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Assessment of the Performance of Semblance Weighted Diffraction Stack

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A variety of seismic reflection data sets has been use to estimate the assessment of a recently developed true amplitude limited-aperture migration based on a modification of the weighting function in the Kirchoff migration operator. Prestack Kirchoff depth migration has become a conventional processing step in seismic reflection imaging. It provides new insights of the reflecting boundaries in crustal studies and it's also an important method for reliable velocity models building. In this migration scheme the weight function on the amplitude part of the diffraction stack algorithm is derived from the semblance of the slant stack of the data. Thus this weight function is exclusively a function of the energy and the direction from which this reflected energy reaches the receiver. The semblance of the slant stack for a particular offset (the receiver offset) represents the total amount of energy that reaches a particular receiver with specific ray parameter (i.e. direction of propagation of the seismic energy). The weight function reduces the diffraction stack to a weighted stack of the amplitudes at a given travel time to every point along a corresponding isochron. This migration scheme is applied to synthetic and real normal incidence seismic reflection data providing a depth images with a better resolution of the sub-vertical structures. For example it provided a depth image of the north dipping Central Unit of the complex suture zone between the Ossa Morena Zone and the Central Iberian Zone of the IBERSEIS Vibroseis seismic profile. Furthermore, this scheme is also successful when migrating wide-angle deep seismic reflection data. In this case a low fold image of the lower crust, Moho and upper mantle across SW-Iberia was obtained by using 6 wide-angle shot gathers. Finally, depth imaging by using VSP's is also a possibility using this migration scheme.