SALNOR Workshop

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Workshop Instructions

Objective: Recommend best 2 out of 8 possible new drilling locations.

1. Overview Data.
2. Mark 9 well locations on Lines 60N, 90N, & 120N and on CDPs 60E, 90E & 120E.
3. Make an overlay of the survey map and mark well locations and CDP Numbers.
4. Us well 16 synthetic as the take off and pick the Base Statfjord on Line 90N and CDP 60E.
5. Tie these picks to time-slices and contour the Base Statfjord on the overlay.
6. Work back and forth between the time-slice and vertical sections to correlate across faults.
7. Make separate overlays for and contour:
   - Top Statfjord;
   - Base Brent;
   - Top Brent; and
   - J-Unconformity.
8. Map the contact of the Brent Sand and the J-Unconformity.
9. Logically OR the oil/water contact, J-Unconformity, and Base Brent and map the extent of the Brent Reservoirs.
10. Use maps and picks to create geologic overlays of CDPs 60E, 90E, and 120E. Mark each horizon, each oil/water contact, and each well for the three sections.
11. Recommend 2 drilling locations.

SALNOR TIME-SLICE INTERPRETATION WORKSHOP

OBJECTIVE

The objective of this workshop is to illustrate the merits of using a 3D seismic data volume to interpret a complex exploration play. This example uses a 3D migrated data set across a complex physical model built to represent a typical North Sea geologic sequence. Techniques for using time-slice sections to carry out an interpretation will be emphasized. The workshop shows that vertical sections and synthetic well logs are also needed to build an accurate interpretation.

THE PROBLEM

Lease block 10 is owned by your company, and the 1983 budget allows two wells to be drilled in one of 8 possible locations. In order to determine the best of these drilling locations, interpret the structural features and areal extent of the Brent and Statfjord sands using available seismic and well data.

If there is time, you should pick the best drilling locations within the entire lease block.

The emphasis of this workshop should be on how interaction between vertical and horizontal sections aids the interpretation of complex geologic structures. When the workshop is over, take time to contemplate the amount of time spent to develop this prioritized list of drilling locations, versus the time normally spent in your own office to come up with similar decisions.

WORKSHOP MATERIALS

1. Survey map showing line geometry and possible drill sites.
2. 7 N-S vertical 3D migrated sections across the lease block.
3. 7 W-E vertical 3D migrated sections across the lease block.
4. 24 horizontal time-slices (3D migrated), 1060 through 1520 ms at a 20 ms increment.
5. 1 synthetic seismic trace from the first producing well in the lease block, with the important depth and velocity information.

By the end of the workshop you should have received:

6. Maps of the J-Unconformity, Brent and Statfjord formations.

7. Map showing the contact of the sand formations with the J-Unconformity.

8. Map showing the extent of the oil reservoirs.

9. Idealized vertical cross-sections through key producing wells.

After the workshop you will be shown:

10. A film or video tape showing an interactive interpretation session of the data volume using a graphics processor.

PROCEDURE

I. (30 minutes)

1) Mark the nine well locations on the vertical sections.

2) Mark the well locations, CDP, and Line numbers on an overlay of the survey map (on tracing paper).

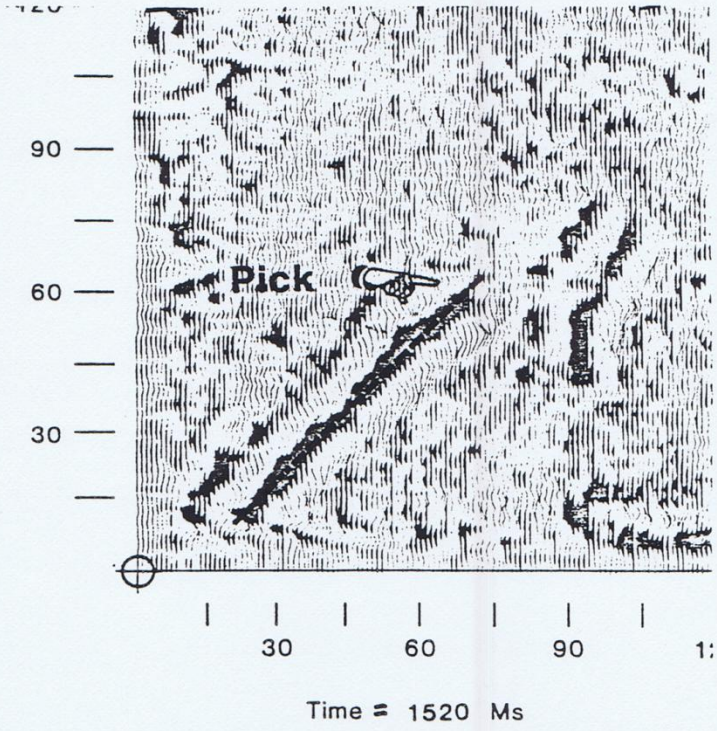


Illustration showing a contour "pick" for the base of the Statfjord.

3) Using the annotated tracing paper above, construct a time contour map of the bottom of the Statfjord sand from the horizontal seismic sections. The bottom of the Statfjord occurs between 1.2 and 1.5 seconds in the lease block area. Picking the same event from the series of time-slices defines directly a time contour map of the reflecting surface. Local strike and dip are quickly resolved. Fault planes are defined where reflections terminate.

Start with T = 1520 and work up to T = 1200 contouring the event in the lower left fault block as shown in the figure above. Note the fault that runs from CDP 120 to Line 150. Fold line 45 E along 1520 msec and tie with Horizontal T = 1520. Note which event in the vertical section has been contoured. How many msec must be subtracted to get to the start of the wavelet? [10 msec]

Vertical sections used in conjunction with the time-slices provide a better understanding of subtle features found in both displays. Vertical sections can be used to correlate events across fault blocks and determine wavelet character.

II. (60 minutes)

Draw contour maps on separate overlays for; top of the Statfjord, base of the Brent, top of the Brent, and the unconformity.

III. (30 minutes)

Using the contour maps, draw a map of the extent of the oil reservoir on a new overlay. Use the well log from well 16 to pick the time for the oil/water contact (1130 msec) in the Brent. Extend until o/w contact meets the base of the Brent, top of the Brent, or the unconformity. If possible, repeat for the Statfjord where the o/w contact is at 1190 msec.

IV. (15 minutes)

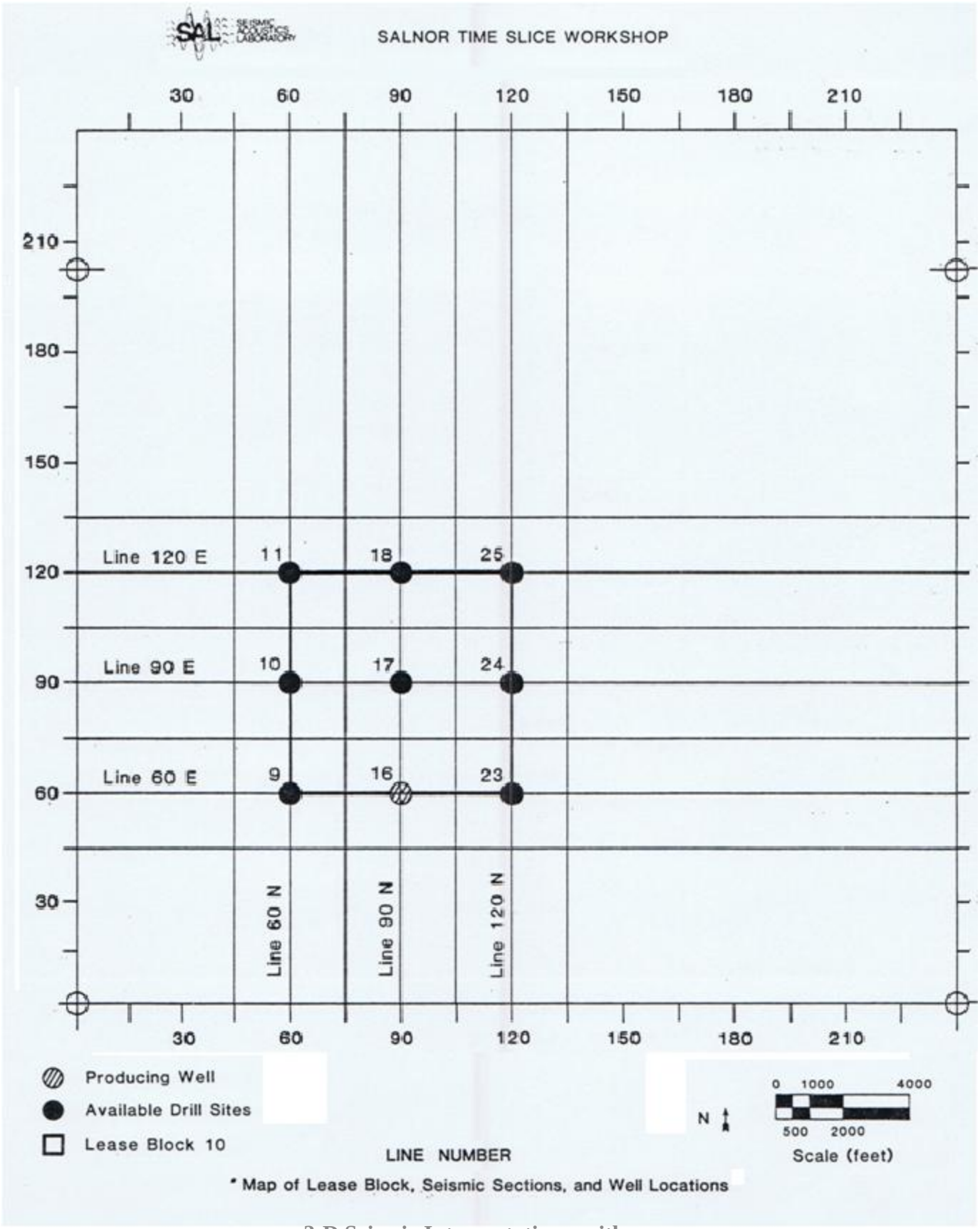
Draw a map of where the Brent sand is in contact with the unconformity.

V. (45 minutes)

Interpret lines 60 E, 90 E, and 120 E. On a separate overlay for each section, mark the base of the Statfjord, top of the Statfjord, base of the Brent, top of the Brent, unconformity, o/w contact in the Brent, o/w contact in the Statfjord, extent of the oil columms, and the three wells.

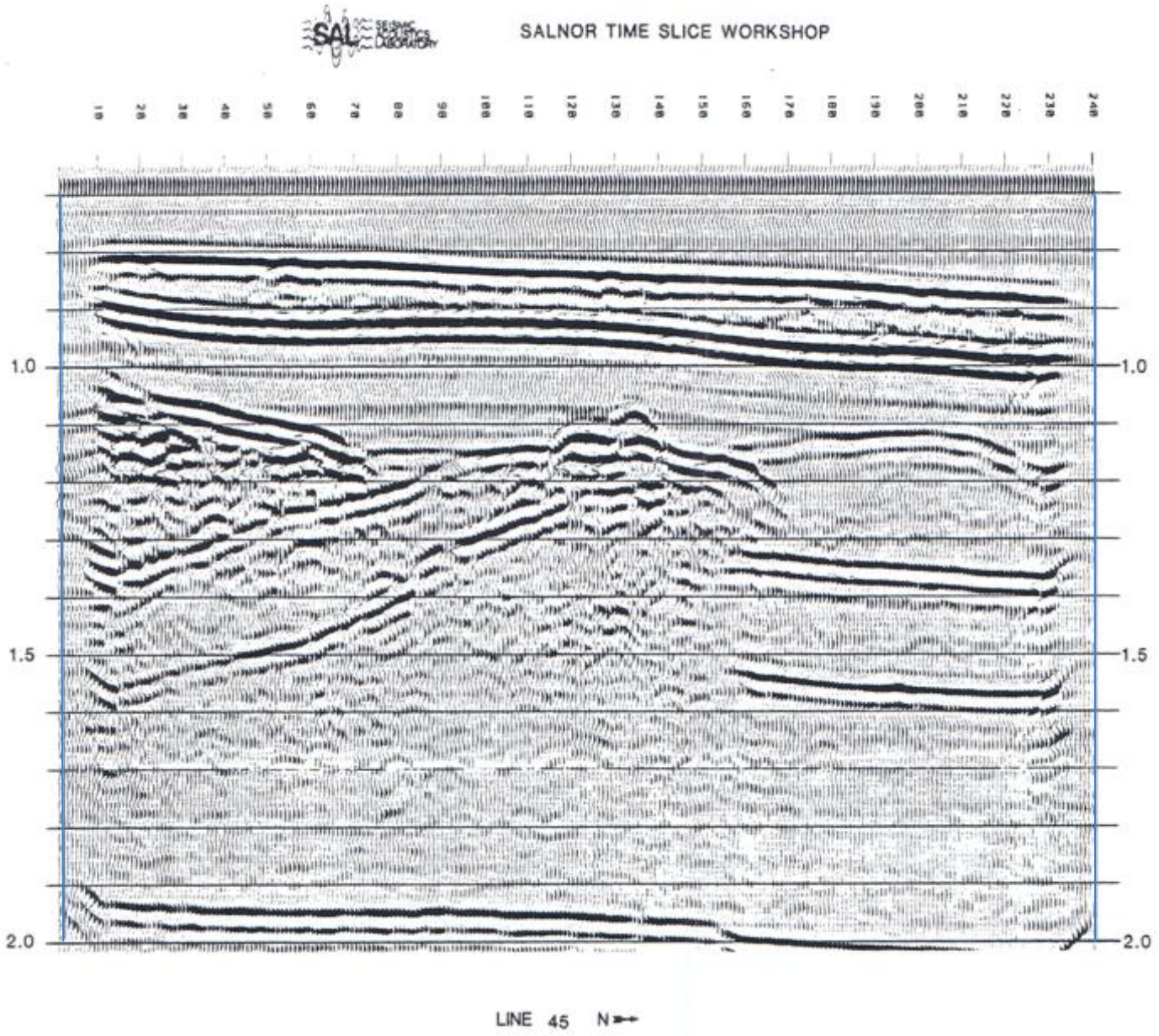
Using all the above information, evaluate all eight possible drilling locations. Pick the best drilling location if wells can be placed anywhere.

