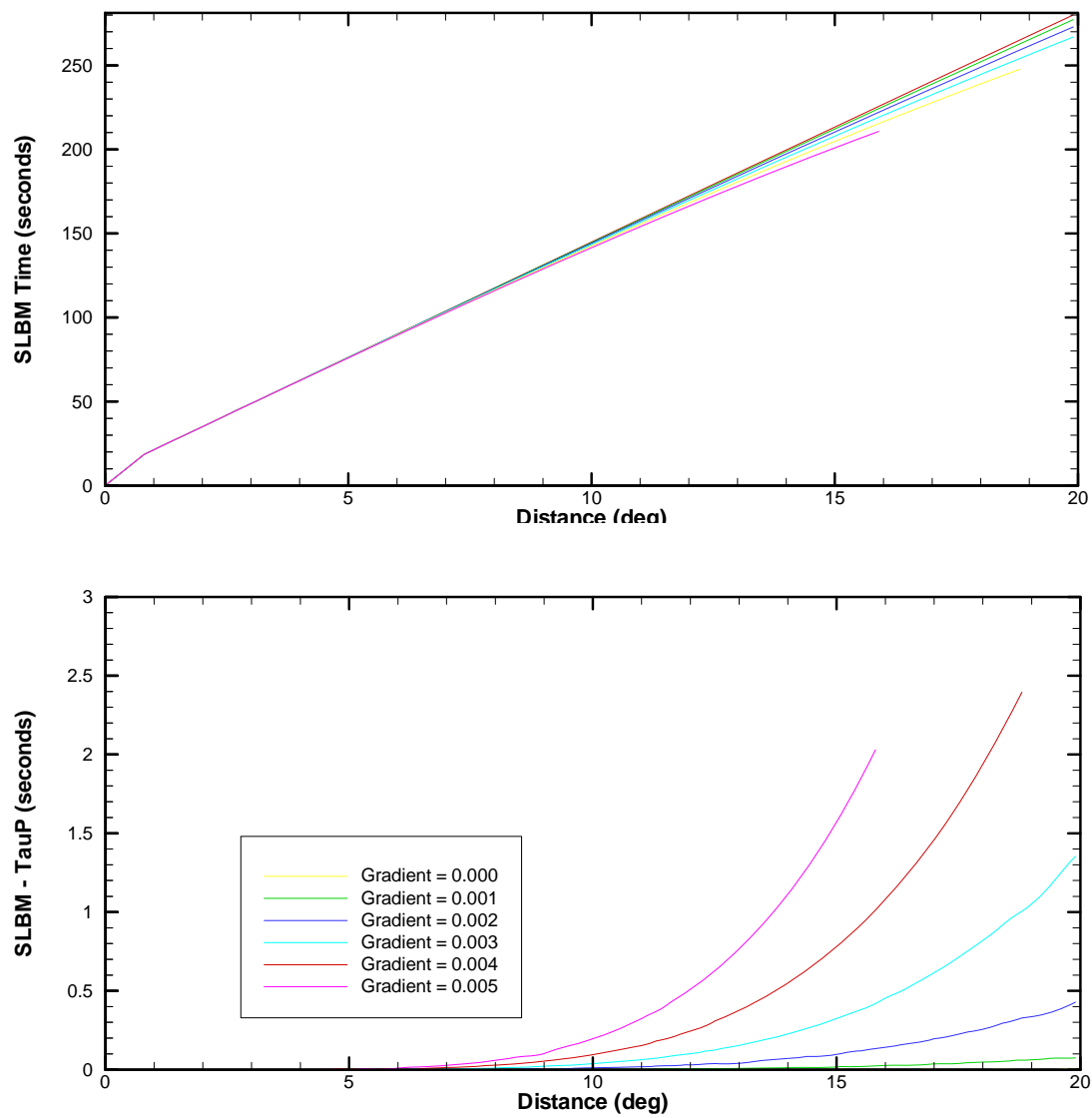


Figure 1 – Travel time as a function of distance. a) computed by SLBM and b) compared to TauP. Curves are terminated when the value of  $C * H$  exceeds 0.2.

