PRAKLA-SEISMOS INFORMATION No. 49

Mapping Module

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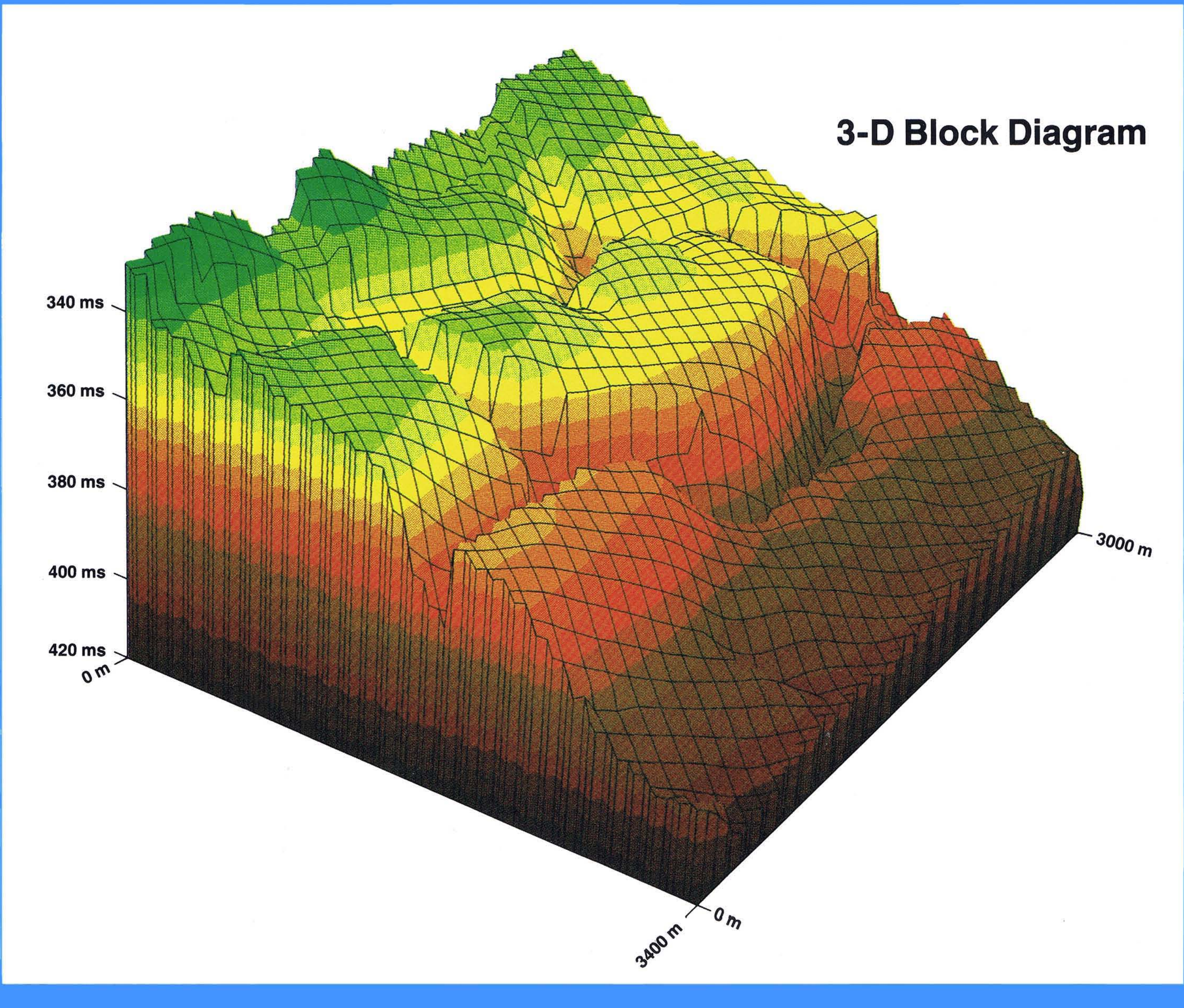
comseis

Fig. 1: 3-D Block Diagram derived from Fig. 14



COMSEIS The 2-D And 3-D Interpretation System
Mapping Module

PRAKLA-SEISMOS Information No. 45 gave a summary of the general features of the COMSEIS interpretation station and included a short hardware description (dual-screen work station). PRAKLA-SEISMOS Information No. 48 dealt with the slice interpretation module. This brochure focuses on some of the most important features the mapping module offers the user of COMSEIS software.

BASEMAP

Coordinates of shotpoint locations may be transferred to the data base by digitizing the locations on a digitizing table or by reading them from a UKOOA tape. These locations may be plotted on a raster or a pen plotter. Various symbols for lines and shotpoints can be chosen (Fig. 2) to identify different survey campaigns.
After some or all of these seismic lines have been interpreted, the user may call up a number of maps containing different information.

POSTED FAULT MAPS

The program searches for faults, differentiating between normal, reversed and undefined, and plots the fault symbols. In addition, the segments in which the seismic interface has been correlated can be indicated and the time values found at the beginning and end of such a horizon segment included (Fig. 3). Such a map may form the basis of a fault map,which can be used as the input for automatic contouring, taking into account the fault pattern for a particular horizon.
The fault map can also be correlated directly on the screen. Apart from fault lines, no-data areas can be defined within which no contours are generated and a grid boundary can be input which defines the margin of the grid (Fig. 7).

POSTED MAPS

Time values may be plotted along the lines in several ways. In Figure 4 values are posted at constant time intervals (100 ms), whereas in Figure 5 values are plotted at constant shotpoint intervals. In both figures the fault symbols are superimposed. The horizon segments, however, are marked differently.

MISTIE MAPS

The absolute time (or depth) values or the differences between the times (or depths) on the intersecting lines can be plotted at the line intersection points. A minimum traveltime difference can be defined so that only differences greater than this minimum are plotted (Fig. 6). If the intersection points are too close to one another the misties are listed. The user is free to superimpose additional information, e.g. fault symbols, horizon segments.

CONTOUR MAPS

Input

Contour maps may be input into the COMSEIS data base via the digitizing table. Building up the map may be controlled graphically on the monitors. Figure 8 shows a screen display of a velocity map for a particular horizon; this velocity data may be gridded and utilized for time-depth conversion. Apart from constant interval velocities, velocity gradient maps combined with a laterally varying initial velocity can be input. Having done this, 3-D map migration, in the case of a conventional survey, or a vertical time-depth conversion may be carried out. Details of the map migration will be the subject of a special brochure.