Location Map

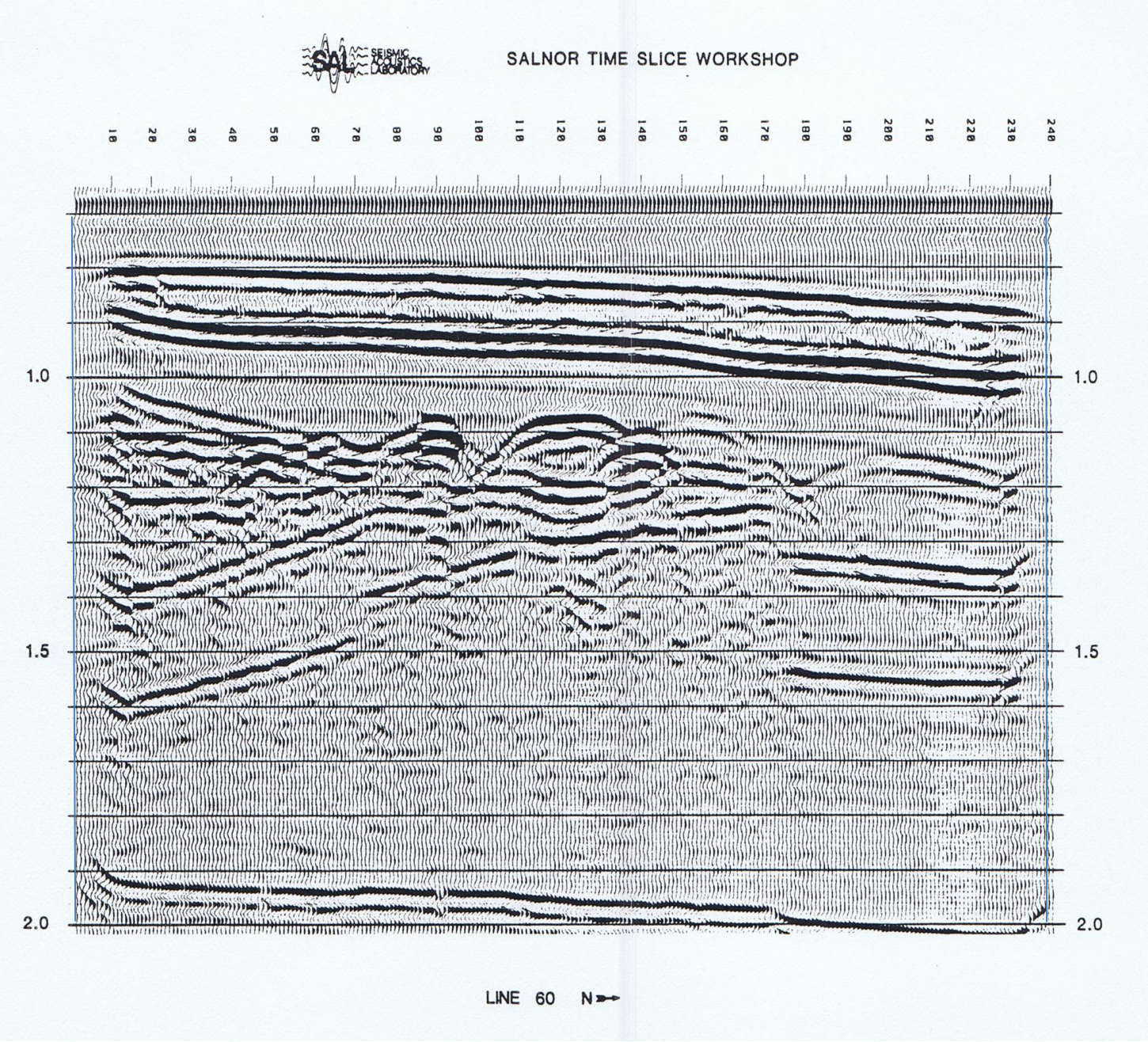


* Map of Lease Block, Seismic Sections, and Well Locations

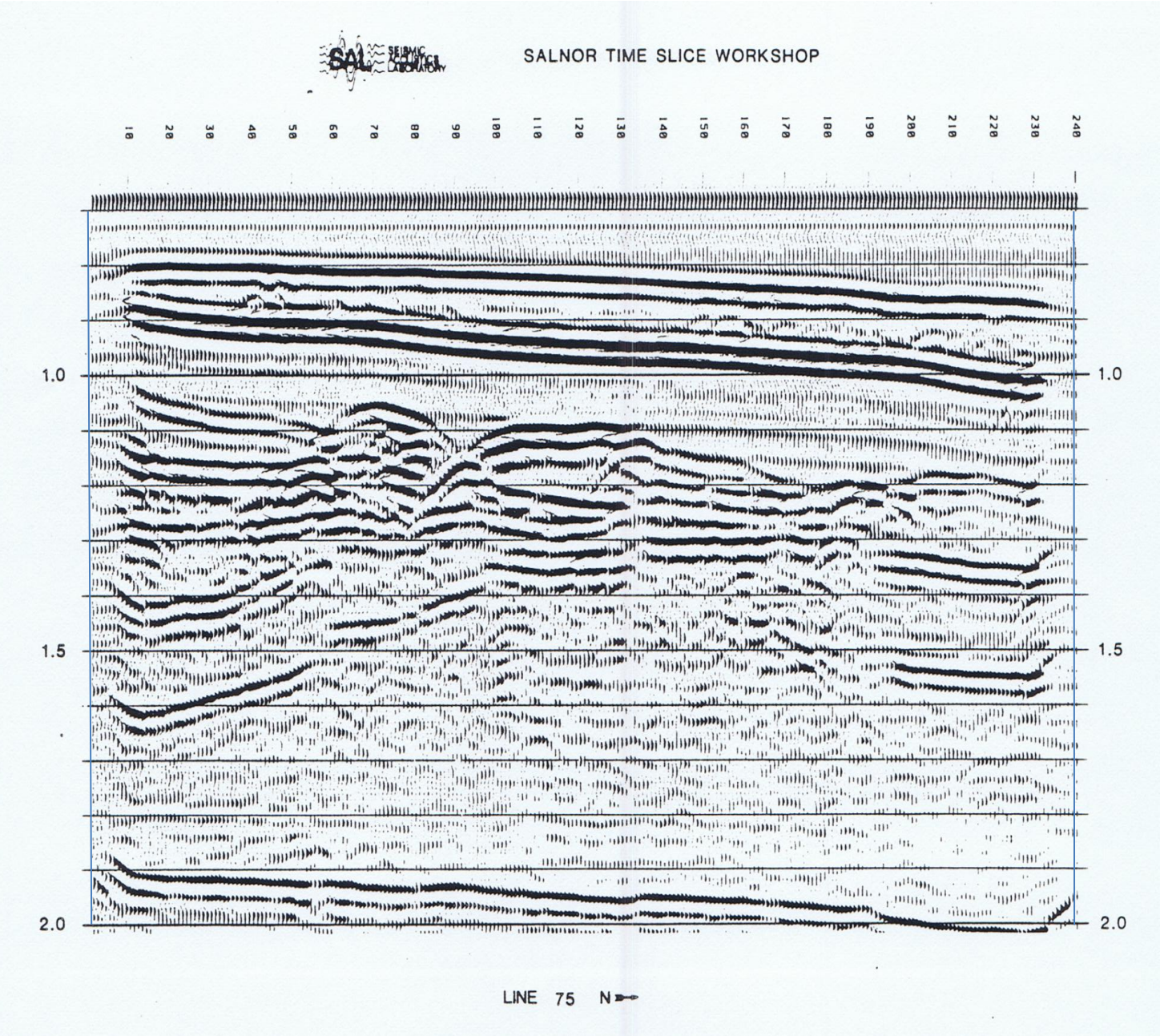
Line-045N



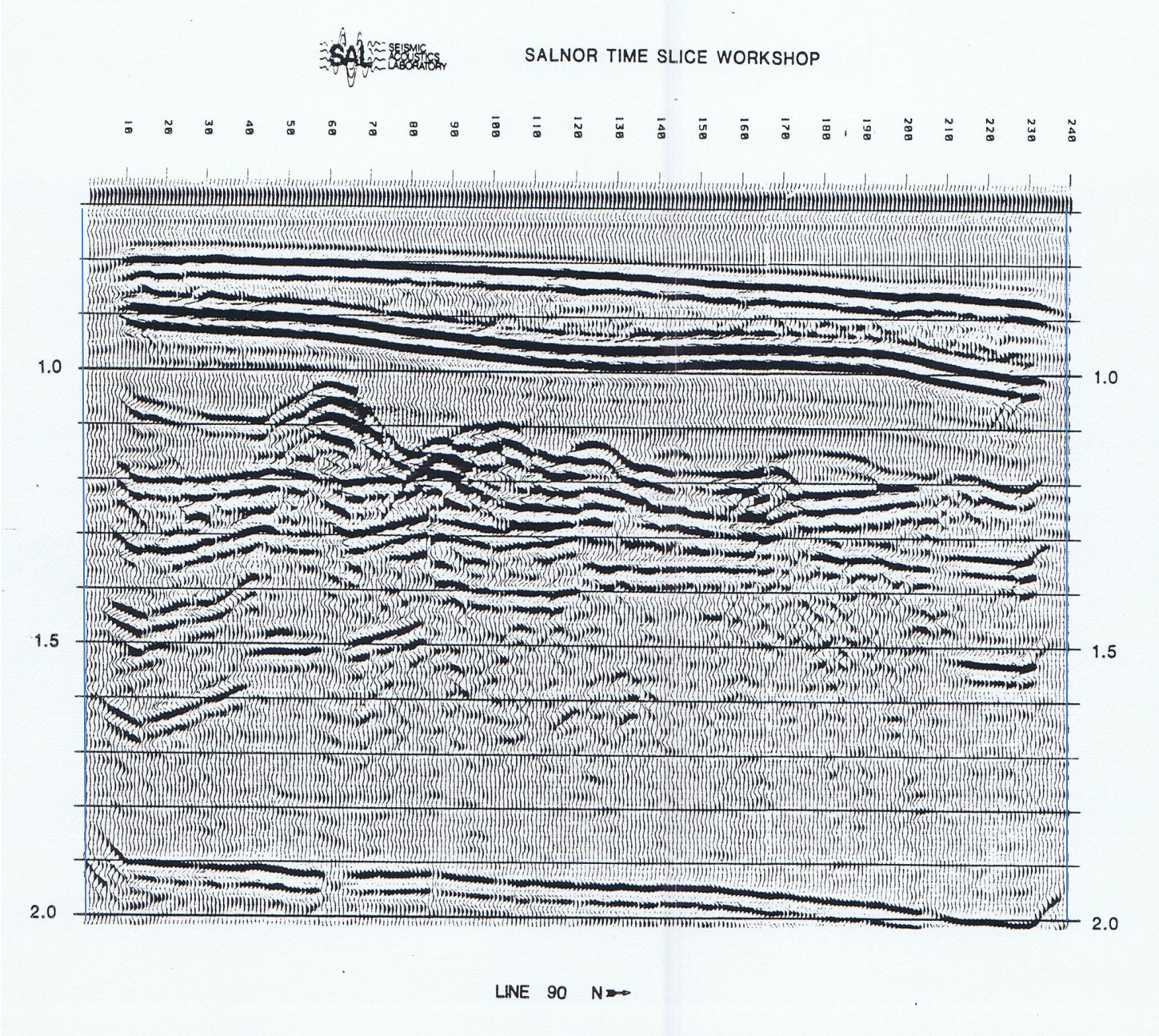
Line-060N



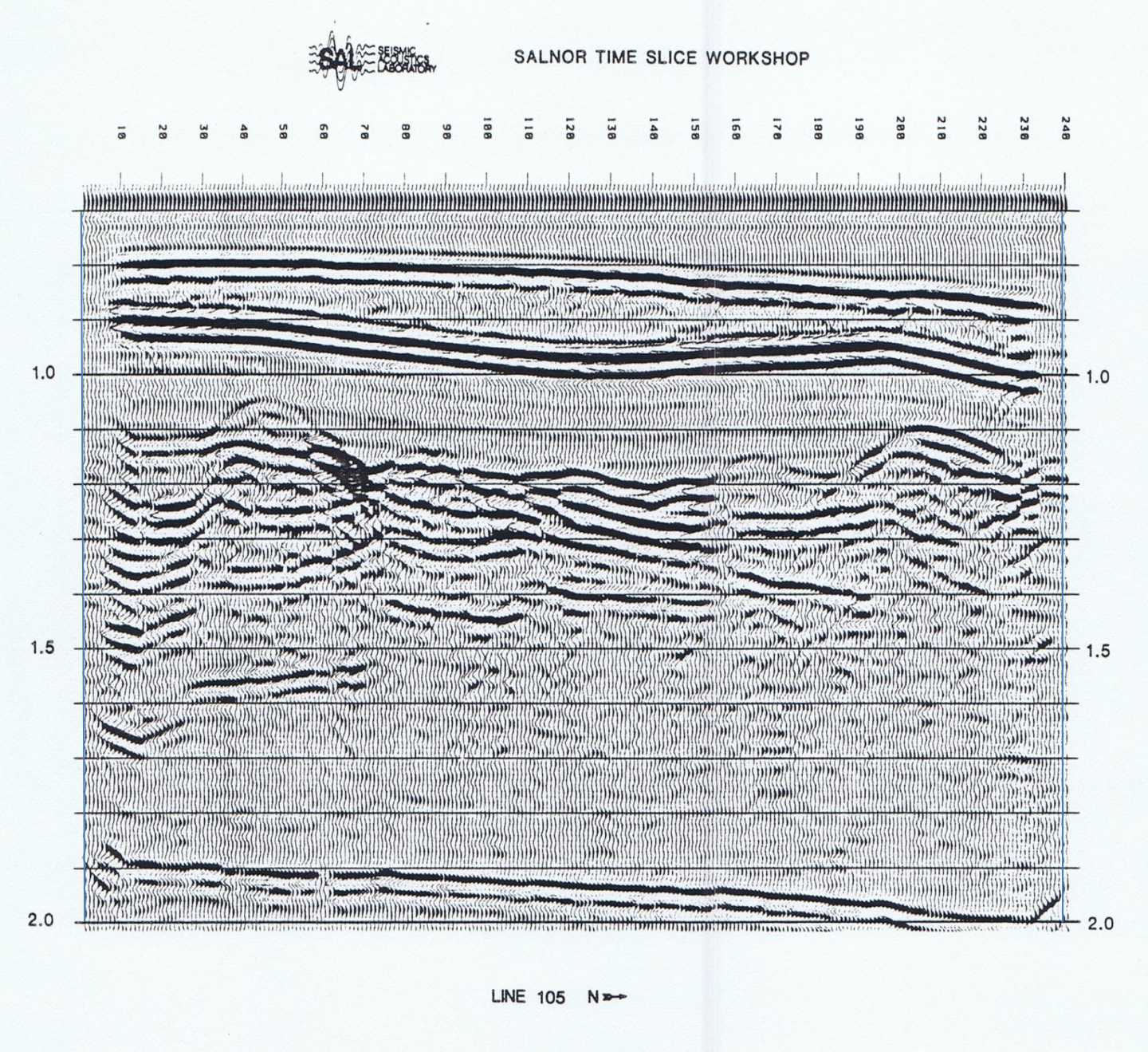
Line-075N



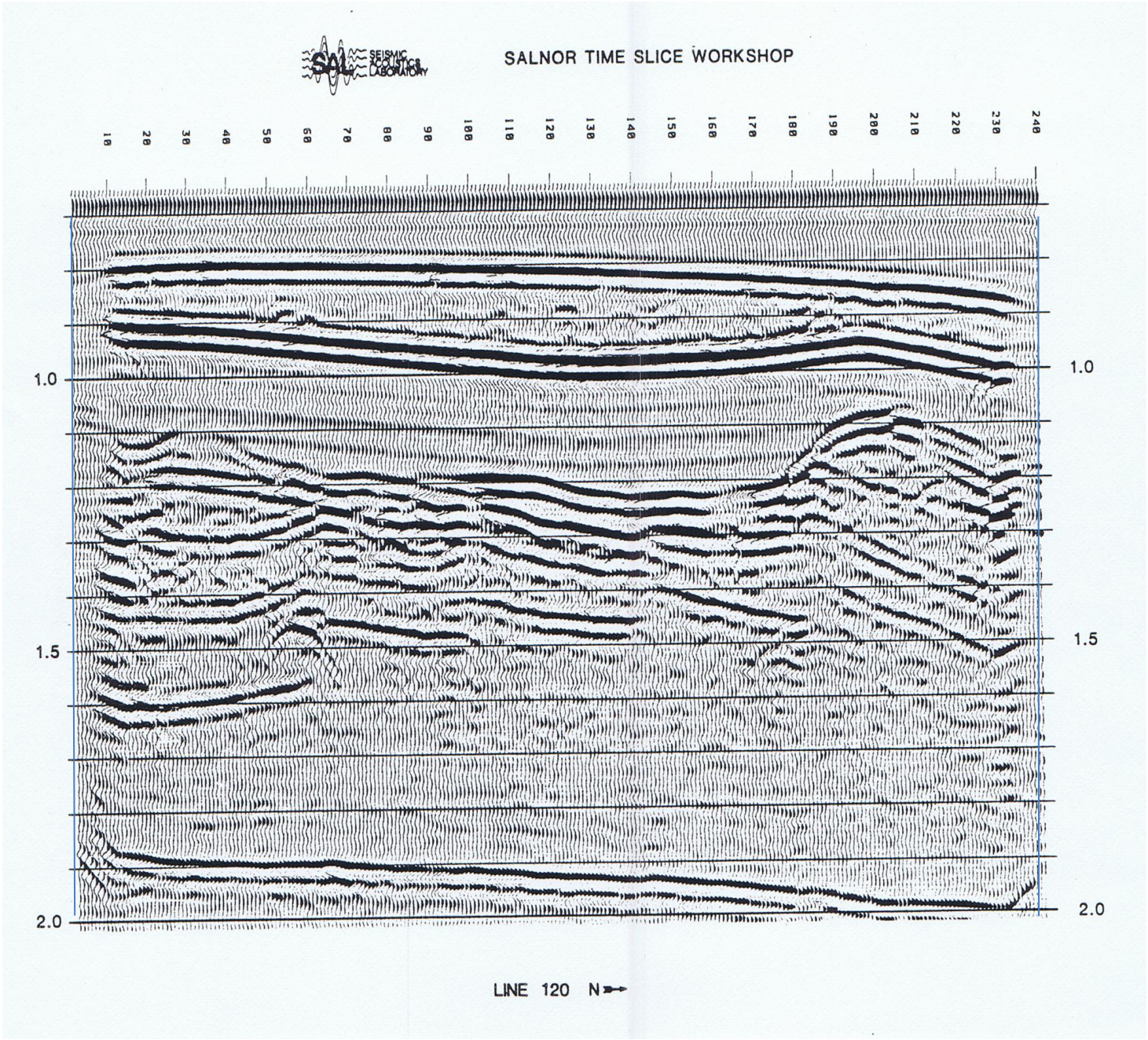
Line-090N



