In this abstract we will present a theoretical framework for demigration of seismic image data under the framework of Gaussian Beam theory. The underlying methodology has no dip limitation and handles multi-valued arrivals well. The practical use of this technology is to perform prestack demigration of existing image volumes (CIG gathers) followed by prestack depth remigration using a replacement velocity and/or anisotropy model. The result is a fast, accurate, and cost effective way to improved seismic imaging as compared to proprietary reprocessing from field tapes.

Ross Hill published seminal works in common offset Gaussian Beam prestack depth migration (Hill, 1991 and 2001). Chevron has been largely the only beneficiary of the Gaussian beam technology. To the best of our knowledge there have been no published work on Gaussian beam prestack demigration.

For example, in prestack demigration, one can start with an individual common offset image volume (Kirchhoff migration volume, Gaussian beam migration volume, or fast beam migration volume). The single fold image is demigrated to reconstruct the corresponding input unmigrated seismic data. In Gaussian Beam prestack demigration, we actually reconstruct the individual beams used as input to the original Gaussian Beam migration. The individual beams are then synthesized to form an unmigrated seismic volume.

There are many uses of Gaussian Beam prestack demigration technology. For example, it can be used as a fast forward modeling tool to generate synthetic data for migration and inversion. Another use of this technology is to perform prestack demigration of existing image data, followed by prestack depth (re)migration with a replacement velocity and/or anisotropy model. This is a faster, more accurate and cost effective way of seismic imaging over proprietary reprocessing from field tapes. Both synthetic and field data examples of this will be shown.
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