Gridding

Once the fault pattern for a particular horizon has been correlated by the user, the gridding procedure can be started. Initially, several parameters must be set (Fig. 11):

1. **Size of Grid Cell**
   The smaller the grid cell, the more exactly the contours can be calculated.
2. **Search Radius**
   If the data points are not close to each other, a large search radius is recommended.
3. **Smoothing**
   A higher smoothing factor corresponds to more points being considered in the calculation of a single grid value.
4. **Mathematical Model**
   For the calculation of a grid value a surface fit is carried out starting with an elliptical model or, in the standard case, with a hyperbolic surface.

If the grid size is constant for the survey area, grid to grid operations may be carried out. A typical application of this operation is the production of an isopach map between two horizons (Fig. 12).

Plotting

As soon as gridding has been completed, plots can be generated on different devices:

1. The preview plot appears on the screen and forms the basis for graphic editing (Figs. 9 and 10).
2. The default output device is a black and white VERSATEC raster plotter (Fig. 13.).
3. The on-line pen plotter connected to the COMSEIS work station may also be utilized (Figs. 11 and 12).
4. Colour-coded maps may be produced on a colour raster plotter (Fig. 14).

It should be emphasized that the treatment of data resulting from the interpretation of a 3-D survey is carried out in the same way as described above. Figures 1, 13 and 14 are in fact derived from the interpretation of a 3-D survey. Figure 1 shows a 3-D block diagram of a faulted horizon.

