

22. The program carrier device of claim 20, further comprising calculating a fault diagnostic display based on a similarity between the clean stratigraphic seismic traces and the respective plurality of collected seismic traces.

23. The program carrier device of claim 22, wherein the fault diagnostic display comprises the cross-correlation coefficients of each clean stratigraphic seismic trace and its respective plurality of collected seismic traces, and cross correlation lines that connect the cross-correlation coefficients between each respective plurality of collected seismic traces and each clean stratigraphic seismic trace.

24. The program carrier device of claim 23, further comprising positioning the fault diagnostic display over a seismic section to determine a seed fault quality.

25. The program carrier device of claim 19, further comprising calculating a diagnostic tool based on each clean stratigraphic seismic trace.

~~26. The program carrier device of claim 25, wherein the diagnostic tool represents an enhanced fault location that is displayed using a code based on a fault location score.~~

~~27. The program carrier device of claim 26, wherein the fault location score is calculated by:~~

$$\text{fault location score}(i) = (m(\text{Left own}, i) - m(\text{Left opposite}, i) + m(\text{Right own}, i) - m(\text{Right opposite}, i)) / 2$$

~~28. The program carrier device of claim 27, wherein the diagnostic tool represents a positional uncertainty for the seed fault that is displayed as one of positional uncertainty~~

~~boundary lines, a transparent infill coded according to the fault location score or a bank of transparent lines at a location of each of the plurality of collected seismic traces.~~

~~29. — The program carrier device of claim 25, wherein the diagnostic tool represents a fault tip that is displayed at a point on the seed fault beyond which a throw of the seed fault is zero.~~

~~30. — The program carrier device of claim 25, wherein the diagnostic tool represents a fault throw that is displayed away from the seed fault with a quality code based on an uncertainty of the fault throw.~~

~~31. — The program carrier device of claim 28, further comprising performing a fault location application using each clean stratigraphic seismic trace, wherein the seed fault is replaced by each enhanced fault location and is displayed with the positional uncertainty for the seed fault.~~

~~32. — The program carrier device of claim 26, further comprising performing a fault tracking application using each clean stratigraphic seismic trace, wherein the seed fault is extended in 2D up and down within a seismic section by linear extrapolation and a location for each extrapolated extension is calculated from the enhanced fault location.~~

~~33. — The program carrier device of claim 26, further comprising performing a fault tracking application using each clean stratigraphic seismic trace, wherein the seed fault is projected in 3D forward and backward onto adjacent seismic sections by linear extrapolation or~~

interpolation and a location for each projection of the seed fault is calculated from the enhanced fault location.

34. ~~The program carrier device of claim 19, further comprising performing an unfaulting application using each clean stratigraphic seismic trace to guide manual unfaulting and obtain a closer match between each clean stratigraphic seismic trace.~~

35. ~~The program carrier device of claim 19, further comprising performing an unfaulting application using each clean stratigraphic seismic trace and a throw calculation for the seed fault to guide manual unfaulting.~~

36. ~~The program carrier device of claim 19, further comprising performing an unfaulting application using each clean stratigraphic seismic trace and a throw calculation for the seed fault to guide automatic unfaulting.~~

37. ~~A non-transitory program carrier device tangibly carrying computer-executable instructions for creating clean stratigraphic seismic traces, the instructions being executable to implement:~~

- a) ~~selecting a first seismic trace beyond a seismic trace gap from a plurality of seismic traces collected parallel to a side of a seed fault;~~
- b) ~~calculating cross-correlation coefficients for the selected seismic trace with a next seismic trace for predetermined number of vertical shifts up and down;~~

- ~~e) — applying a parabolic curve fit to each cross correlation coefficient to obtain a sub-sample shift between the selected seismic trace and the next seismic trace, and a score;~~
- ~~d) — accumulating the sub-sample shift(s) between the selected seismic trace and the next seismic trace;~~
- ~~e) — selecting the next seismic trace beyond the seismic trace gap from the plurality of collected seismic traces;~~
- ~~f) — repeating steps b) through e) until the score is not greater than a predetermined threshold and there are no more seismic traces in the plurality of collected seismic traces;~~
- ~~g) — extrapolating the accumulated sub-sample shifts across the seismic trace gap back to the seed fault to form a line or a surface;~~
- ~~h) — calculating the clean stratigraphic seismic trace by stacking the plurality of collected seismic trace along the line or the surface on the side of the seed fault beyond the seismic trace gap; and~~
- ~~i) — repeating steps a) through h) for another plurality of seismic traces collected on another side of the seed fault.~~

~~38. — The program carrier device of claim 37, wherein the seed fault is a 2D line or a 3D surface.~~

39. ~~The program carrier device of claim 38, wherein the 3D line is a 2D polyline in a 2D seismic section or a vertical section through a 3D seismic volume.~~

40. ~~The program carrier device of claim 38, wherein the 3D surface is interpolated or extrapolated on multiple 2D seismic sections or on vertical sections through a 3D seismic volume.~~