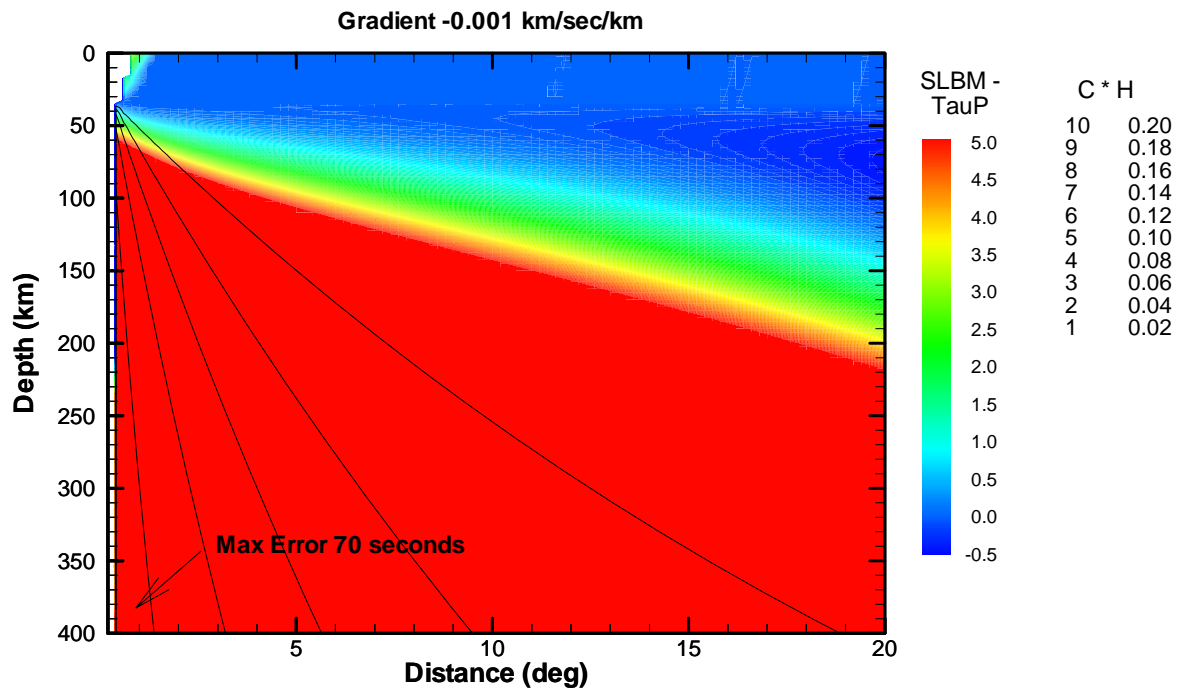


Figure 2

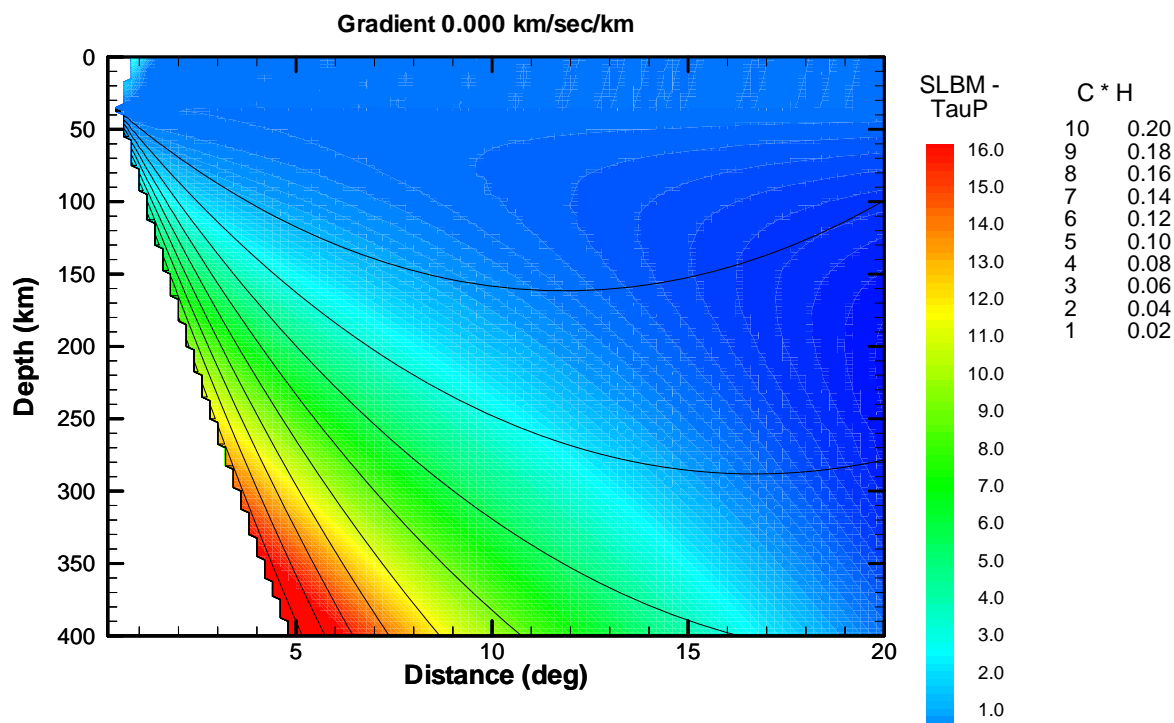