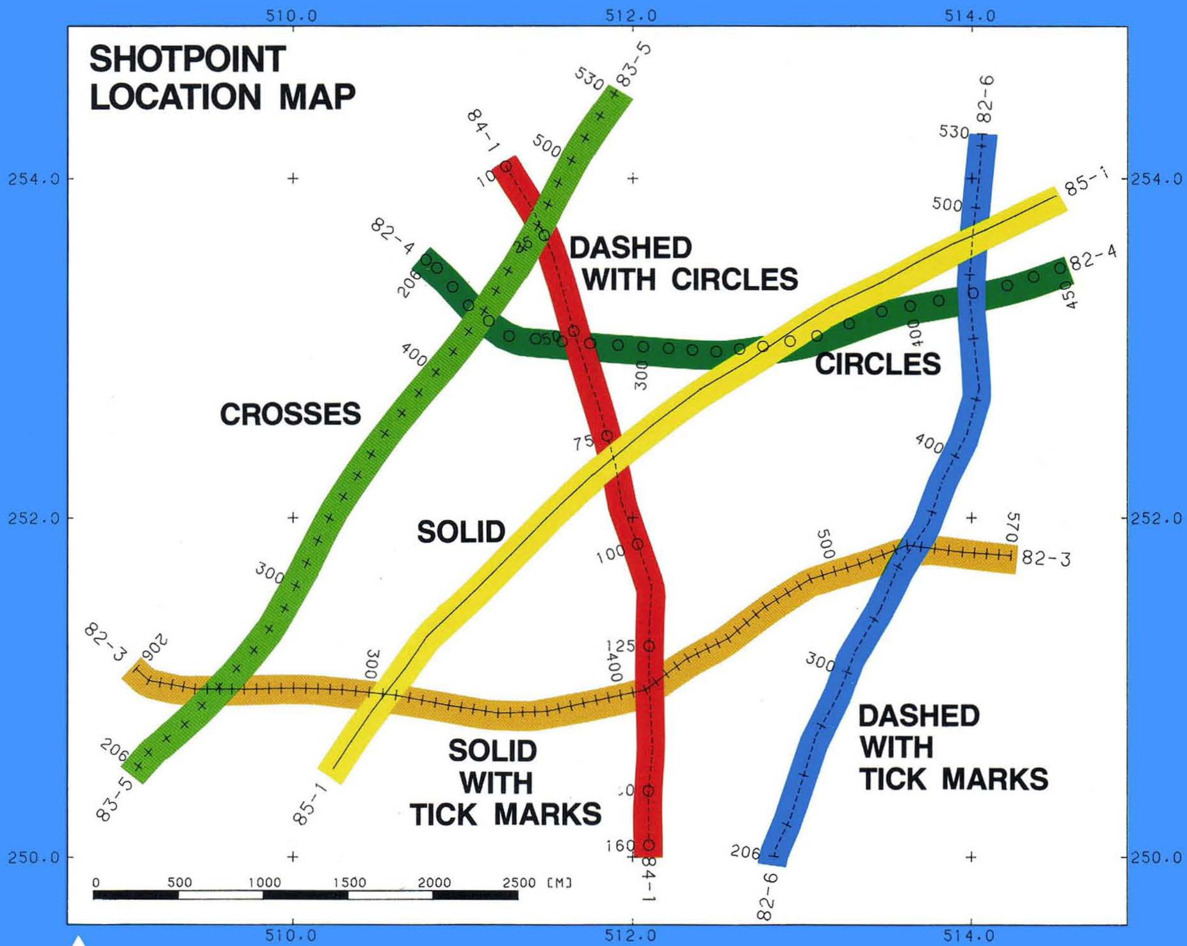


Fig. 2: Conventional Shotpoint Location Map