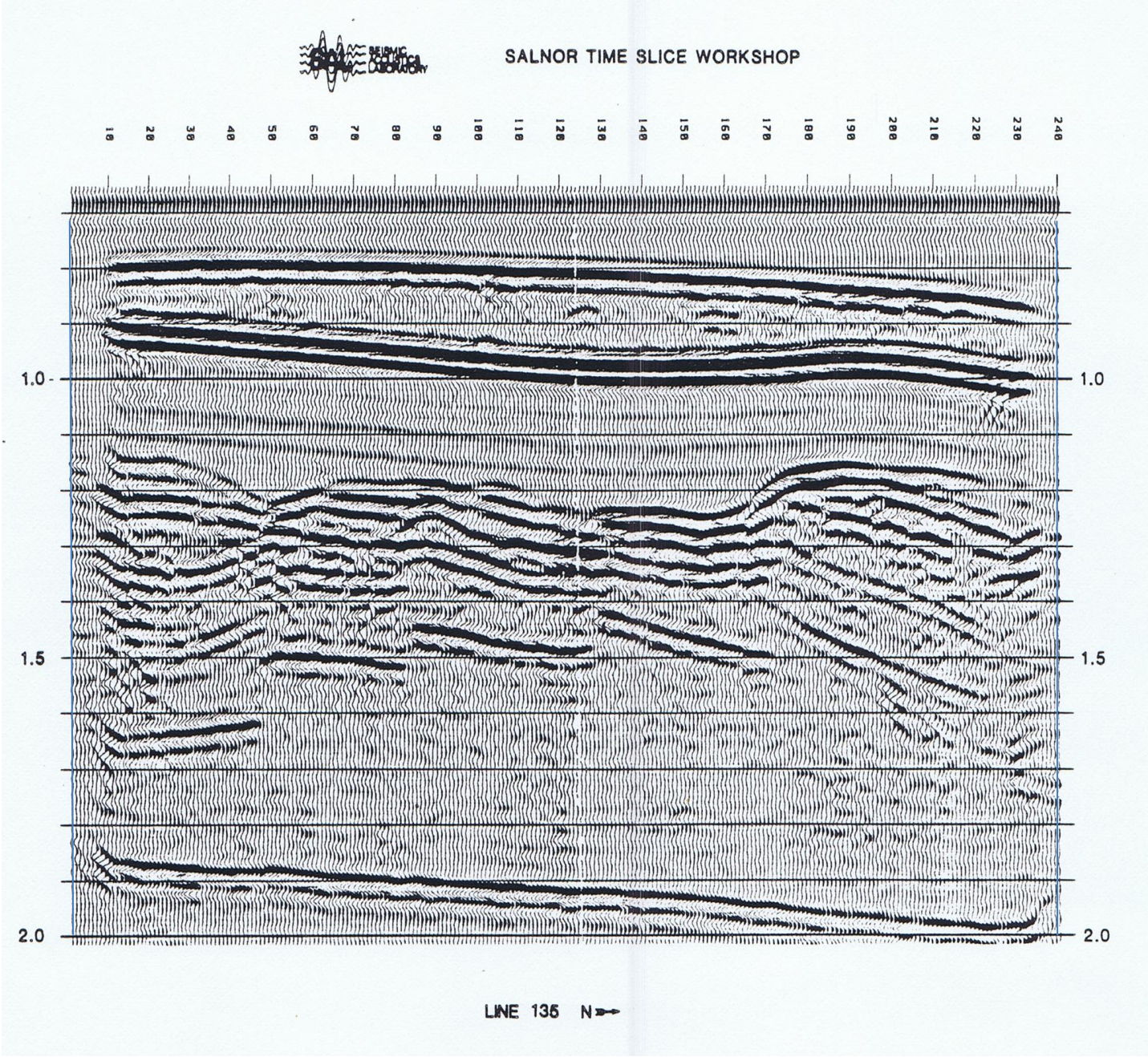
Line-105N



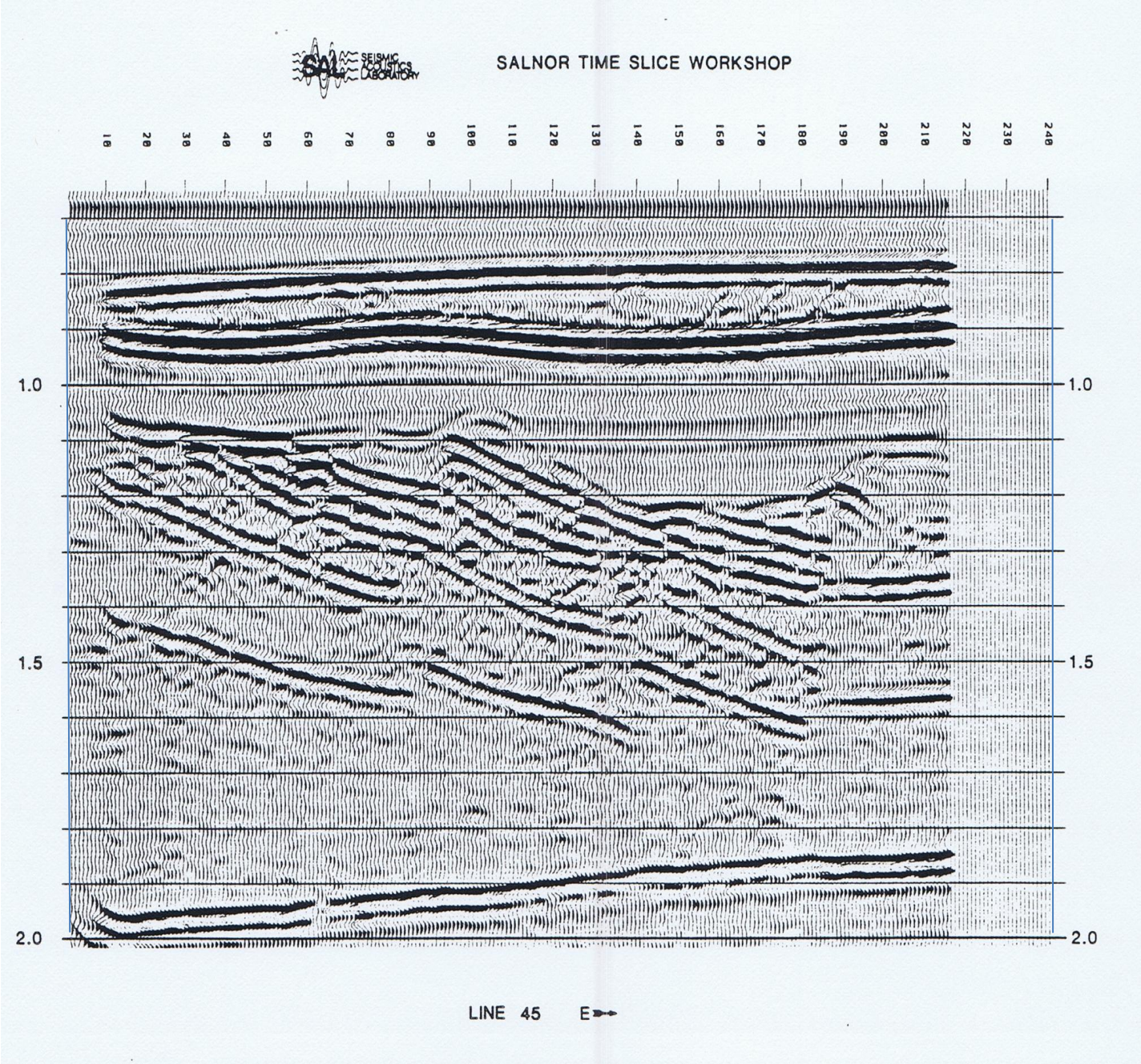
Line-120N



Line-135N



CDP-045E



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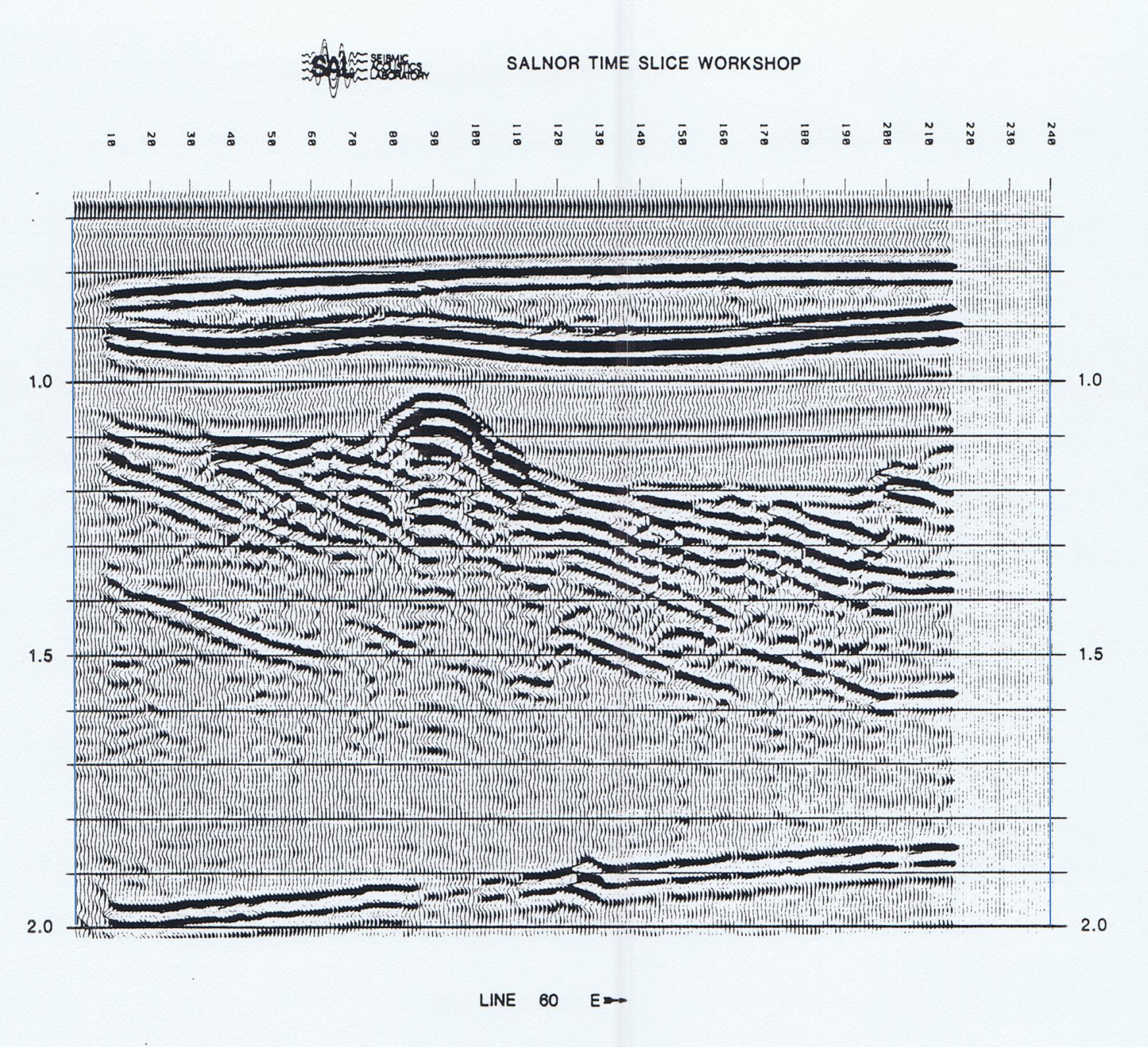

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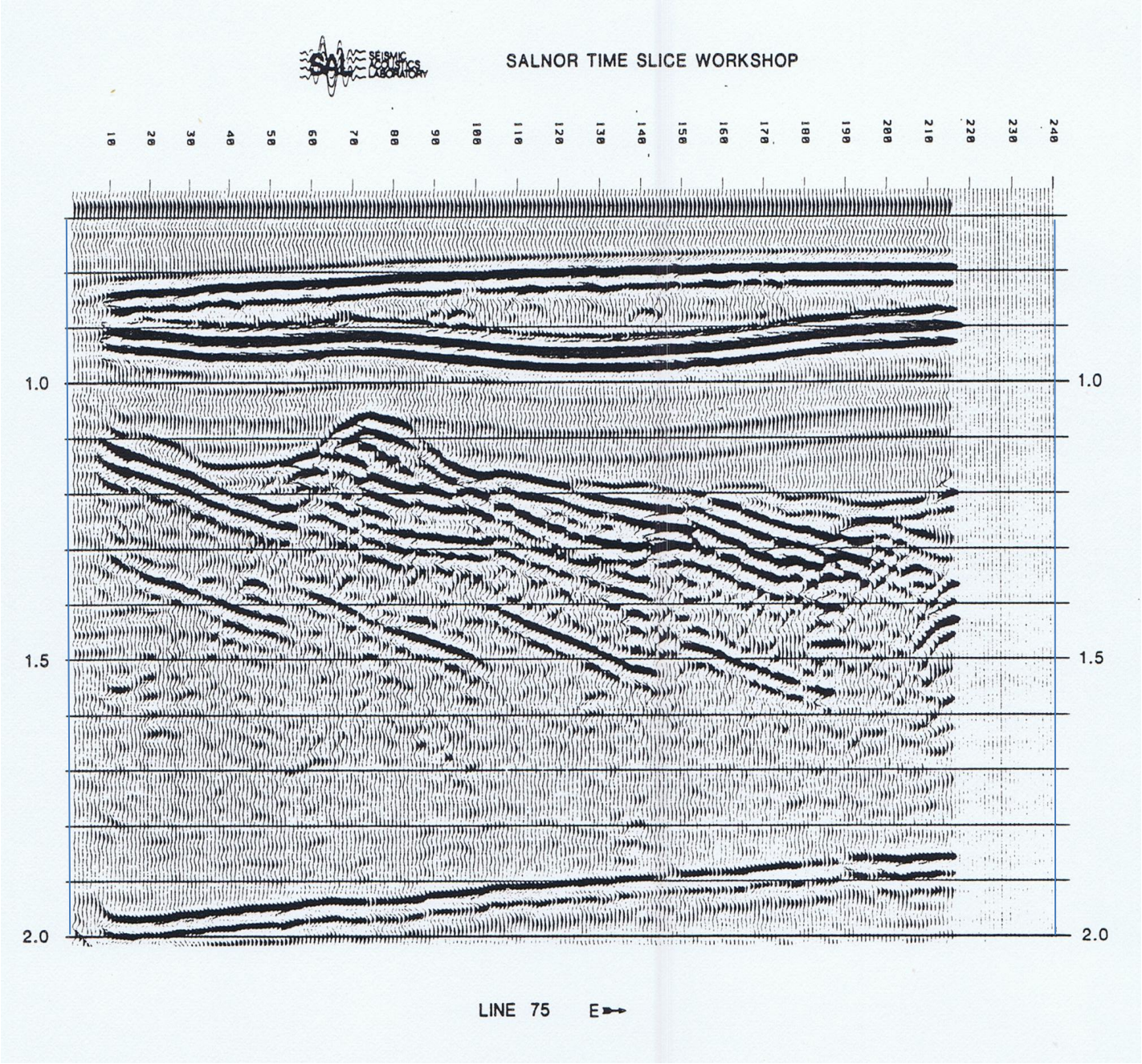

