MODELING OF MULTIPLES IN 3D FOR ANY ACQUISITION GEOMETRY

Antonio Pica[1], Pierre Plasterie[2], Mag Magesan[3], Jean-Charles Ferran[3], Stefan Kaculini[3], Jan Faulkner[3], Philippe Herrmann[1], Gordon Poole[4], Guillaume Poulain[1], Laurie Delmas[1], and Sylvain Le Roy[1], Dechun Lin[5], Lin Wen-Jack[5], Sheng Xu[5].

[1] Technology CGGVeritas France, 1 Rue Léon Migaux, 91341 Massy, France.
antonio.pica@cggveritas.com , philippe.herrmann@cggveritas.com, ,
guillaume.poulain@cggveritas;com, laurie.delmas@cggveritas;com
sylvan.leroy@cggveritas.com
[2] A Division of CGGVeritas Australia Pty Ltd, CGGVeritas Centre, 38 Ord Street West Perth WA 6005, Australia
pierre.plasterie@cggveritas.com
[3] CGGVeritas Americas, 16430 Park Ten Place, 77084 Houston, TX, USA.
mag.magesan@cggveritas,com , jean-charles.ferran@cggveritas.com ,
stefan.kaculini@cggveritas,com , jan.faulkner@cggveritas;com
[4] CGGVeritas Geophysical Technology, Vantage West, Great West Road, Brentford, Middlesex, TW8 9GG, UK.
gordon.poole@cggveritas.com
[5] CGGVeritas GeoServices, 10300 Town Park Drive, 77072 Houston, TX, USA.
dechun.lin@cggveritas.com , lin.wen-jack@cggveritas.com , sheng.xu@cggveritas.com

While constrains on source and receiver sampling for convolution SRME are easily fulfilled in the 2D case, the problem become significantly more complex in 3D. By requiring ideally equal and coincident source and receiver sampling for performing the surface consistent data auto-convolution required by the method, it constrains the acquisition geometry toward the denser possible designs.
For allowing the acquisition effort to be focused in illumination considerations related to imaging purposes instead of anti-multiples constrains, a series of processing solutions are now available, that made possible the use of 3D SRME methods for any kind of 3D acquisition geometries, including OBS (Ocean Bottom Surveys) and WATS (Wide Azimuth Towed Streamer) geometries.
Latest improvements on efficient interpolation methods, allied to larger storage and computing capacities, allow for the regularization of irregularly sampled and aliased data toward regularly sampled grids suitable for the convolution based 3D SRME. It is a purely data based approach, free of any previous knowledge of the propagation velocity fields.
The alternative approach is the partial or full model based approach where wave equation modeling techniques are used for predicting 3D multiple models. The particularity of such approach is that its flexibility allow for handling any extreme acquisition geometry, as it can even apply to OBC geometries when no surface data is made available.
Although natural higher folds related to WATS geometries allow for better stacked or migrated sections even when not any anti-multiple is applied, 3D de-multiples are still needed for improving the data quality pre-stack. In this context, we can show that the state of the art of data-based and model-based 3D multiple modeling techniques allow for an efficient and accurate de-multiple processing.

Keywords: 3D SRME, 3D OBS, WATS.