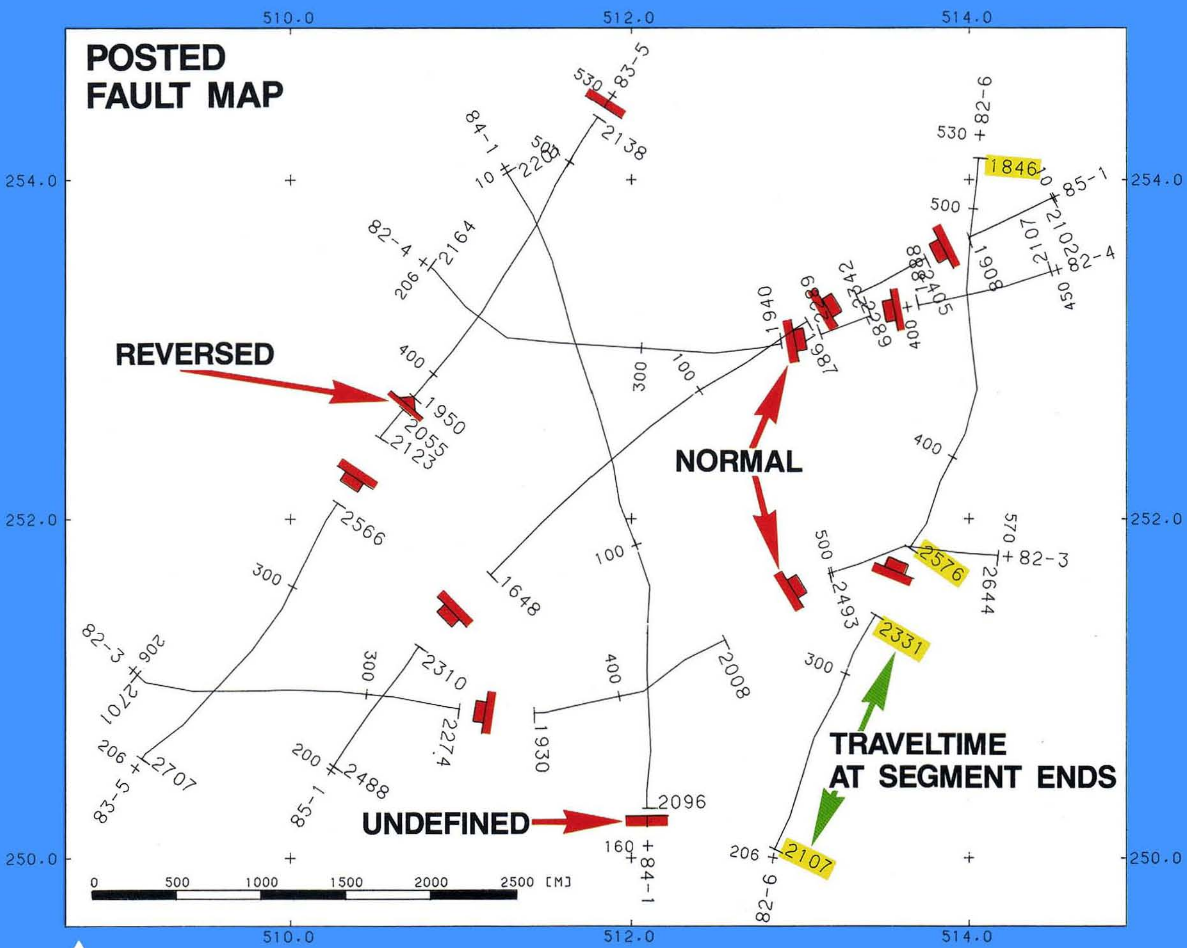
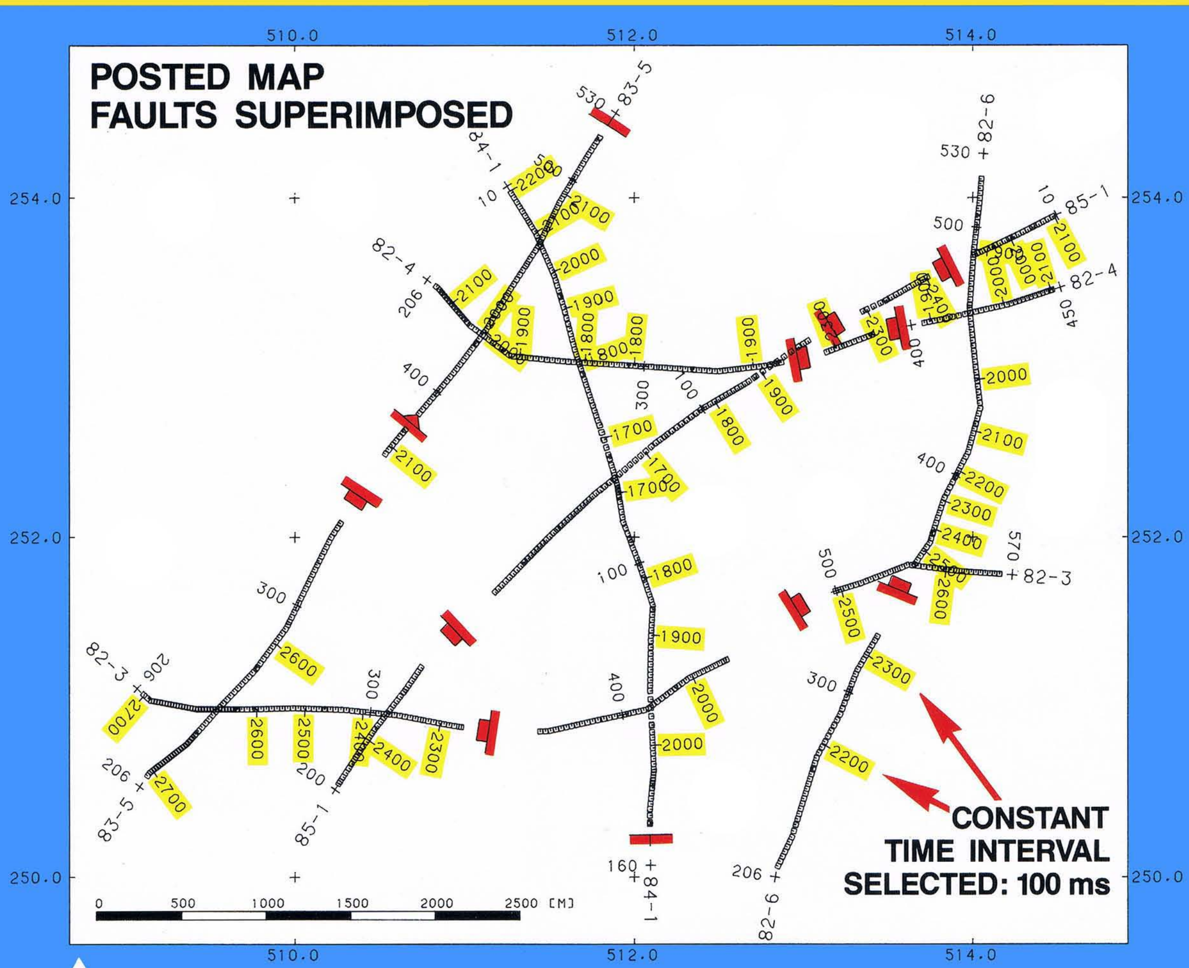
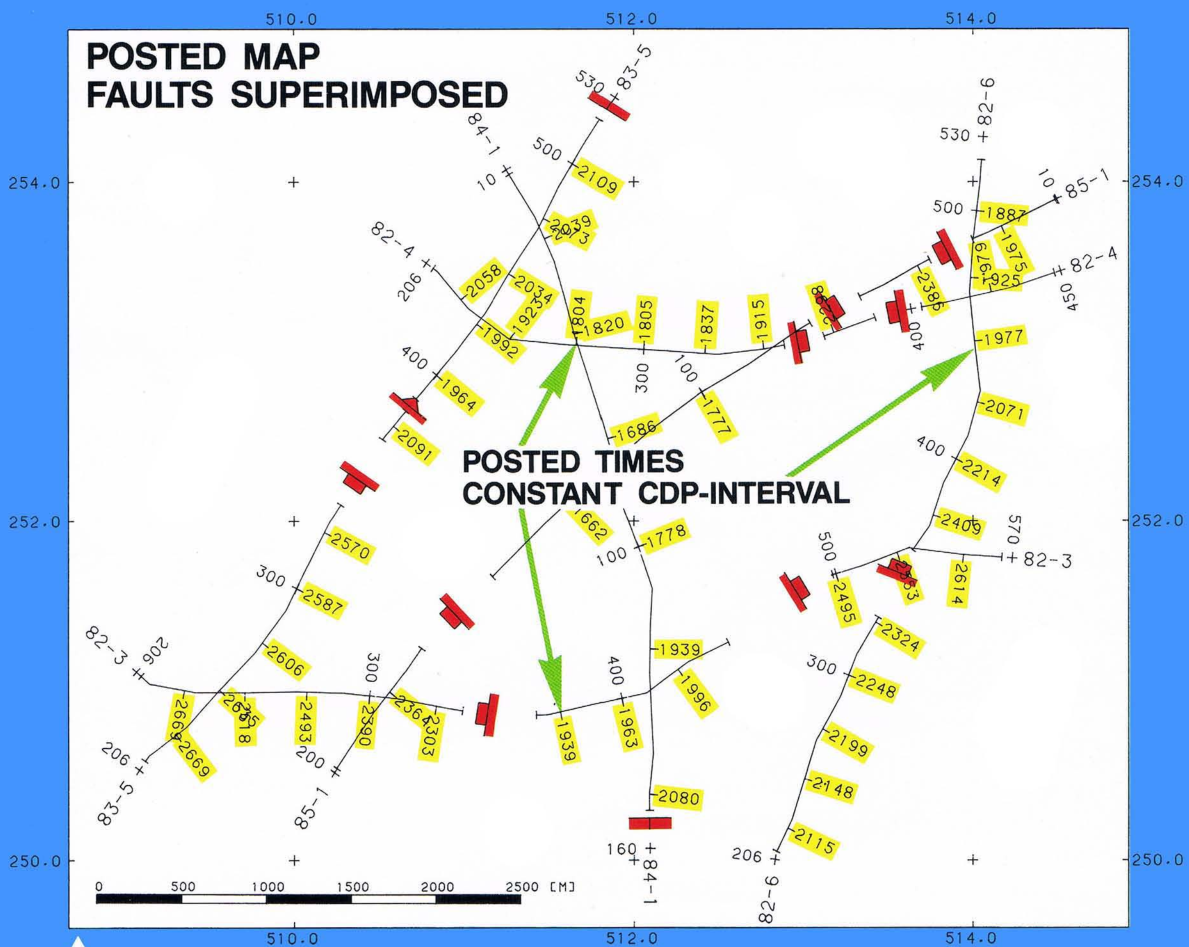