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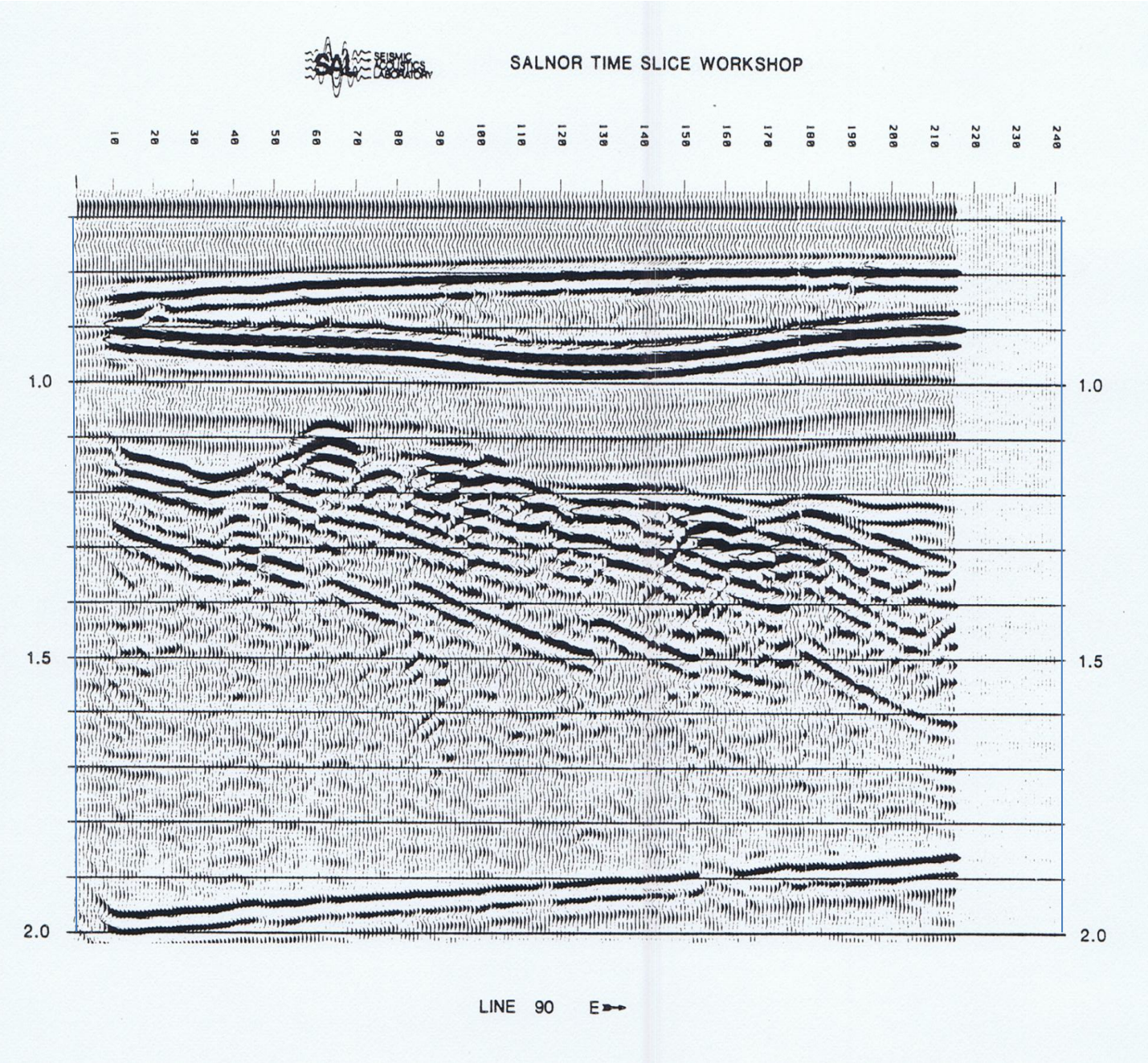
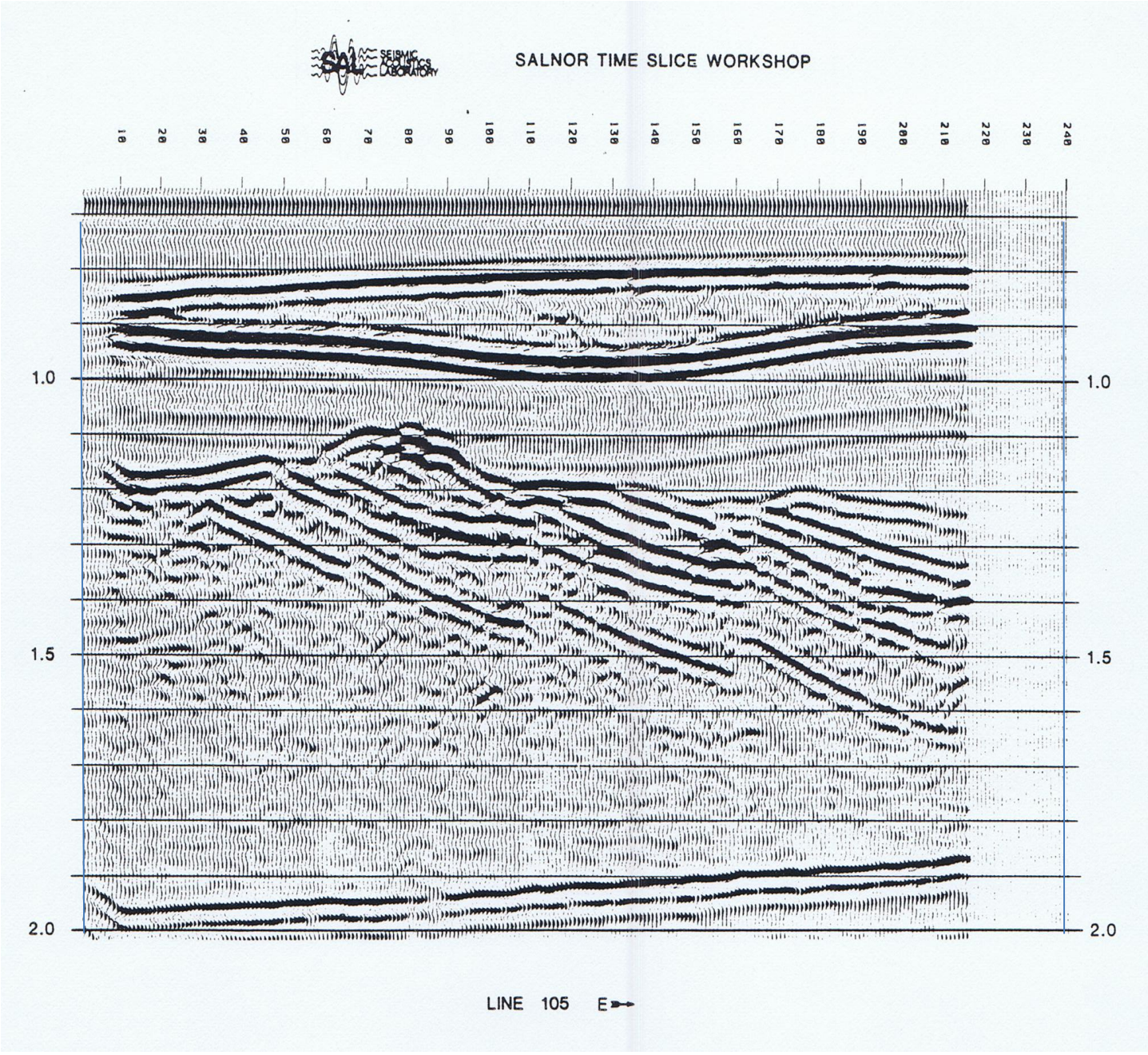


CDP-105E



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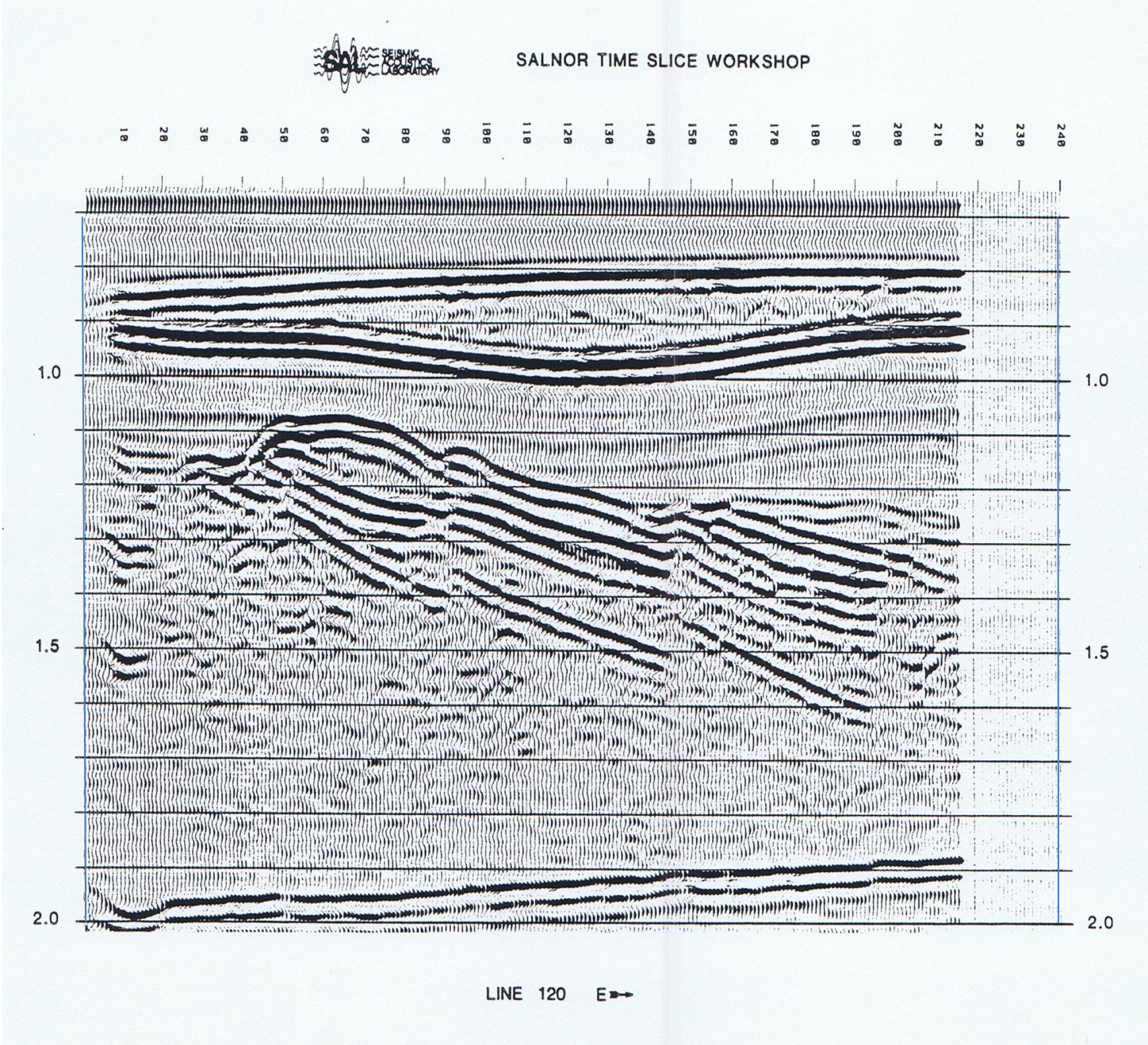
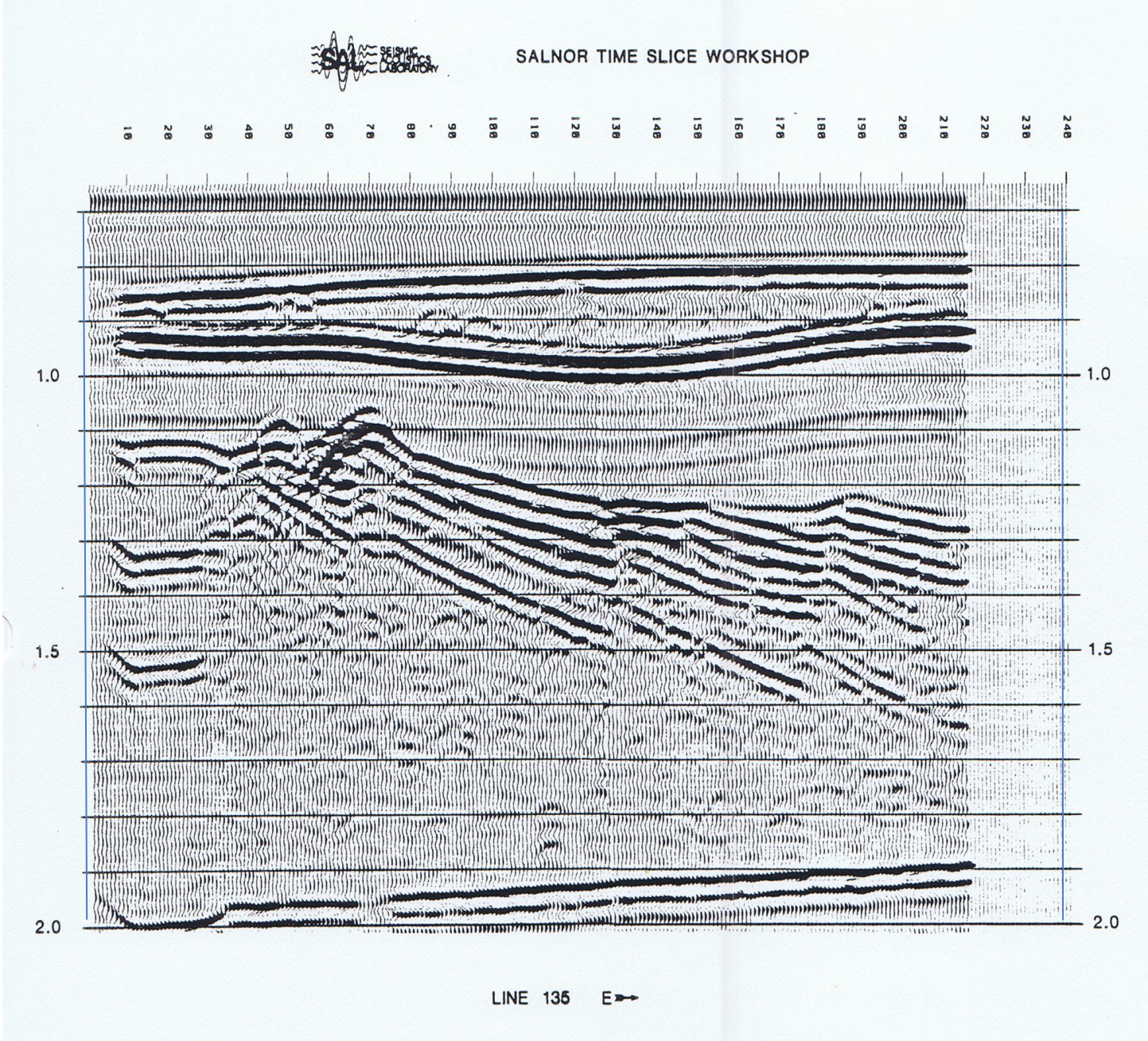
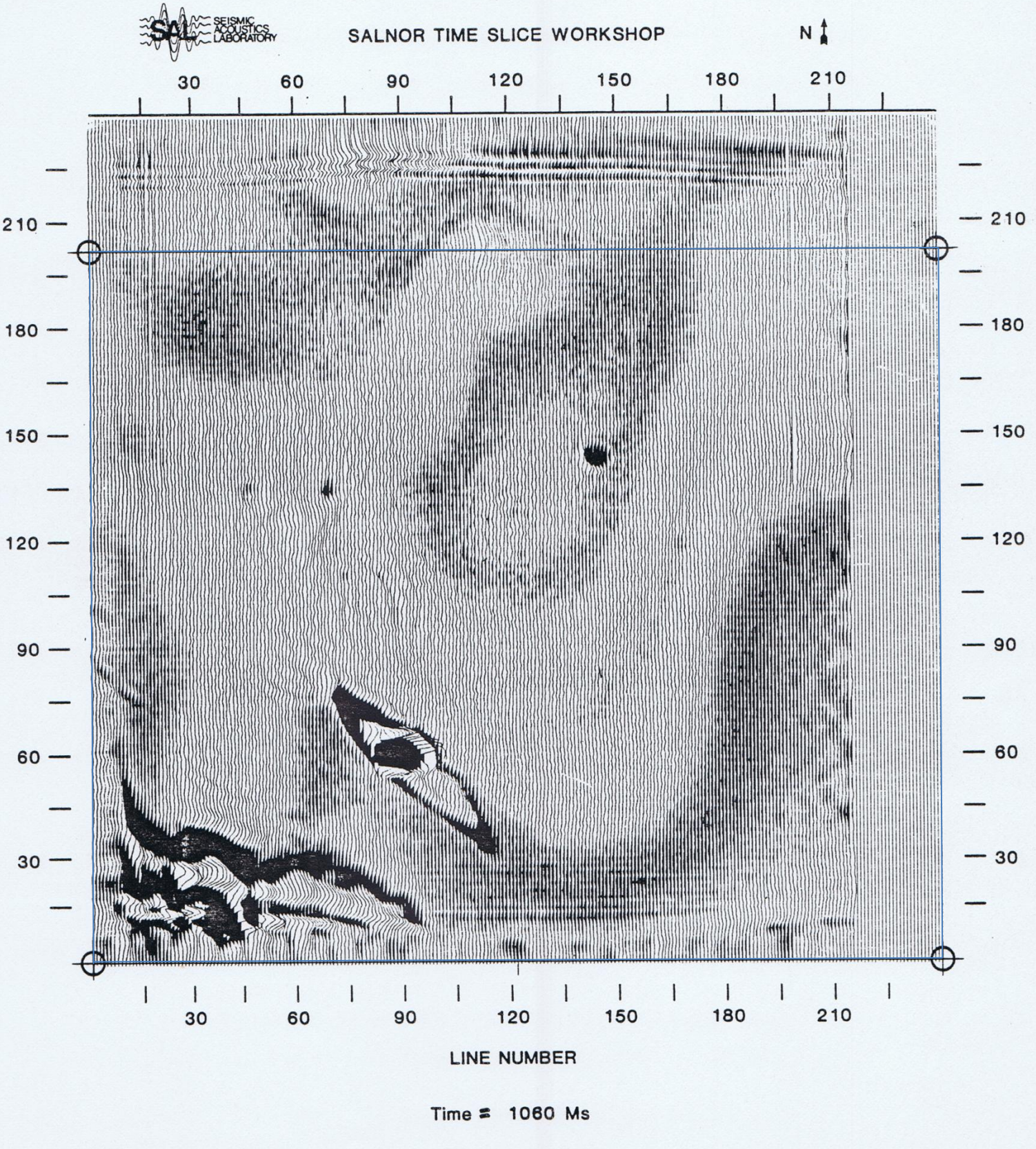


