Large dip artifacts in 1.5D internal multiple prediction and their mitigation

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The origins and mitigation of prediction artifacts

Internal multiple prediction challenges on land lead us to seek refinements of our parameter choices. Here we investigate the origins of large dip artifacts in 1.5D multiple predictions, and with a linear $\varepsilon(k_g)$ parameter rule see them greatly suppressed.

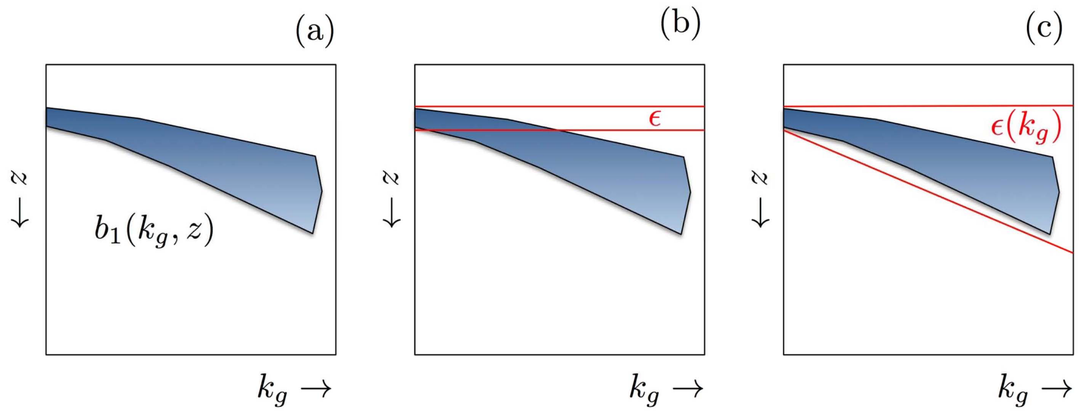

Fig. 1. Internal multiple prediction in 1.5D involves searching the input $b_1(k_g,z)$ for the right combinations of sub-events. We often search using 1D (k_g=0) thinking, but $b_1(k_g,z)$ varies strongly with k_g. (a) Input $b_1(k_g,z)$; (b) parameter ε chosen with 1D specs; (c) a more realistic k_g with varying ε.

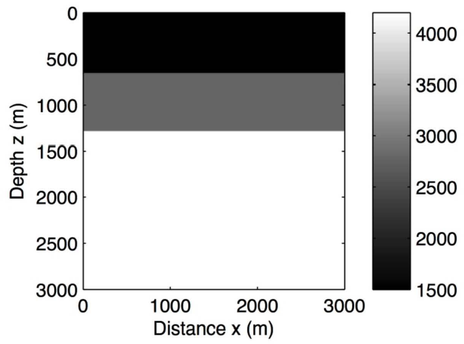

Fig. 2. Layered, two interface medium model on which we recreate the prediction artifacts & seek approaches to their mitigation.

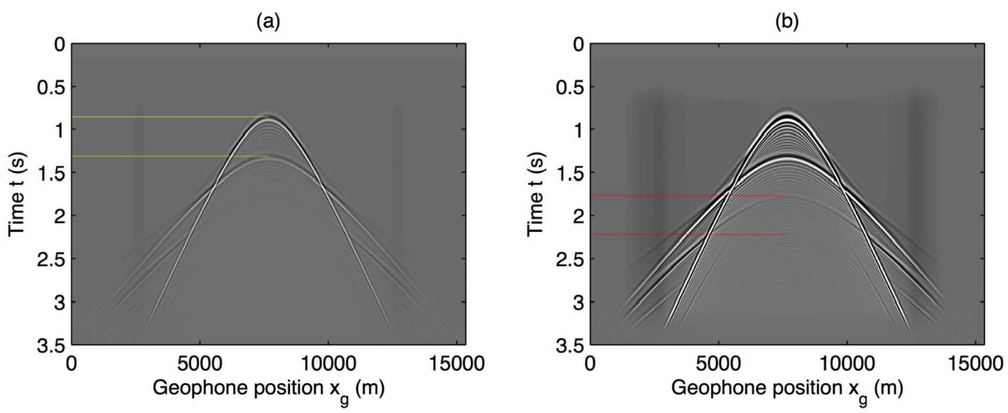

Fig. 3. Synthetic data set with which to reproduce the large dip prediction artifacts. (a) Two primaries (yellow); (b) two internal multiples (red).