Figure 3

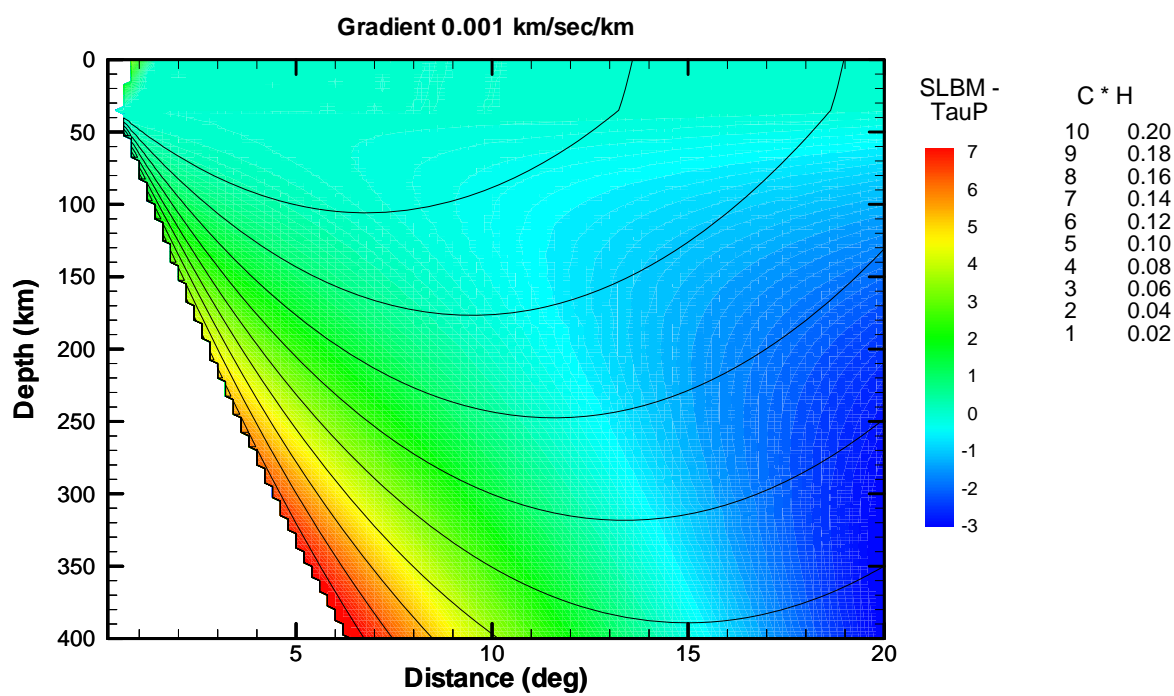


Figure 4

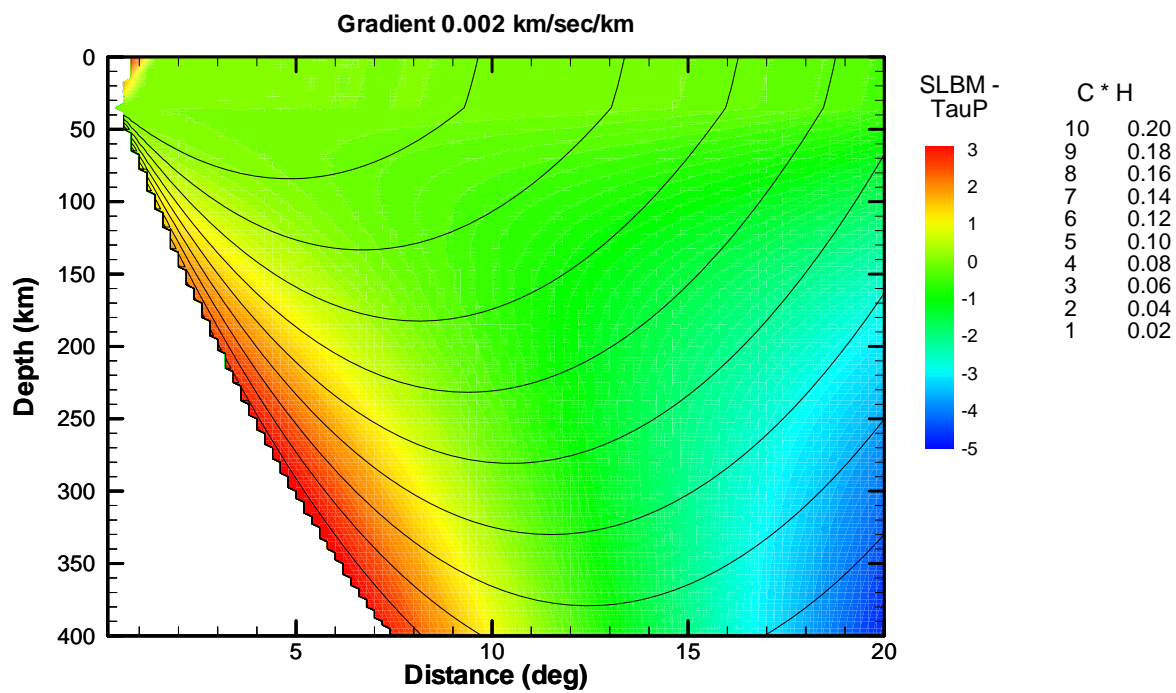