CDP-135E



Time-Slice 1060 ms



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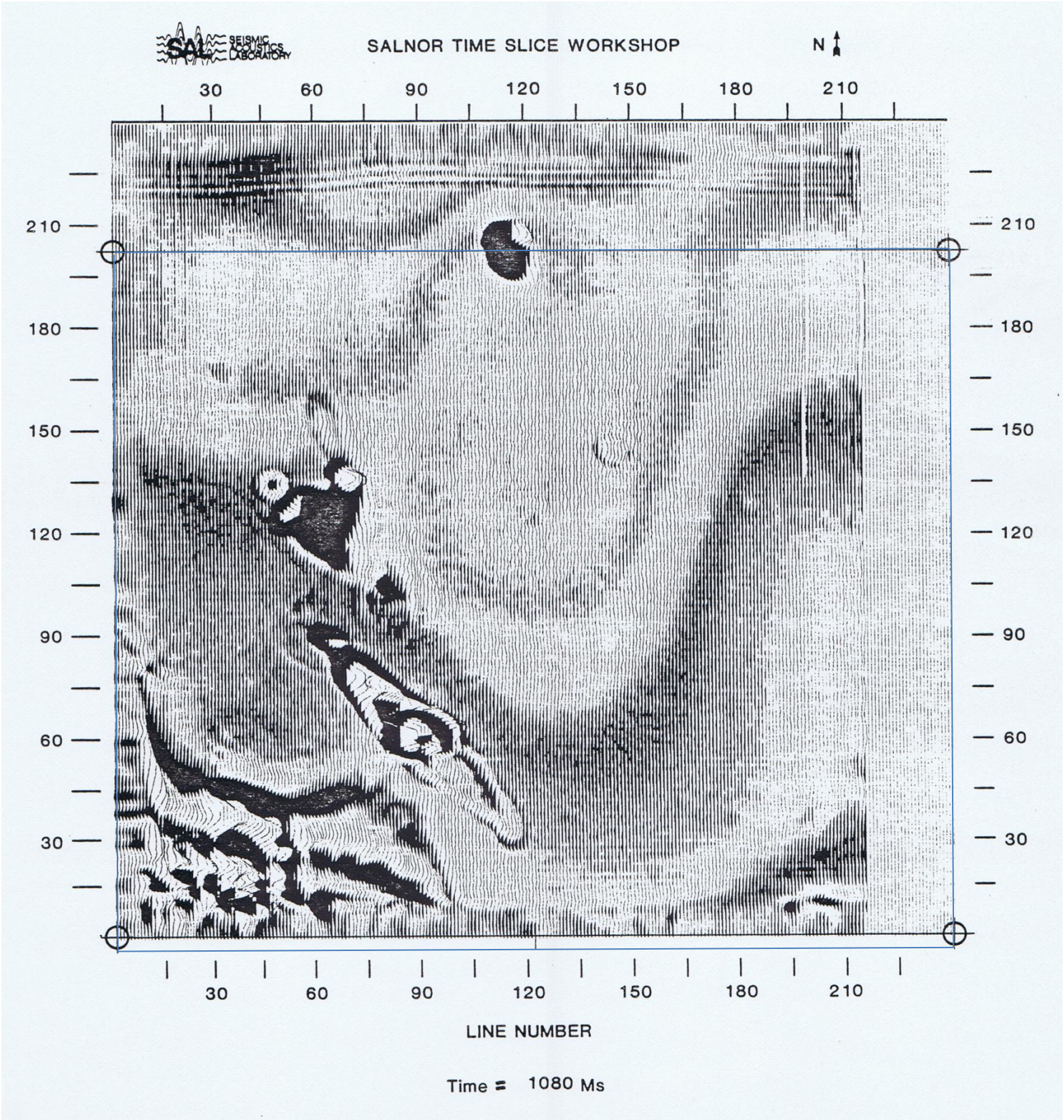

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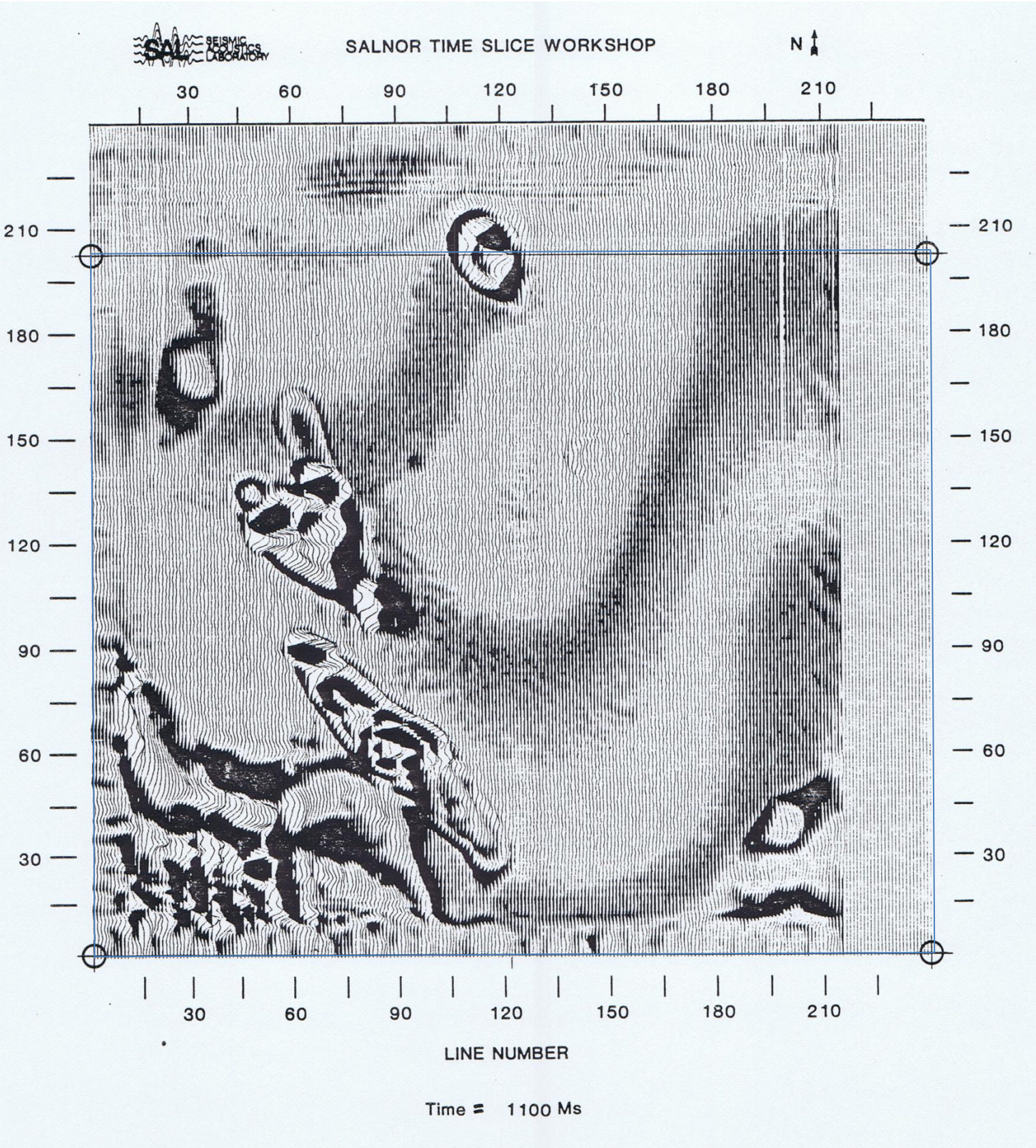

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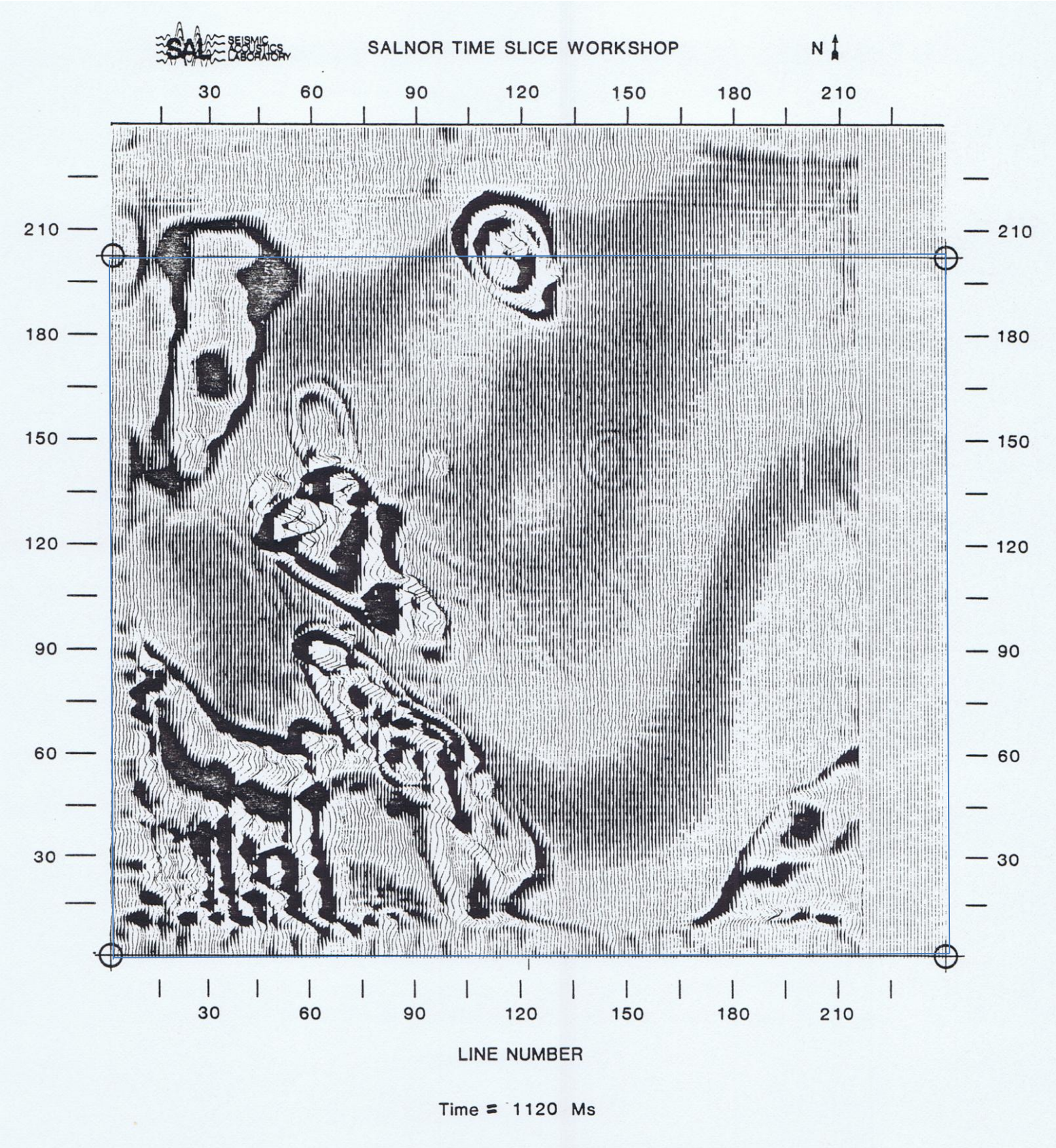
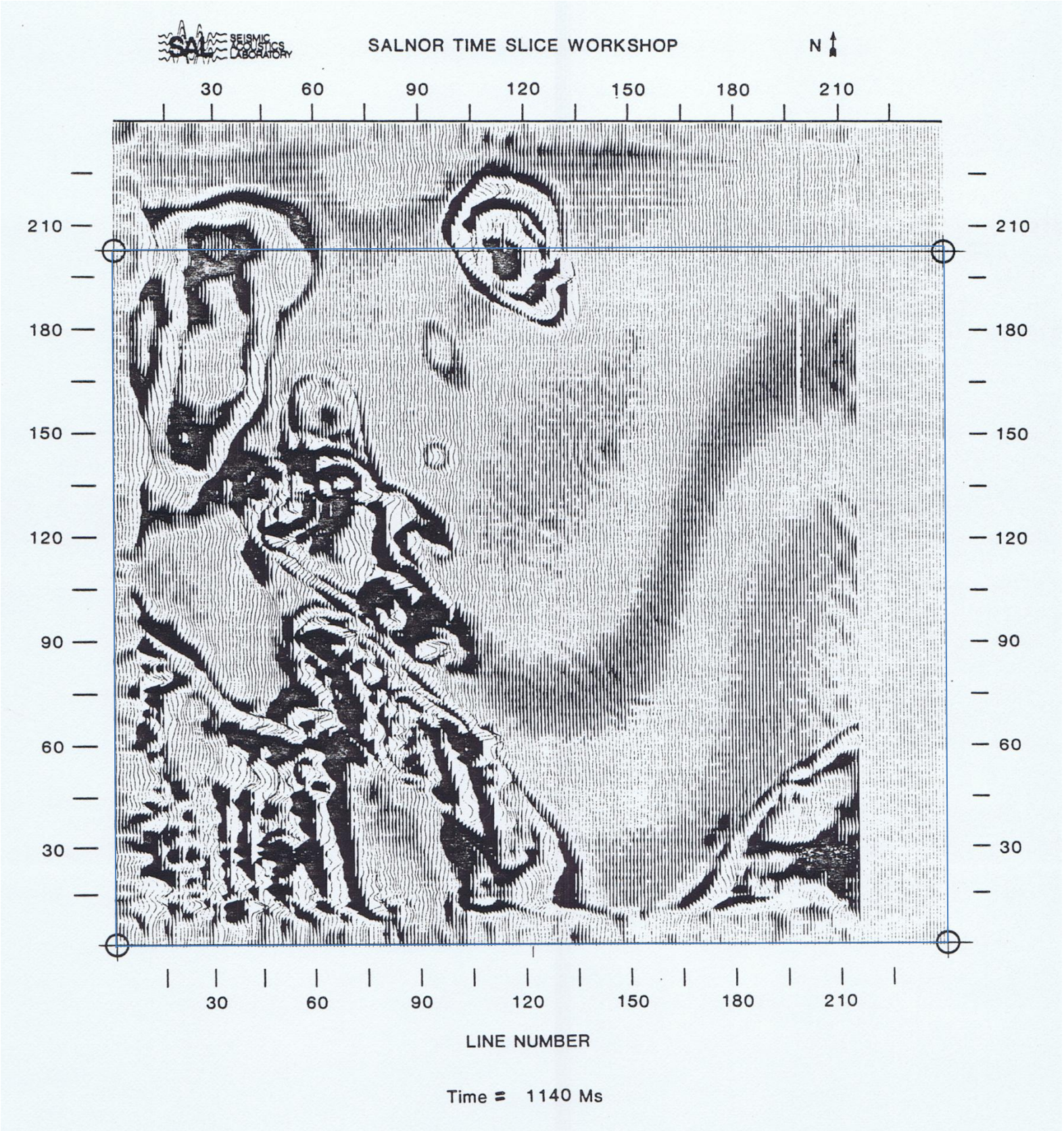