Fig. 3: Posted Fault Map



▲
Fig. 4: Posted Map (constant time interval)



▲
Fig. 5: Posted Map (constant CDP interval)

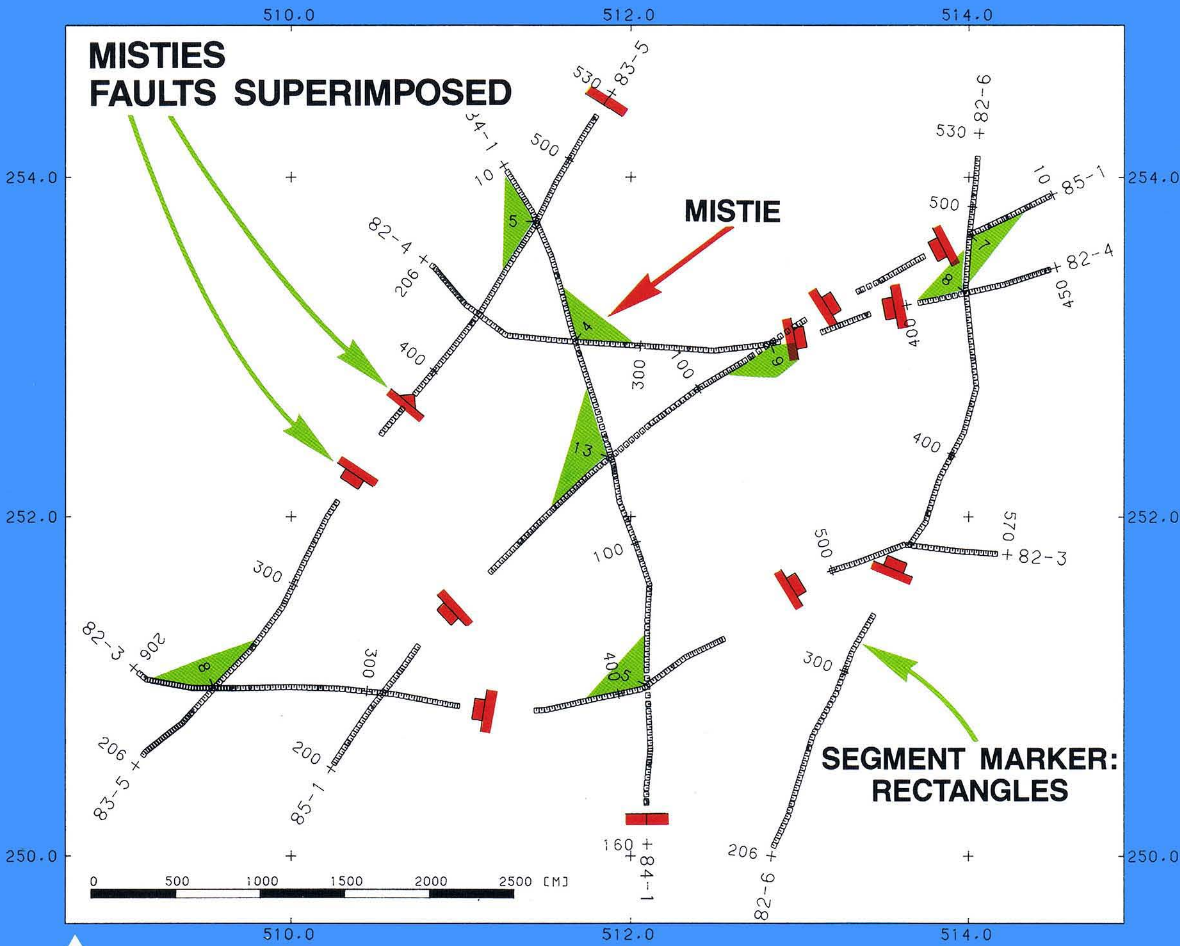


Fig. 6: Mistie Map (faults superimposed)