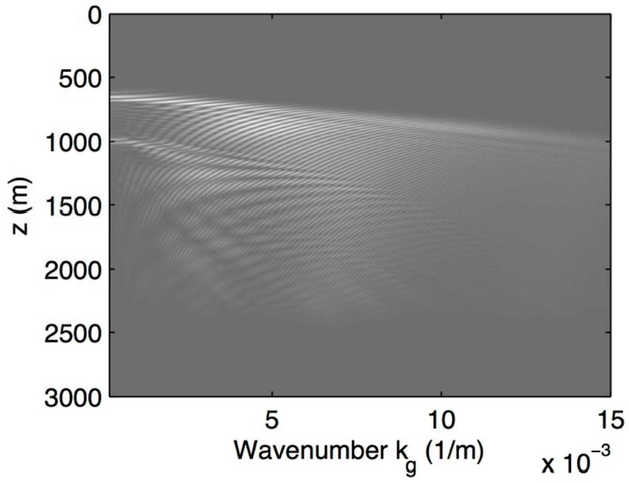

Fig. 4. Absolute values of $b_1(k_g,z)$ as created from the input data set in Figure 3. The two primaries are localized in pseudo-depth z at k_g=0, but as k_g increases a characteristic spread in z is notable. A fixed ε is unlikely appropriate.

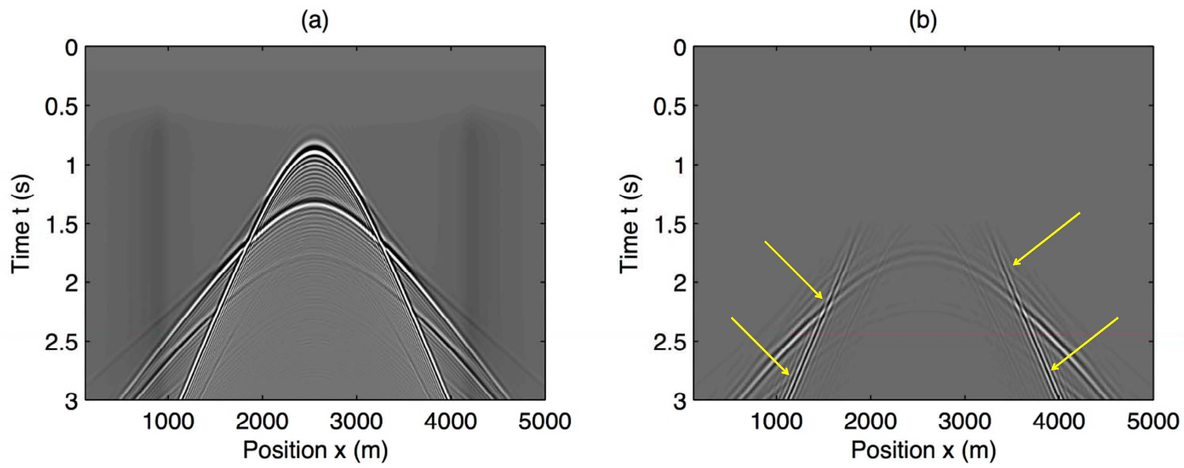

Fig. 5. Synthetic data set (a) and raw prediction constructed with constant ε; see Fig. 1b. The artifacts are visible at large dip intersecting t=3s at 1000m and 4000m. The correlation between the artifacts and the first primary in (a) are suggestigve of an insufficiently large ε.

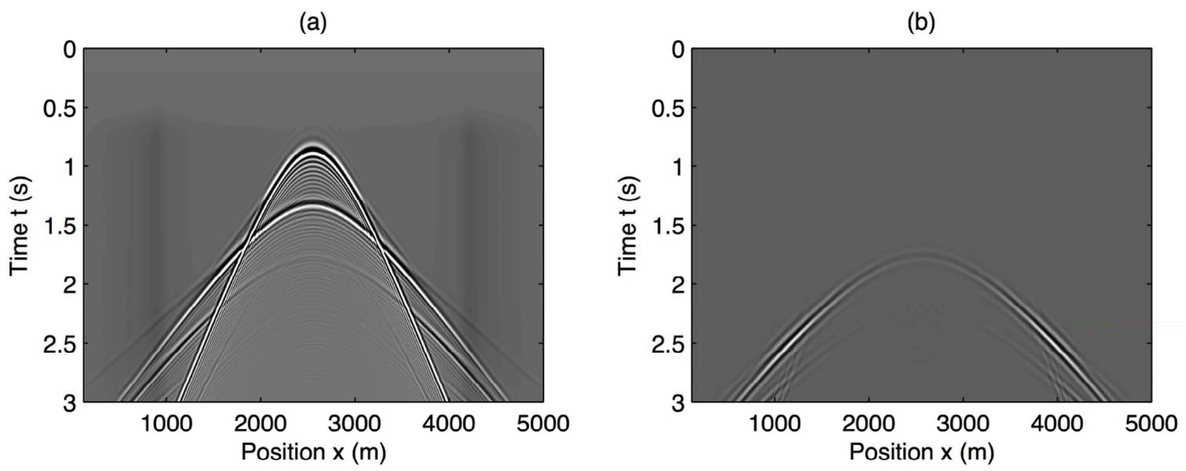

Fig. 6. Synthetic data set (a) and prediction constructed with $\varepsilon(k_g)$; see Fig. 1c. The artifacts at large are almost completely suppressed.