Time-Slice 1140 ms



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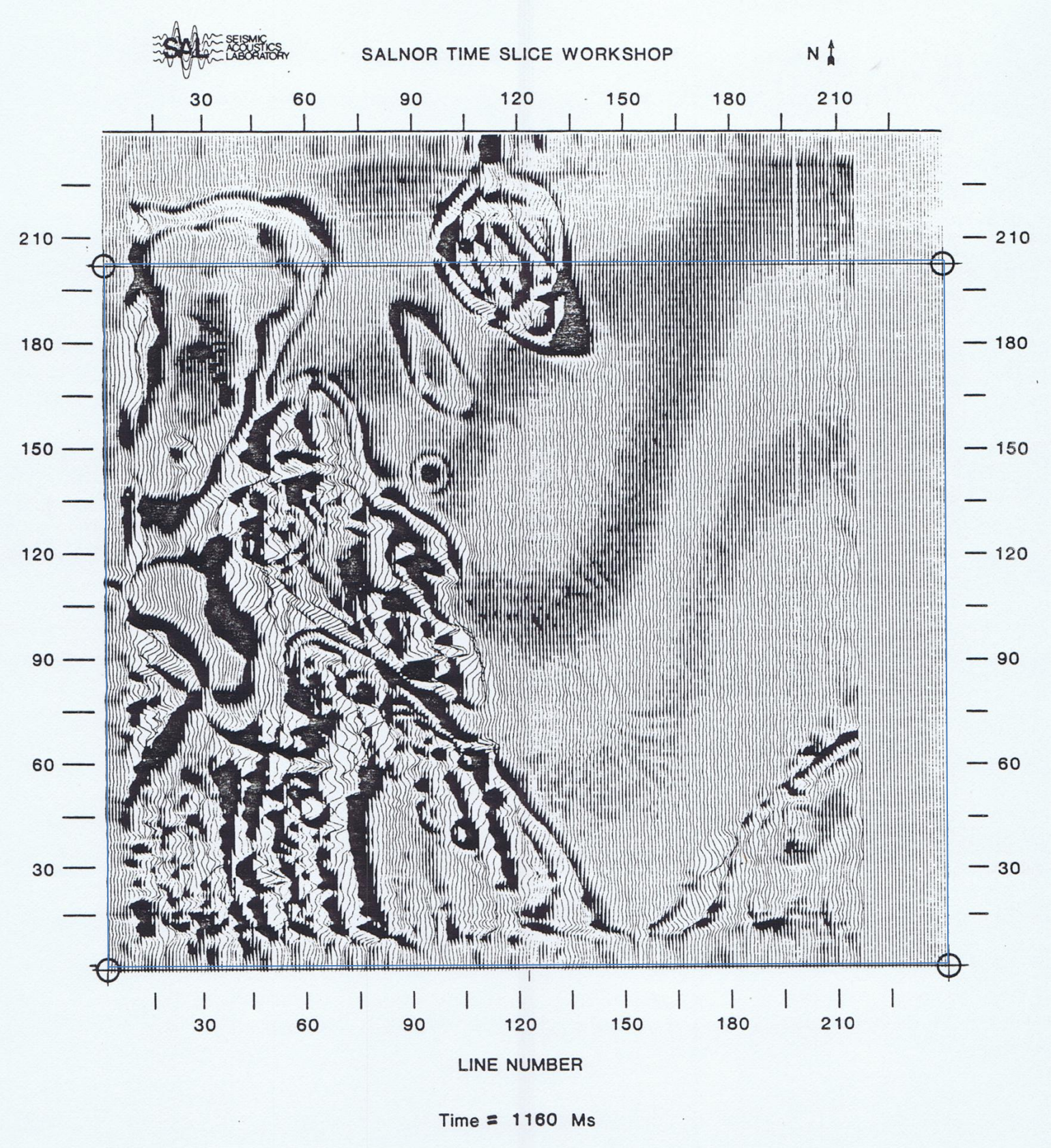
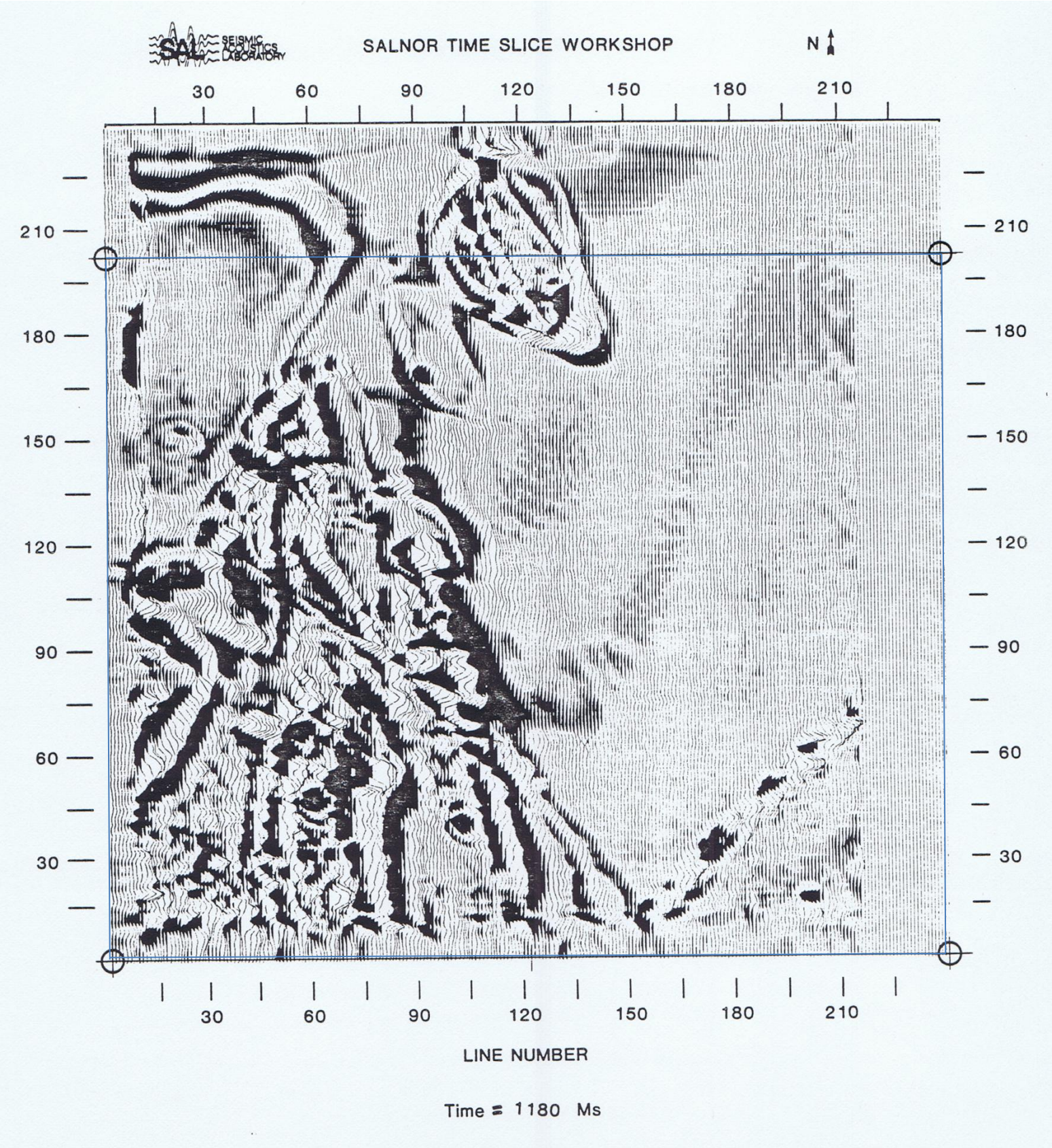
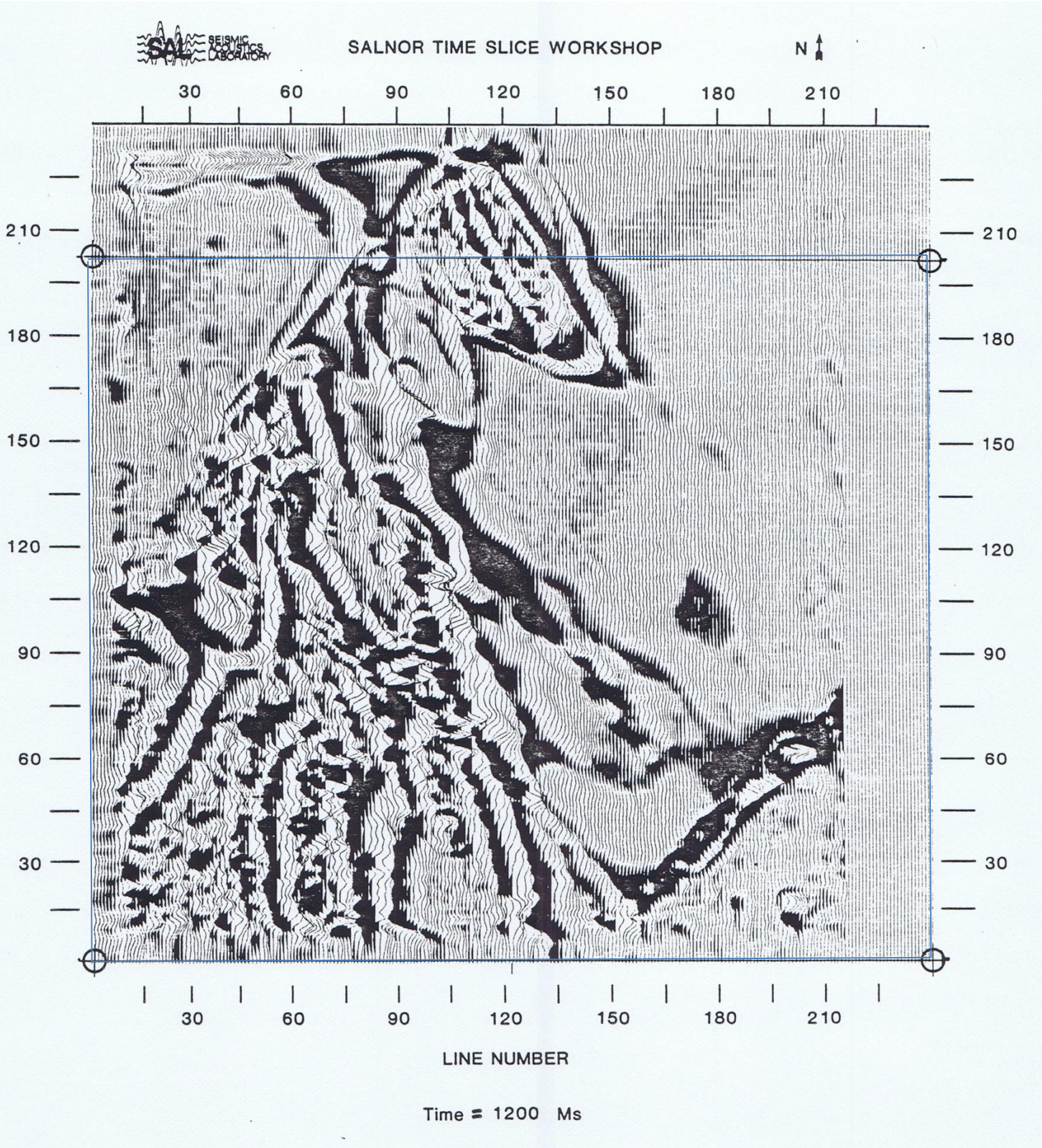


