PSS-Geo

Geophysical services to the oil industry

Depth migration model building and model verification sequence

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PSS-Geo provides Kirchhoff Anisotropic (TVI &TTI) Wavefront Propagation Depth migration from anisotropic interval velocity models. Such models are built in a step by step manner involving integration of diverse geophysical information in multiple progressively deeper imaging to continuously update and verify the model. .

Our methodology is based on the definition of a vertical interval velocity model and an anisotropy field. As a rule of thumb the vertical velocity field should represent a valid Time/depth function typically used for depth conversion in interpretation work; the anisotropy field should be congruous with surface seismic velocities as for its sub horizontal raypaths.

We are focussed on the creation of models that are both correct in the time and depth relationship and highly plausible from the geological interpretive point of view. The objectives of the anisotropic approach is to optimize the image quality - flat gathers - and to tie the main reflectors to the wells within 1% whilst still maintaining a geologically sensible spatial distribution of the velocities for each layer. A typical sequence will include a:

Building a starting interval anisotropic velocity model

- Build initial vertical velocity model using suitable check-shots within the survey and time interpreted horizons. The check-shot could be verified/optimized by doing a well-tie to the PSTM stacks. An initial horizontal (anisotropy) velocity model can be derived using Dix converted and smoothed RMS velocities or from an isotropic V0 model with corresponding gradients (k).

- Near surface sub resolution velocity anomalies (pull-ups/down) can be detected and modelled to avoid distortion on deeper horizons.

- Depth migrate well tie or target lines. Measure anisotropy parameters in well positions, and build an anisotropy model. Typically initial anisotropy model is created interpolating the anisotropy between wells and supplied horizons. The anisotropy model can be updated/adjusted in each iteration to ensure correct depth in well positions is maintained.

Iterative tomographic inversion

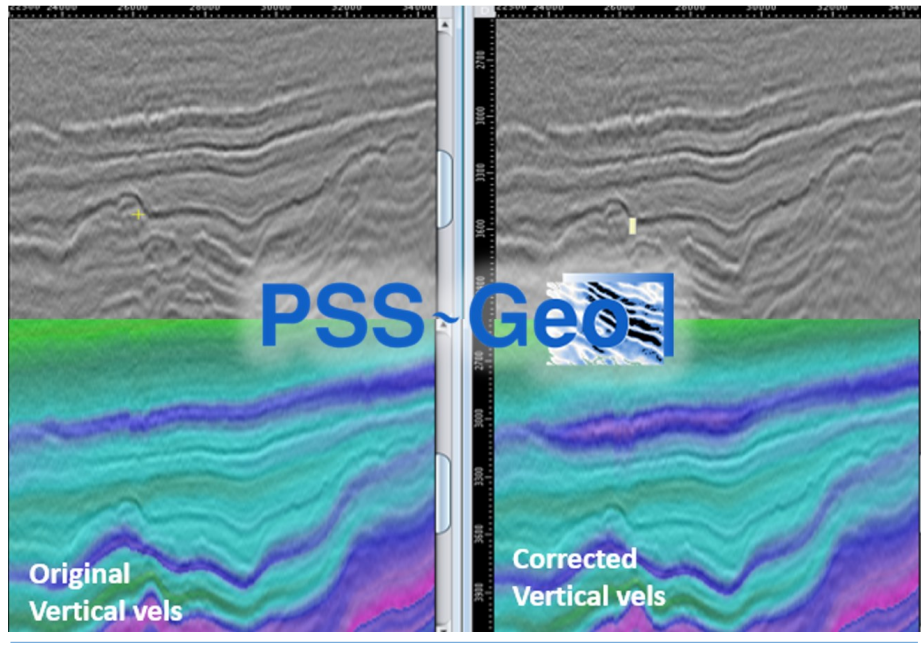
- On progressively deeper volumes the data will be depth-migrated using Kirchhoff migration, to an appropriate depth, using the current velocity model.

- Residual moveout are auto-picked on gathers. Such pick must be representative of primary energy: a Hi-Res Radon demultiple, or other process, might be used to increase moveout measure quality. Events must be geologically meaningful as displayed on imaged stack.

- The residual moveout picked on the velocity analyses to be inverted to update the interval velocity field using an anisotropic VTI/TTI gridded tomographic solution

- The number of iterations is defined by the complexity of the area involved and the consistency of results.

3D Pre-Stack Depth Migration tie the key wells is made to confirm the velocities and anisotropy parameters. Our approach is flexible and can allow for continuous update of vertical and anisotropic velocity models and aim at a well data consistent depth image.



PSDM depth images and original velocity model, and velocity model after tomographic inversion correction

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