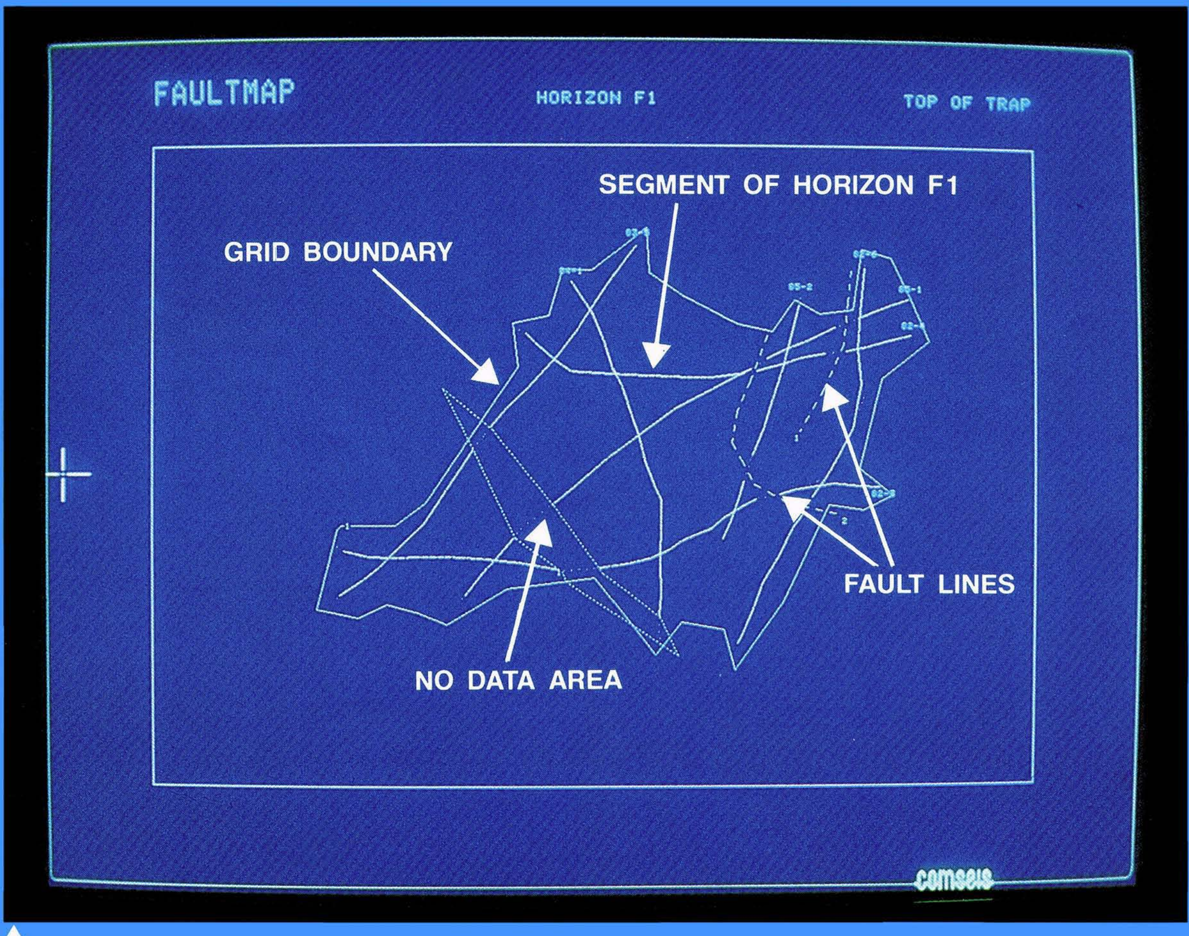


Fig. 7: Segment Distribution Map displayed on the monitor

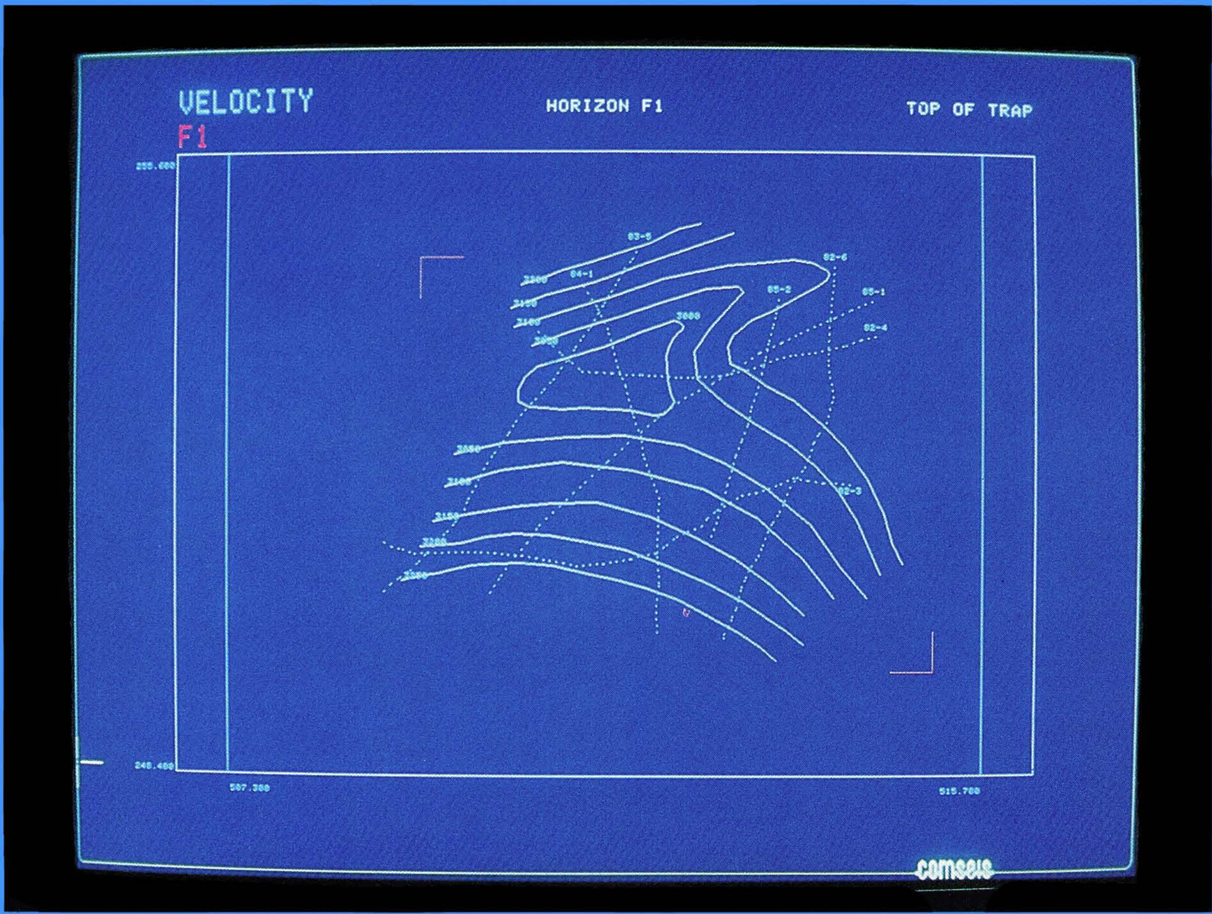


Fig. 8: Digitized Velocity Map displayed on the monitor

Velocity input for 3-D map migration or vertical time-depth conversion

The following velocity distributions between 2 horizons are implemented:

1. $V = V_0$ (see Fig. 8)
2. $V = V_0 + kz$
   V_0 and the gradient "k" may vary laterally
3. $V = a\sqrt[n]{z}$
   for $n = 3$ or $n = 6$, "a" may vary laterally