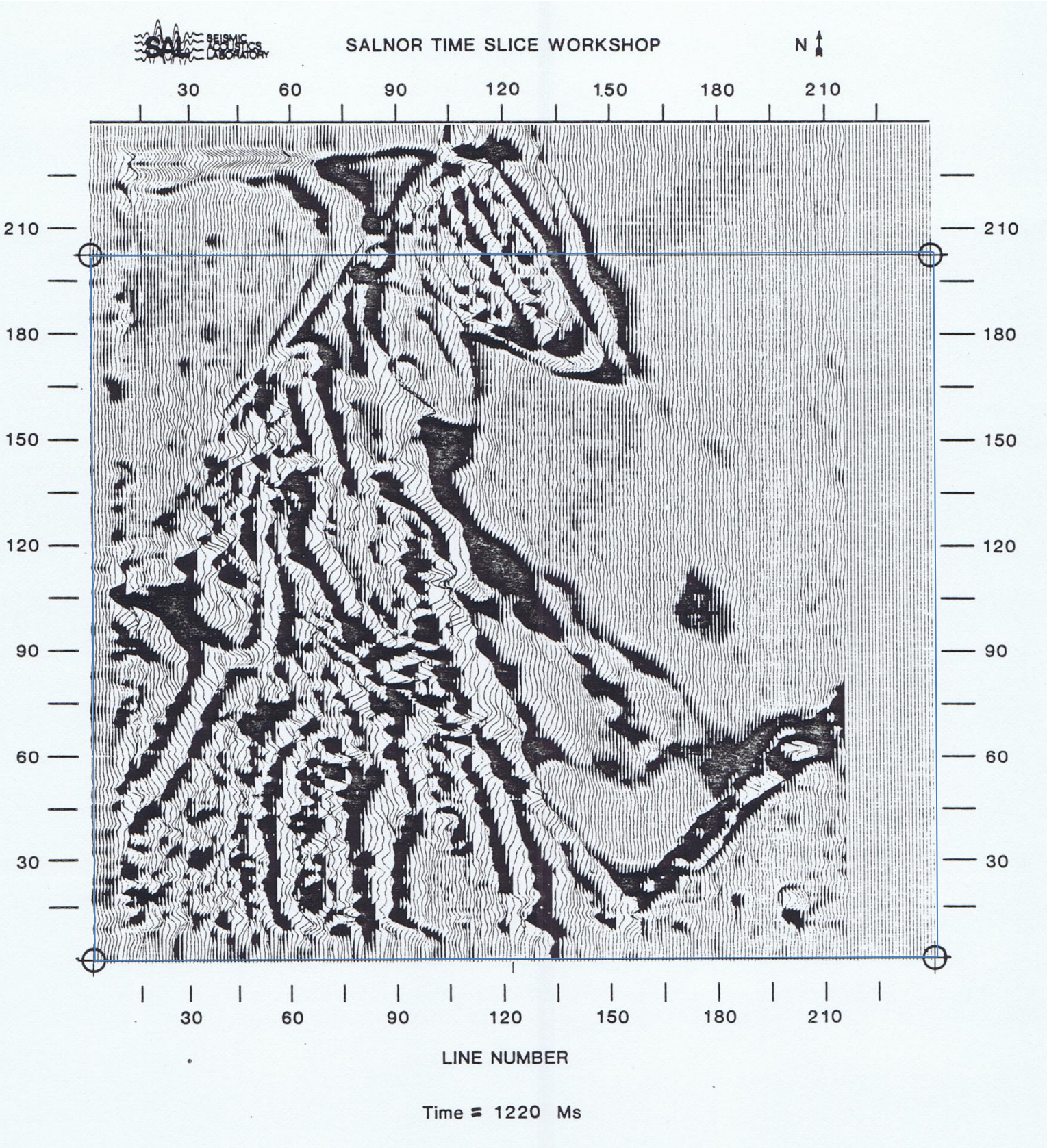
Time-Slice 1180 ms



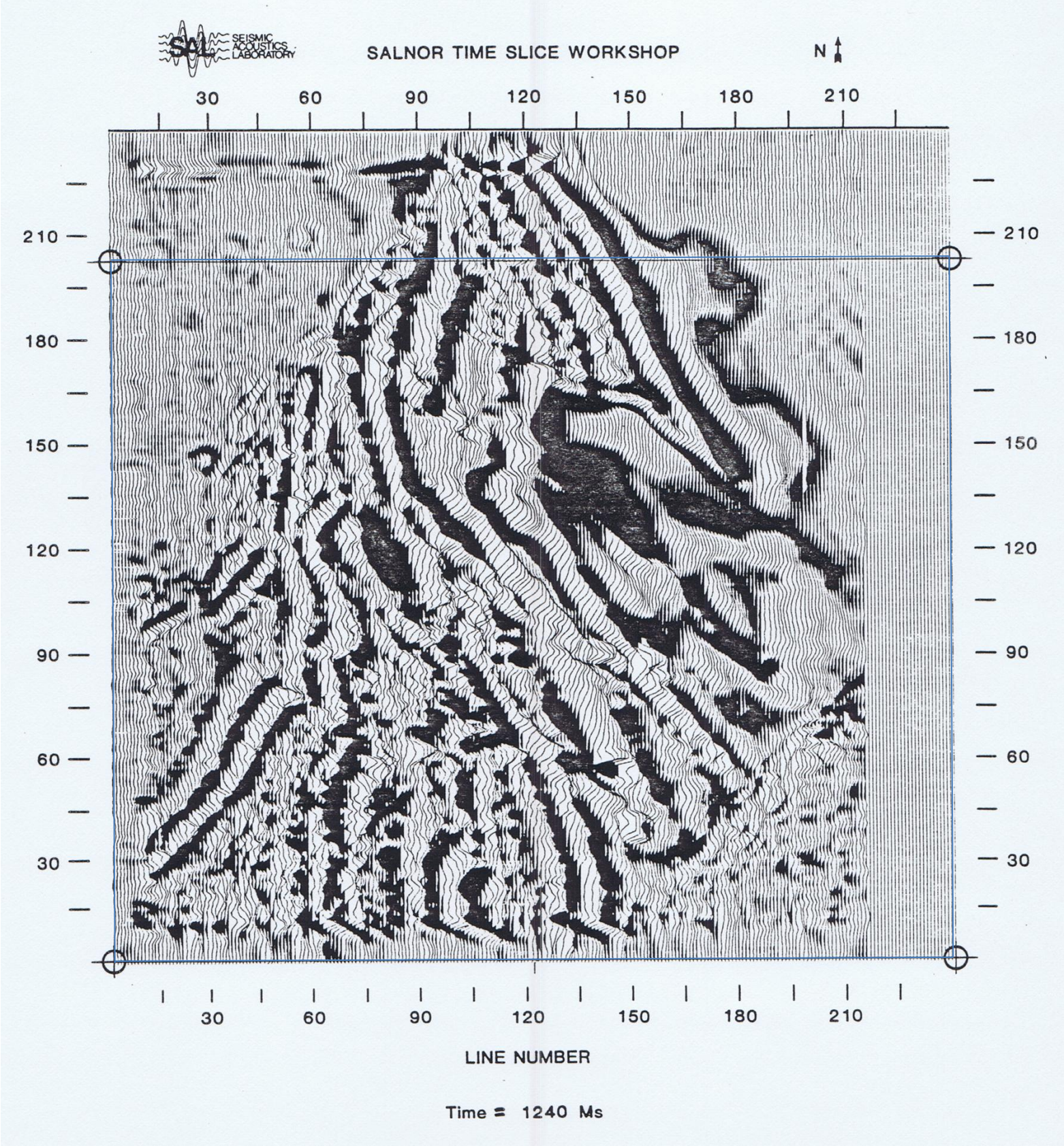
Time-Slice 1200 ms



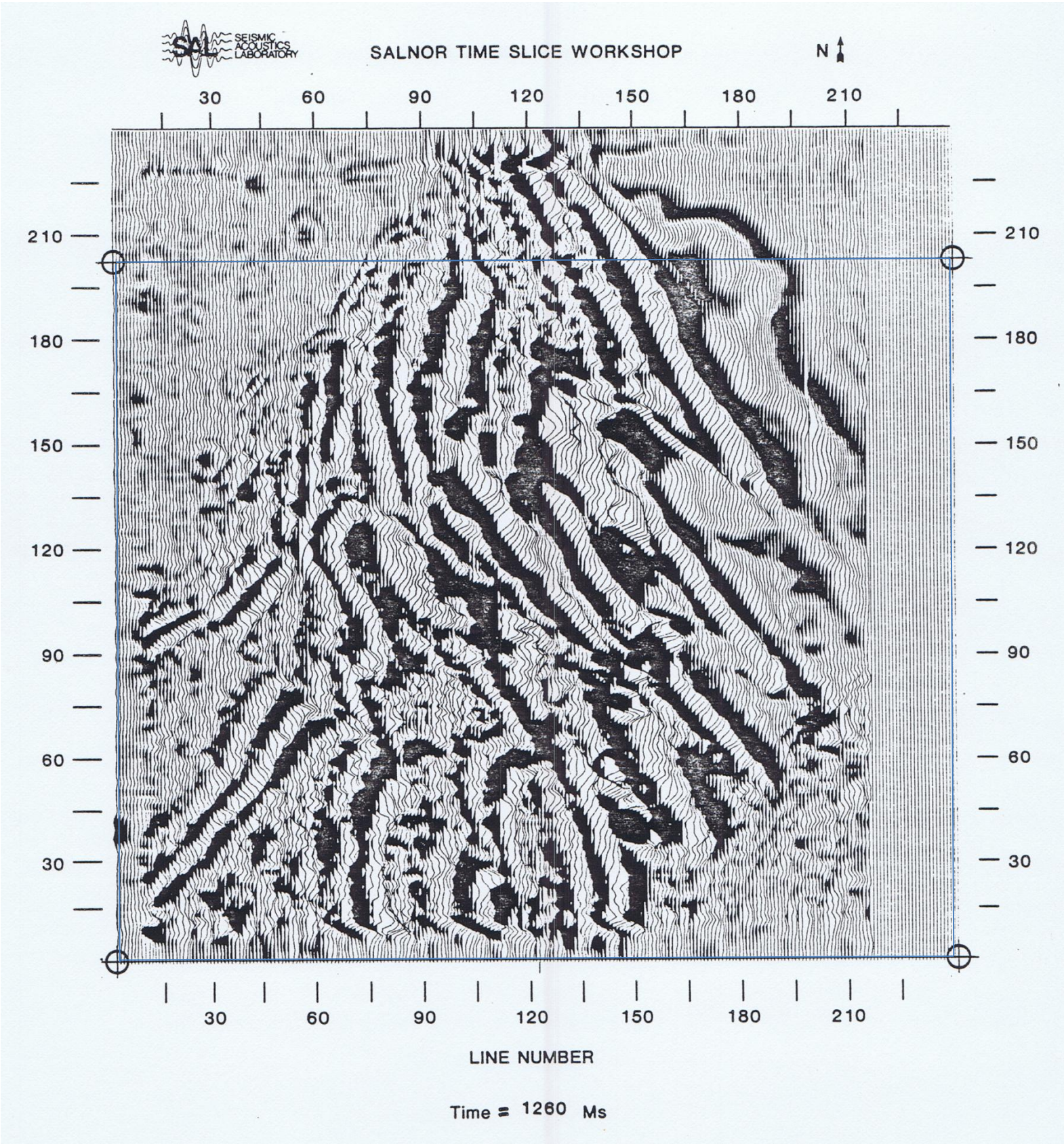
Time-Slice 1220 ms



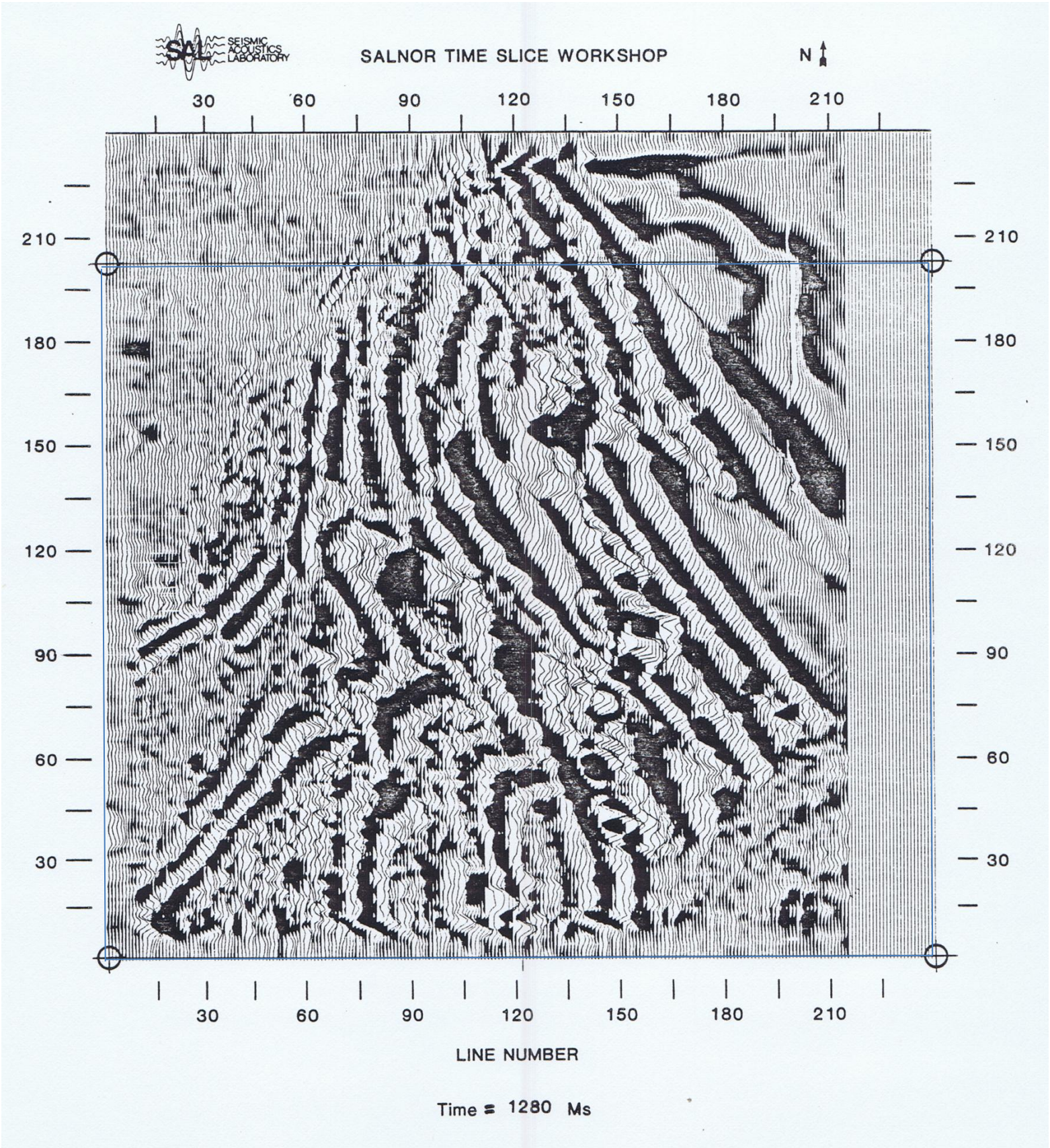
Time-Slice 1240 ms



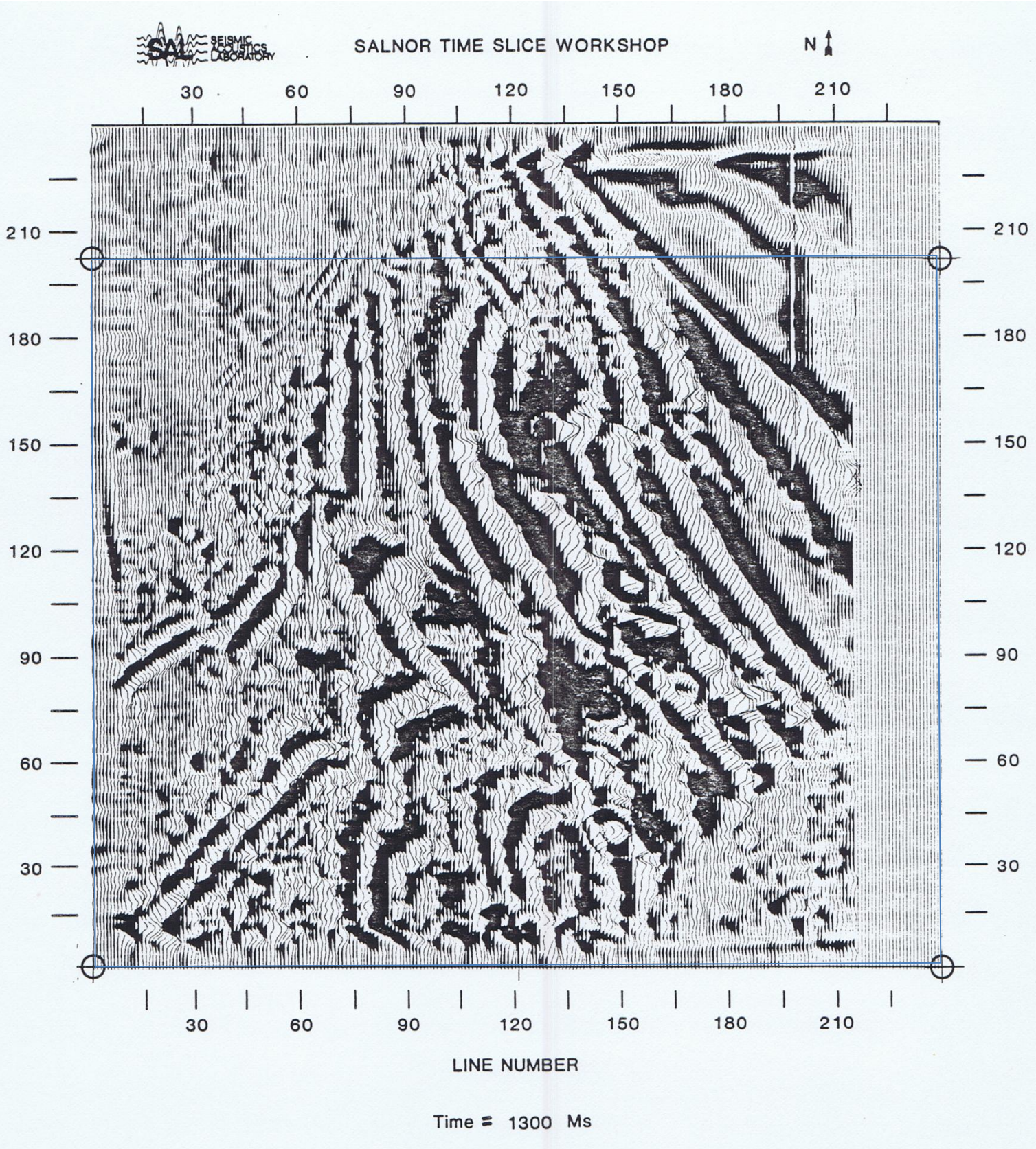
Time-Slice 1260 ms



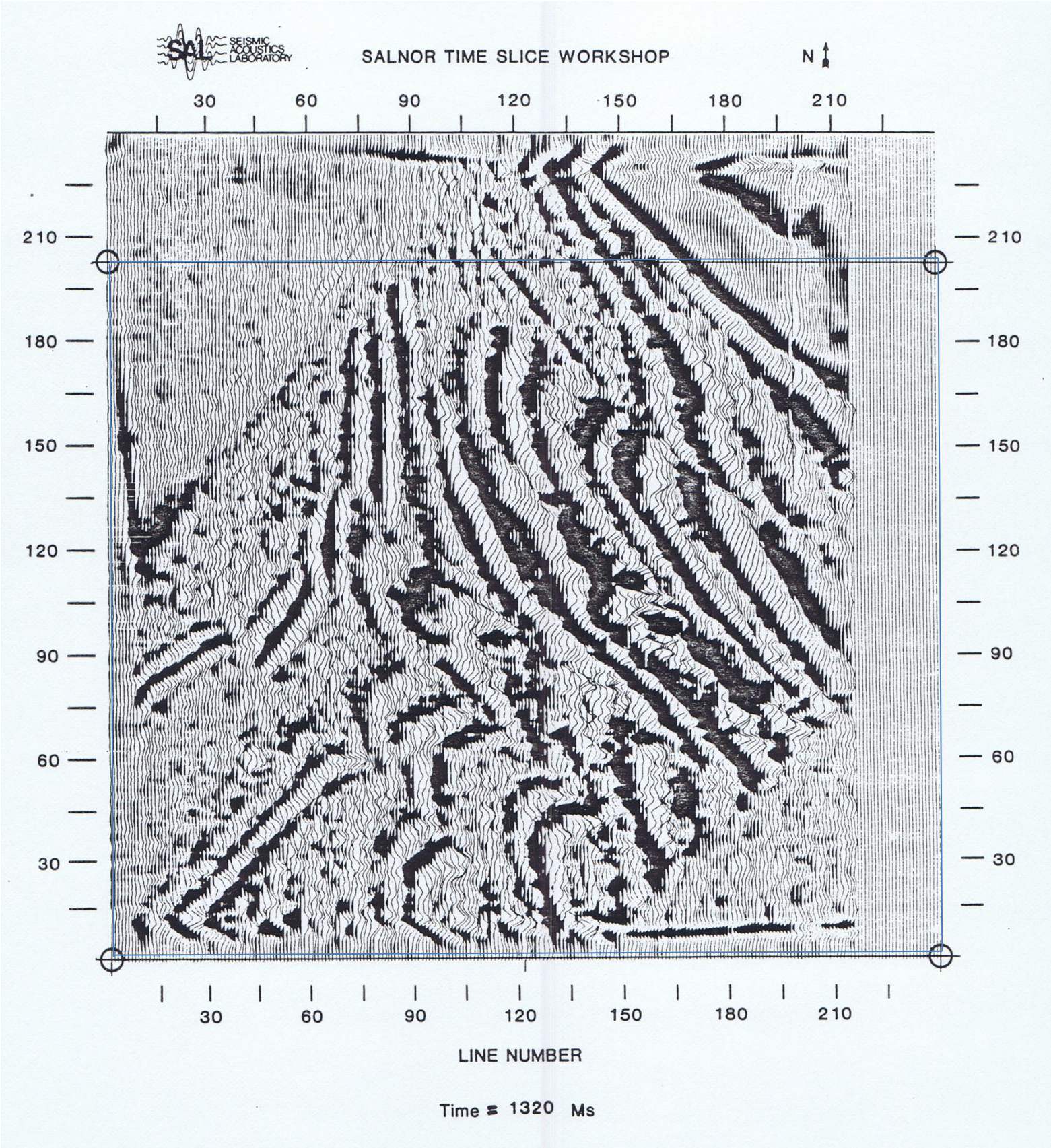
Time-Slice 1280 ms



Time-Slice 1300 ms



Time-Slice 1320 ms