Figure 5

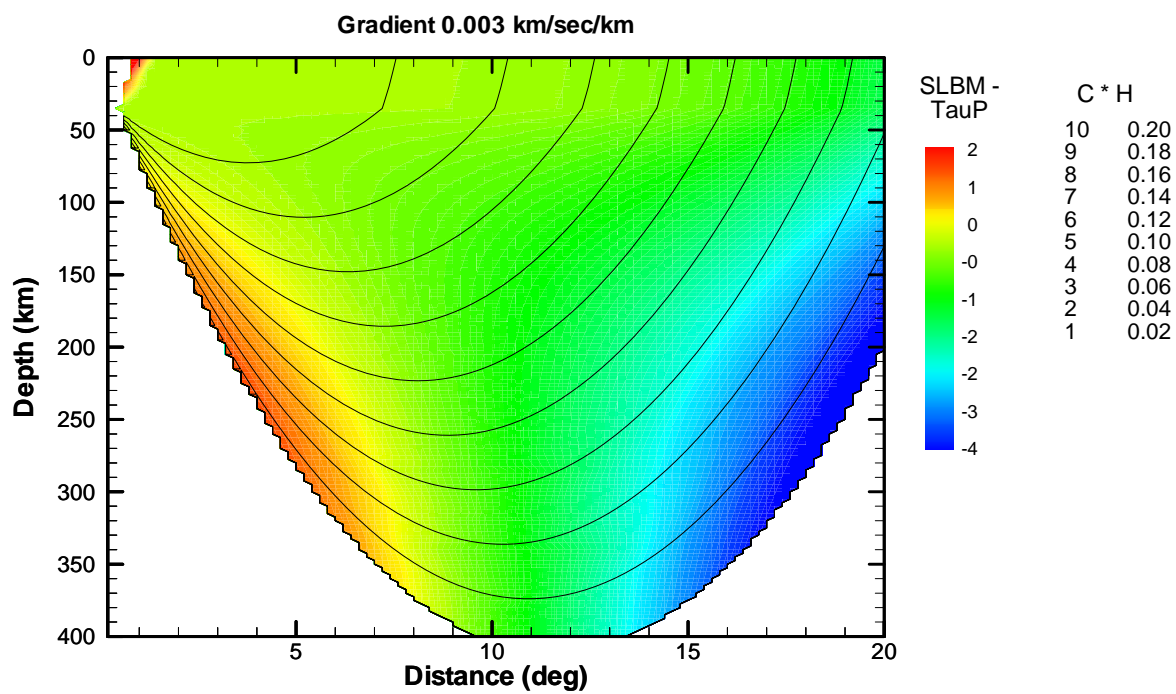


Figure 6