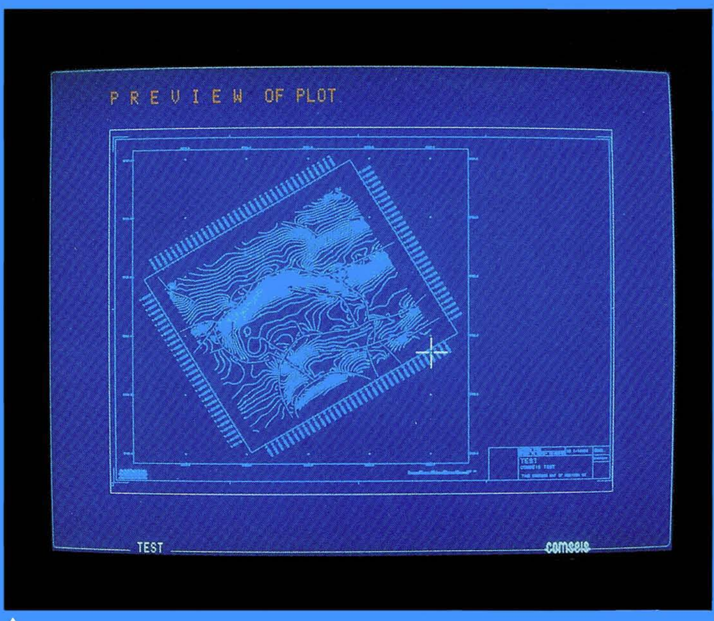


Fig. 9: Preview Plot on the monitor

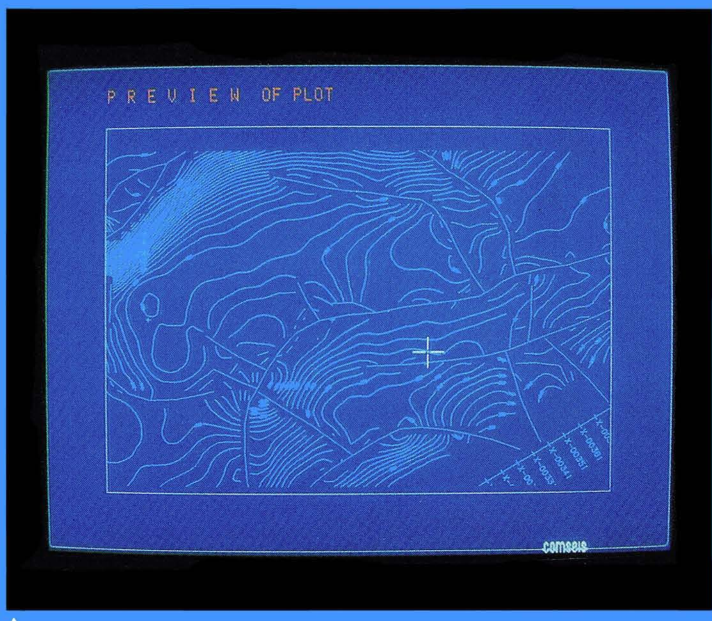


Fig. 10: Portion of Fig. 9 zoomed for graphic editing

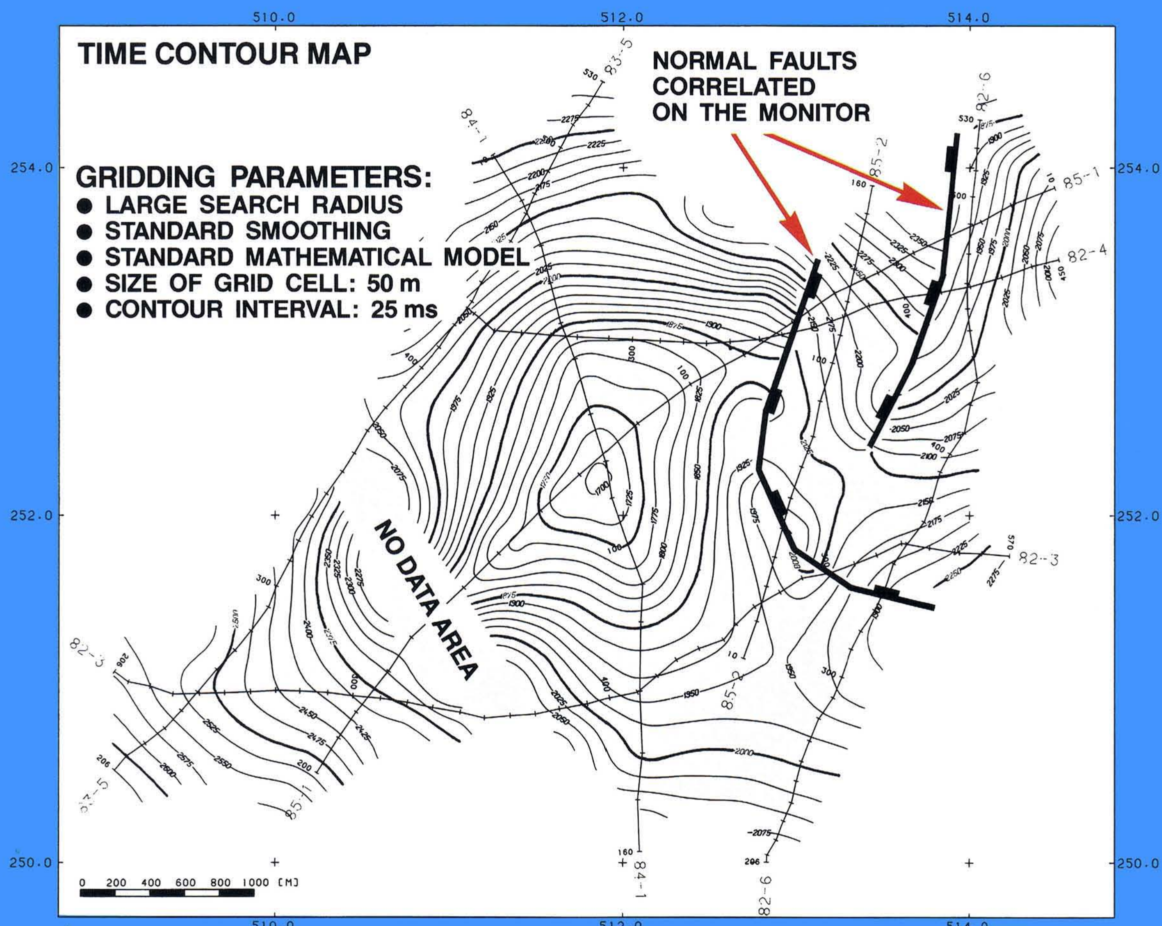


Fig. 11: Time Contour Map including faults

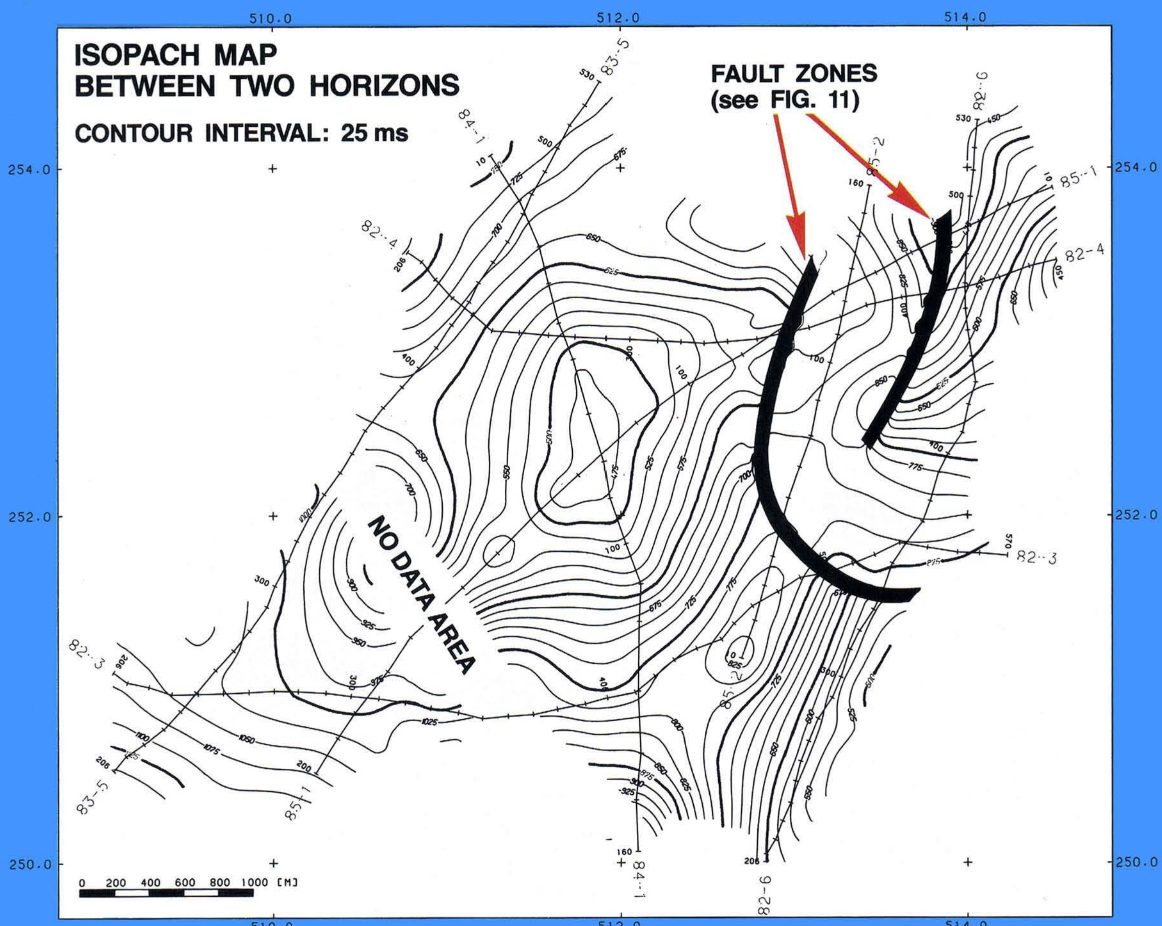


