Different Approaches for Removing the Primary Artifacts in Reverse Time Migration

Hongwei Liu[1], Tong Fei[1], Yi Luo[1]

[1]Expec ARC GPT, Saudi Aramco , Dhahran, Eastern Province, SAUDI ARABIA

ABSTRACT

The main advantage of reverse time migration (RTM) is its ability to image steep-dip reflectors by imposing a no-angle limit on simulating wave propagations. After removing the limits on propagating angles, the up- going wavefield from the source side and the down-going wavefield from the receiver side could generate strong imaging artifacts. These artifacts could not only mess seismic image, but also mislead interpretation, resulting in incorrect well placements. It is highly desired to remove these artifacts without sacrificing the strengths of RTM. In this abstract, six different approaches for removing the imaging artifacts are analyzed in theory, along with supporting numerical tests. The approaches we will discuss include: (1) the explicit wavefield separation method; (2) the implicit wavefield separation method using a spatial Hilbert transform; (3) the implicit wavefield separation method using spatial and temporal Hilbert transforms; (4) the Laplace filter method; (5) the muting method applied to the angle domain common image gather (ADCIG); and (6) the muting method applied to the offset domain common image gather (ODCIG). Our studies show that approaches 1, 3 and 5 can effectively remove the primary artifacts while the other three approaches cannot. In addition, we will also compare the computational efficiency of these approaches.