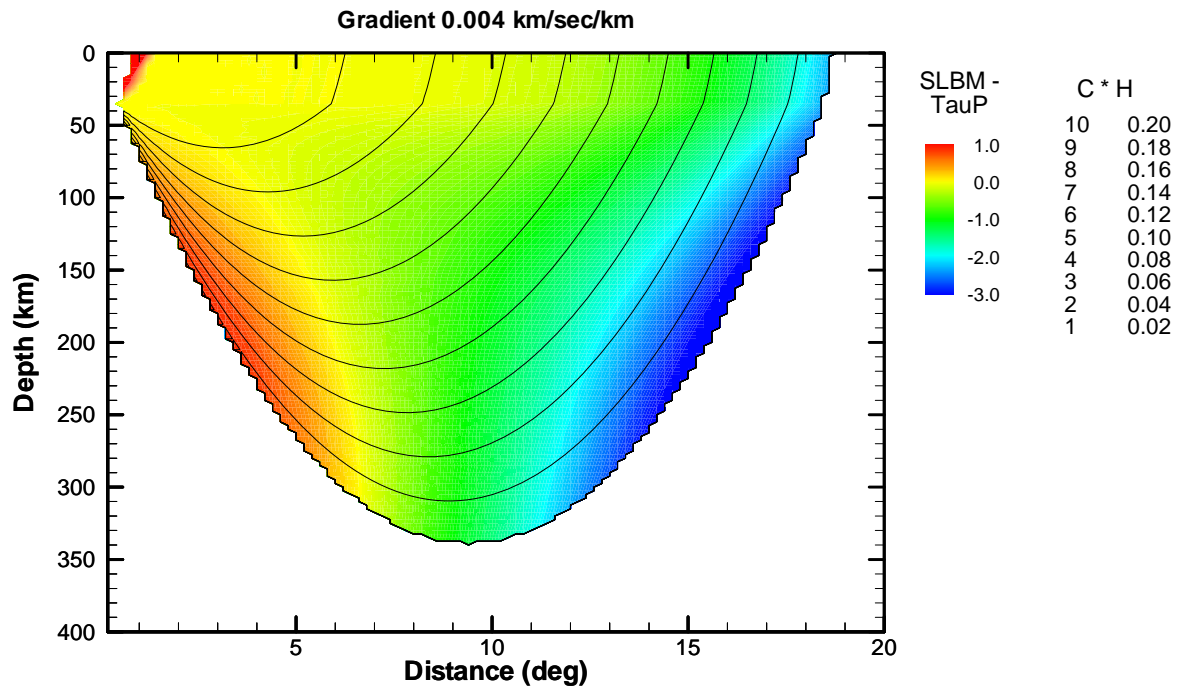


Figure 7

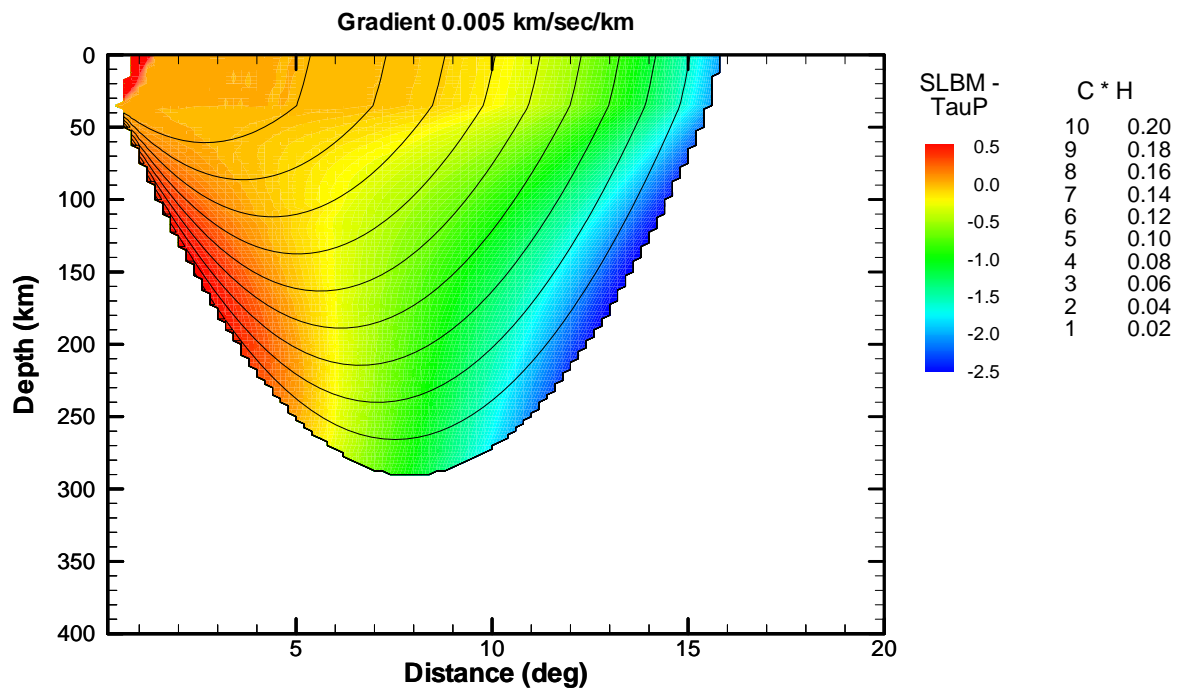


Figure 8