Fig. 12: Isopach Map between two horizons

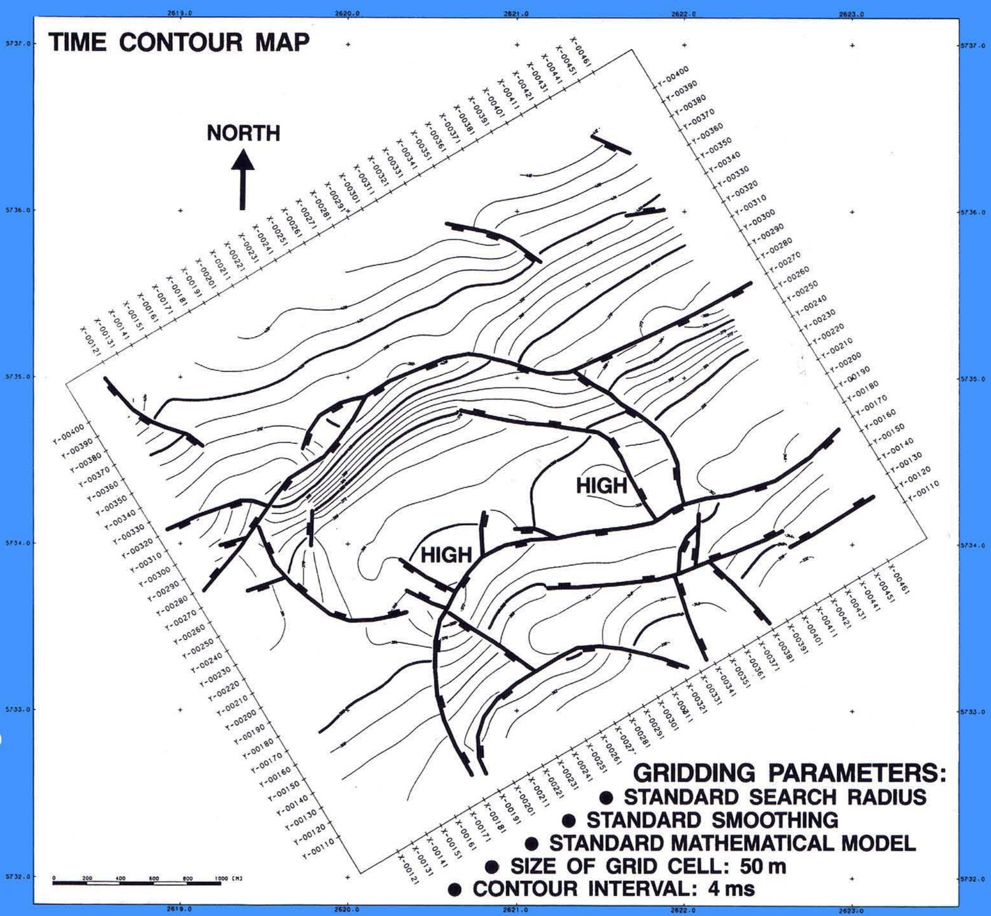


Fig. 13: Time Contour Map derived from the interpretation of a 3-D survey

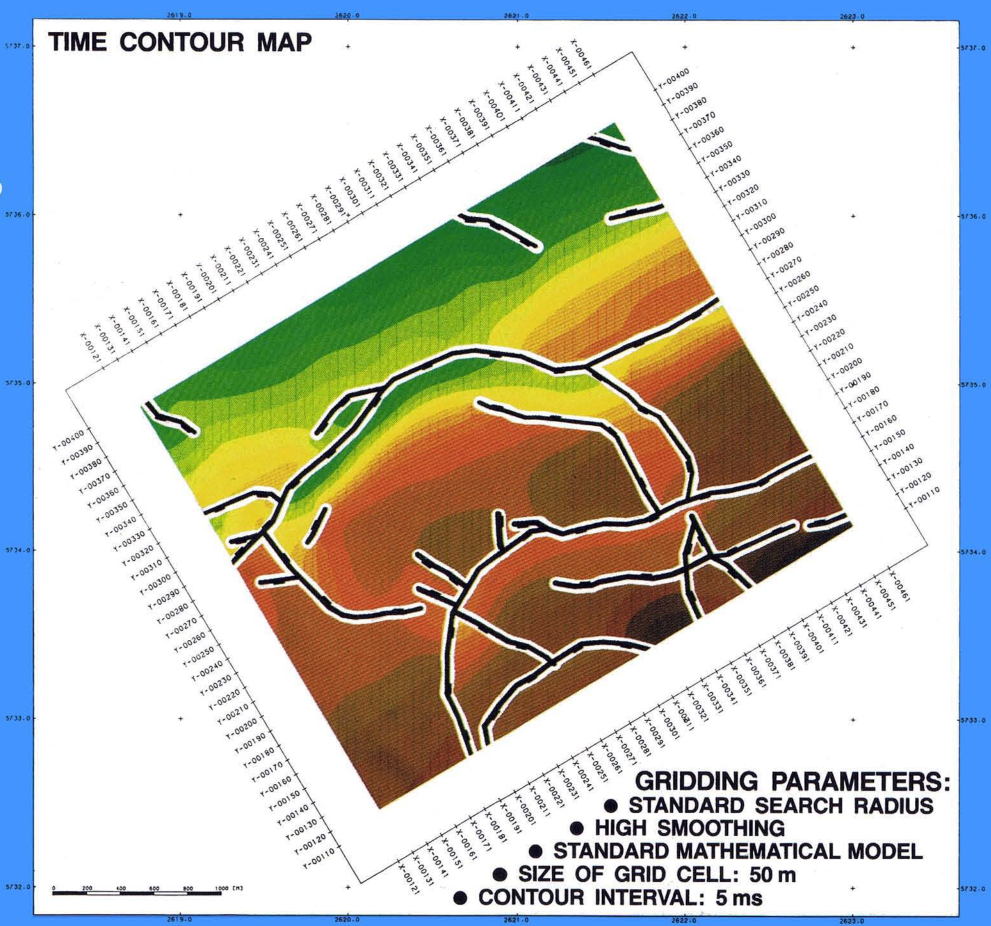


Fig. 14: Colour-Coded Time Contour Map of the same horizon (Fig. 13).

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