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| Please fill in your manuscript title. | Amplitude Effect Based on Weight Function and Aperture Size towards True-Amplitude Imaging |


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## Abstract


Accurate migration amplitude results in reliable estimation of AVO analysis, hence the necessity of having 'true-amplitude' migration. However, it would be impossible to have true-amplitude data since the amplitude loss can be due to many factors. In this study, we focus on compensating the seismic amplitude during the Kirchhoff summation process by applying the suitable weight function and migration aperture together for a better result. It can be said that the amplitudes in the resulting migrated image are proportional to the reflector strength if the weight function as well as the aperture are chosen correctly. The combination of accurate control over migration aperture and proper weight function in Kirchhoff migration leads to true-amplitude imaging.

The synthetic SEG sedimentary layer model is used to determine the best way to correct the migrated amplitude. Based on Kirchhoff migration formulation, weight function and the size of aperture are the two parameters that may influence the amplitude of migrated data. First test is done by selecting several weight functions based on previous research paper and the migration been done using these weights on the synthetic model. The amplitude of migrated images with different weight function are compared and the weight function produce the closest amplitude to the true amplitude are chosen. With the chosen weight function, together with suitable minimum aperture, it is being used to identify the effect of this combination on the amplitude of migrated image.

Figure 1 shows the amplitude comparison between true-amplitude and migrated amplitude of synthetic layer model. Figure 1(a) shows the amplitude when purely kinematic migration is considered, no weight function is applied in Kirchhoff migration while Figure 1(b) shows the amplitude after applying weight function. Notice the difference in migrated amplitude range are huge. The application of weight function may increase the total cost of migration process as whole, but it is worth to include it in the migration scheme as it increased the accuracy of the migrated data. We extend the test by specifying the size of aperture and the result shown as in Figure 1(c). The migrated amplitude is getting closer to the true-amplitude, showing that the combination of proper weight function and aperture size did influence the accuracy of migrated amplitude.

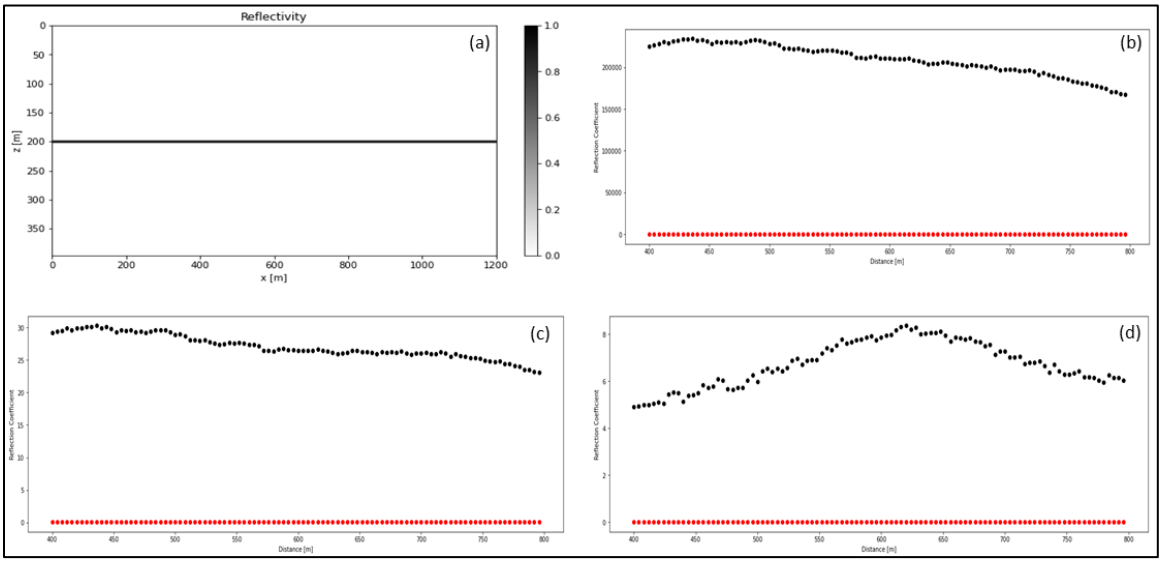


**Figure 1 (a) shows the reflectivity model of synthetic layer model, and the comparison plotting between the migrated amplitude with true-amplitude for (b) purely kinematic migration, ranging from 18000-2400 (c) with exact weight function for 2D common shot, full aperture, ranging from 18-30 and (d) with exact weight function but specified aperture size, ranging from 4.2-8.3. The accuracy of migrated amplitude based on the combination of weight function and specified aperture size in migration scheme is increased.**

Next, we tested on SEG model to investigate the robustness of the selected weight function on complex model, results as shown in Figure 2. Even it did improve the amplitude, but the value is very small which indicate that the weight function is not suitable for this model. Thus, we simplified the weight function, and the results are shown in Figure 2(c). The accuracy of the amplitude improved especially around the flat layer area but further improvement on the weight function is required to increase the accuracy and reliability of amplitude towards higher geologic complexity area.

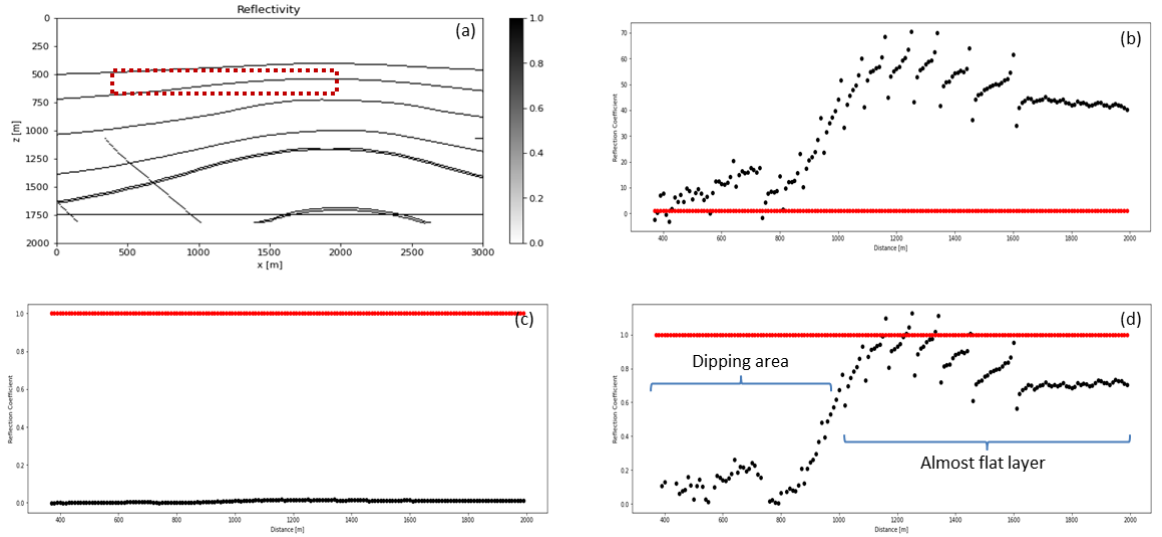


**Figure 2 shows the results based on SEG model where (a) is the reflectivity model, with highlighted area as in red box, and the amplitude comparison for (b) no weight is applied, and the amplitude based on the combination of weight function and specified aperture size in which (c) same exact weight used in previous example, and (d) with new simplified weight function. As expected, combination of weight function and aperture size did improve the migrated amplitude but the accuracy of amplitude using simplified weight function is more accurate especially at the flat layer area.**