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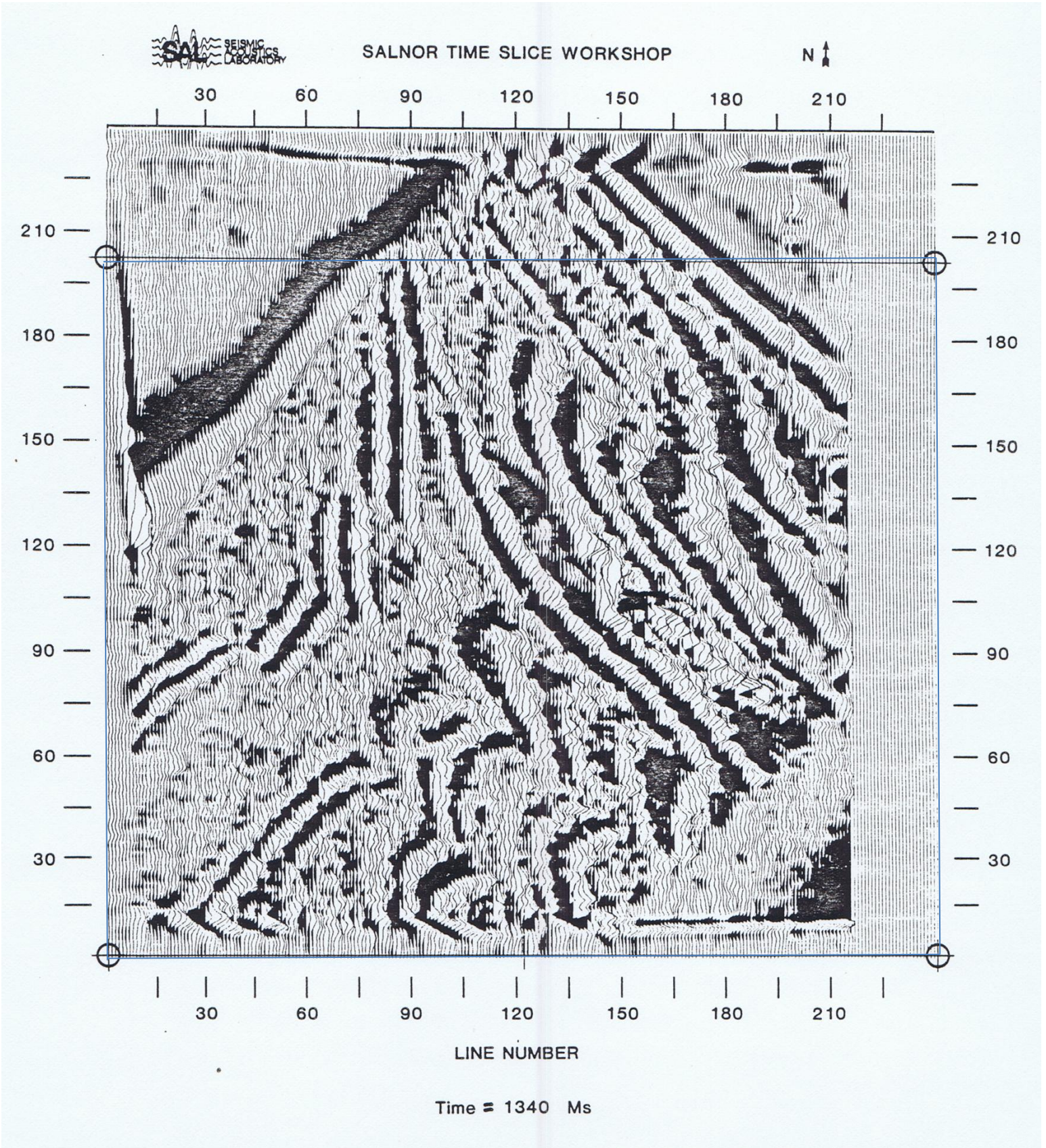
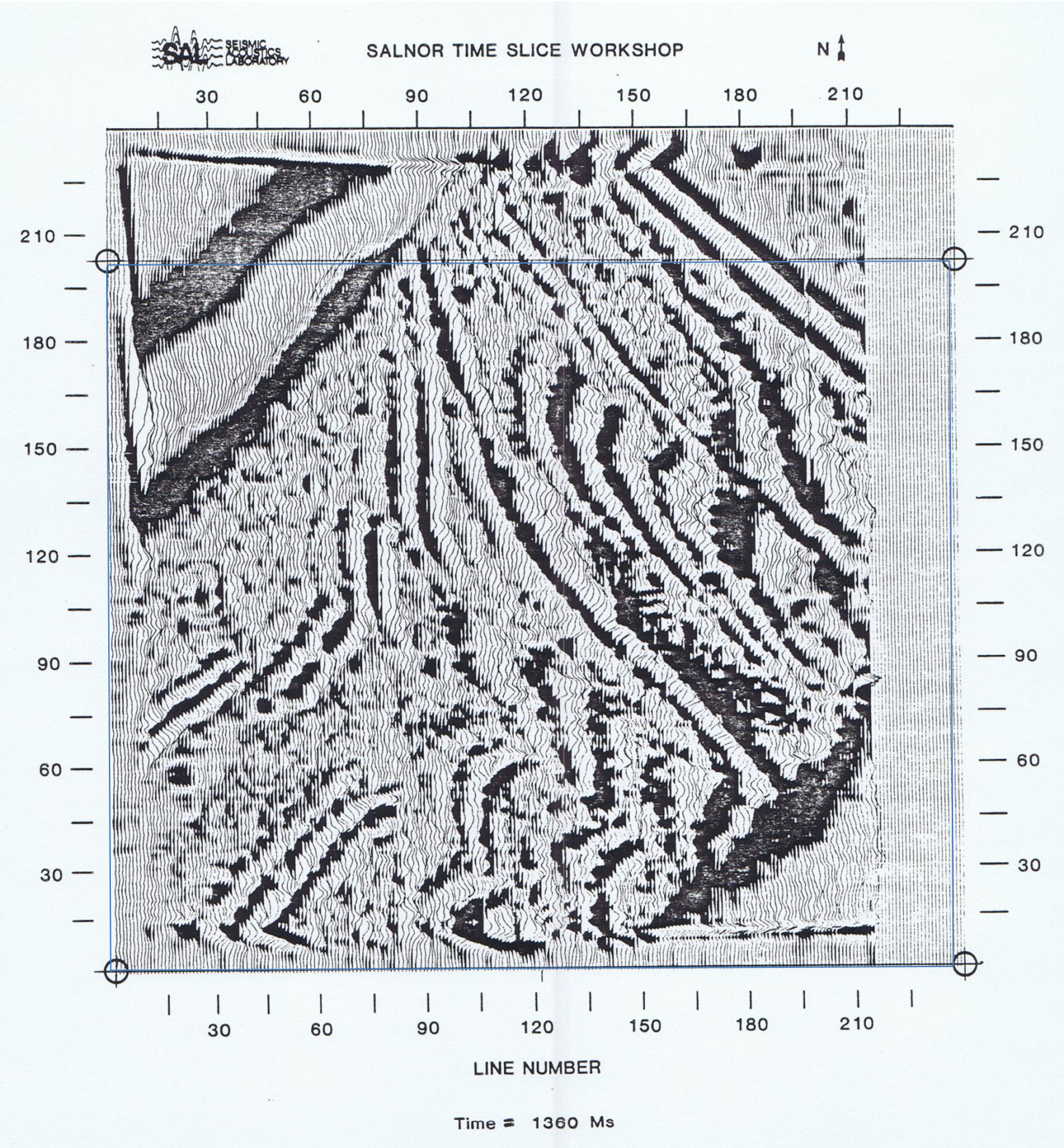


Time-Slice 1360 ms



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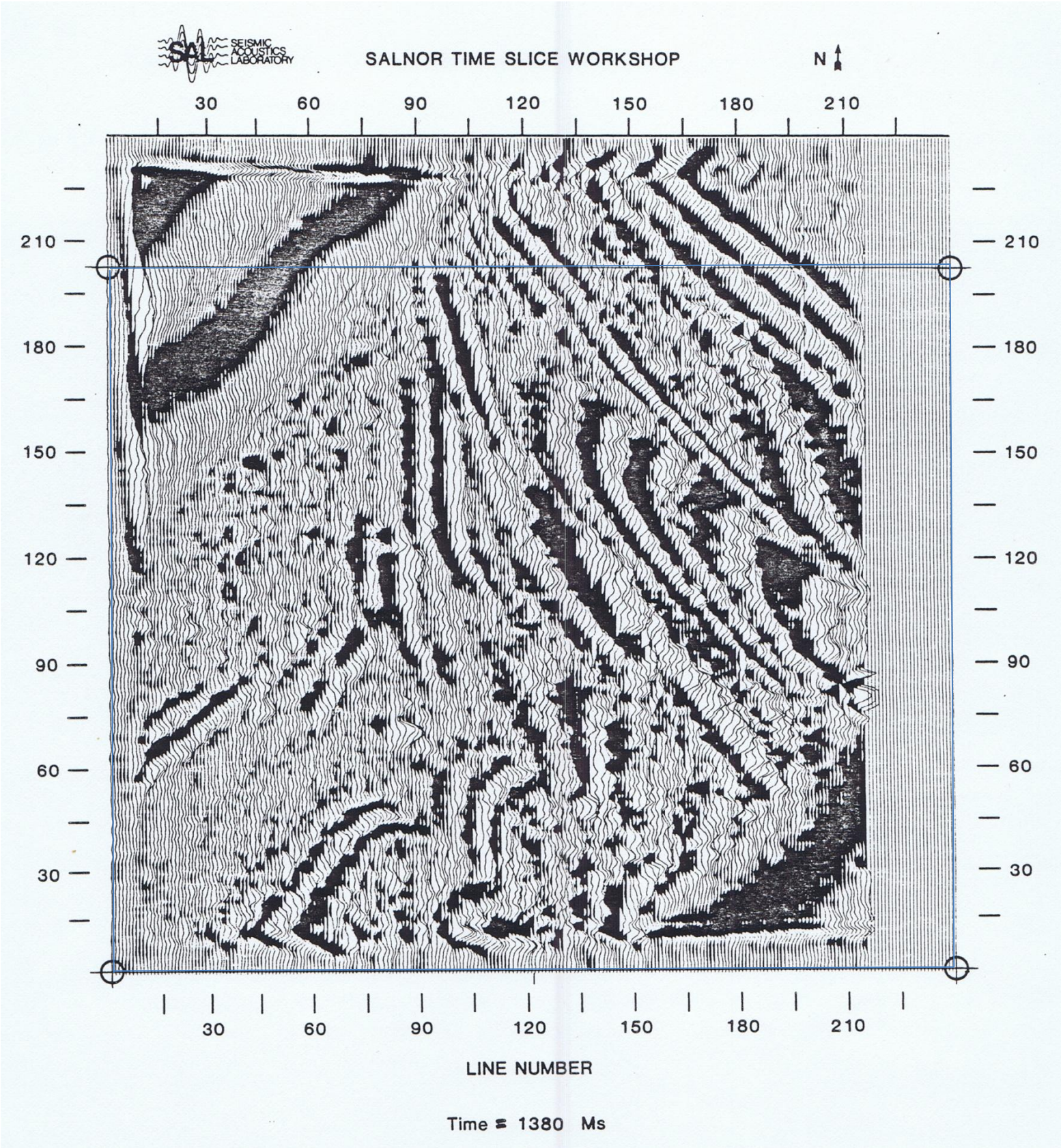
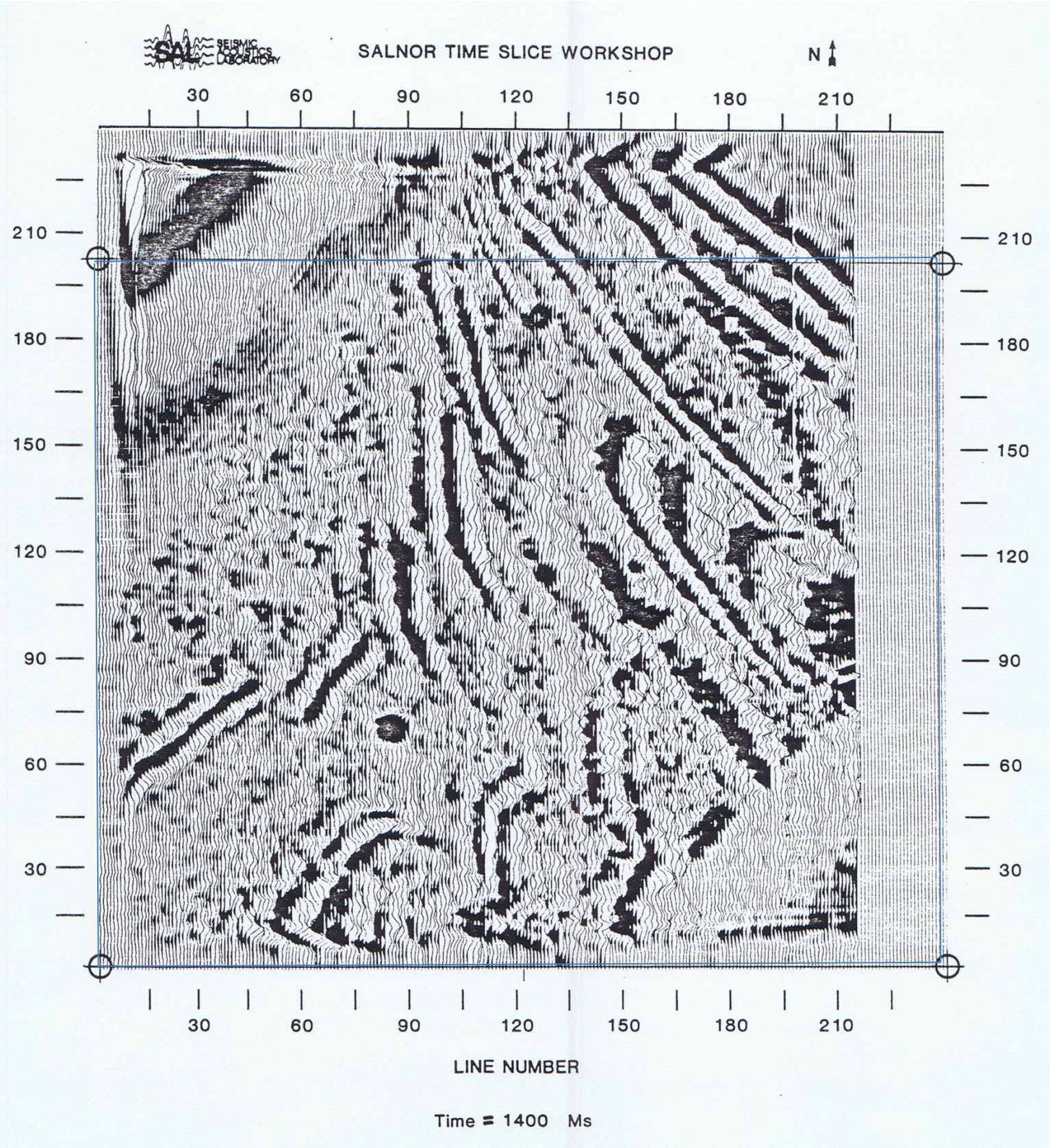


Time-Slice 1400 ms



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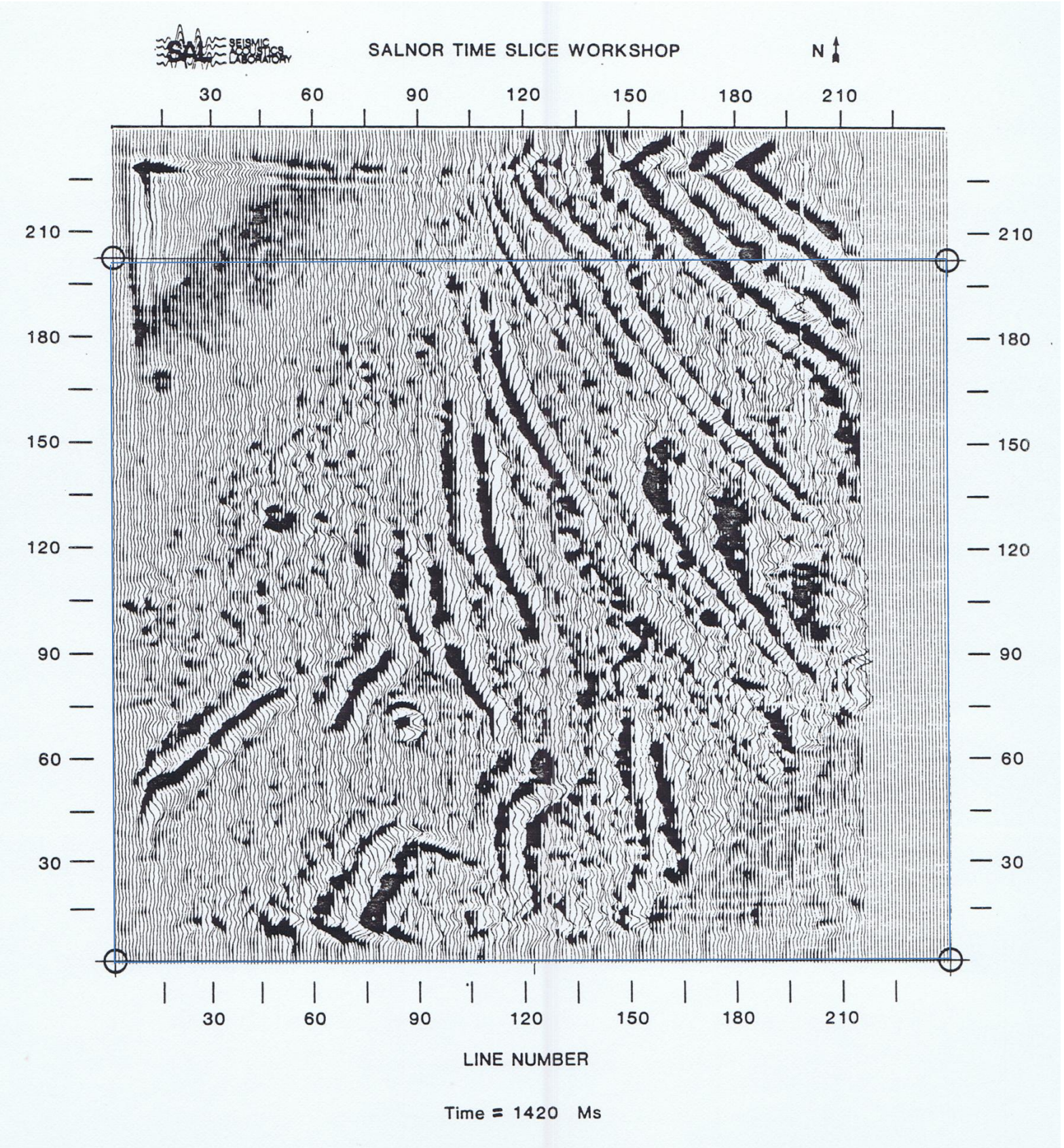

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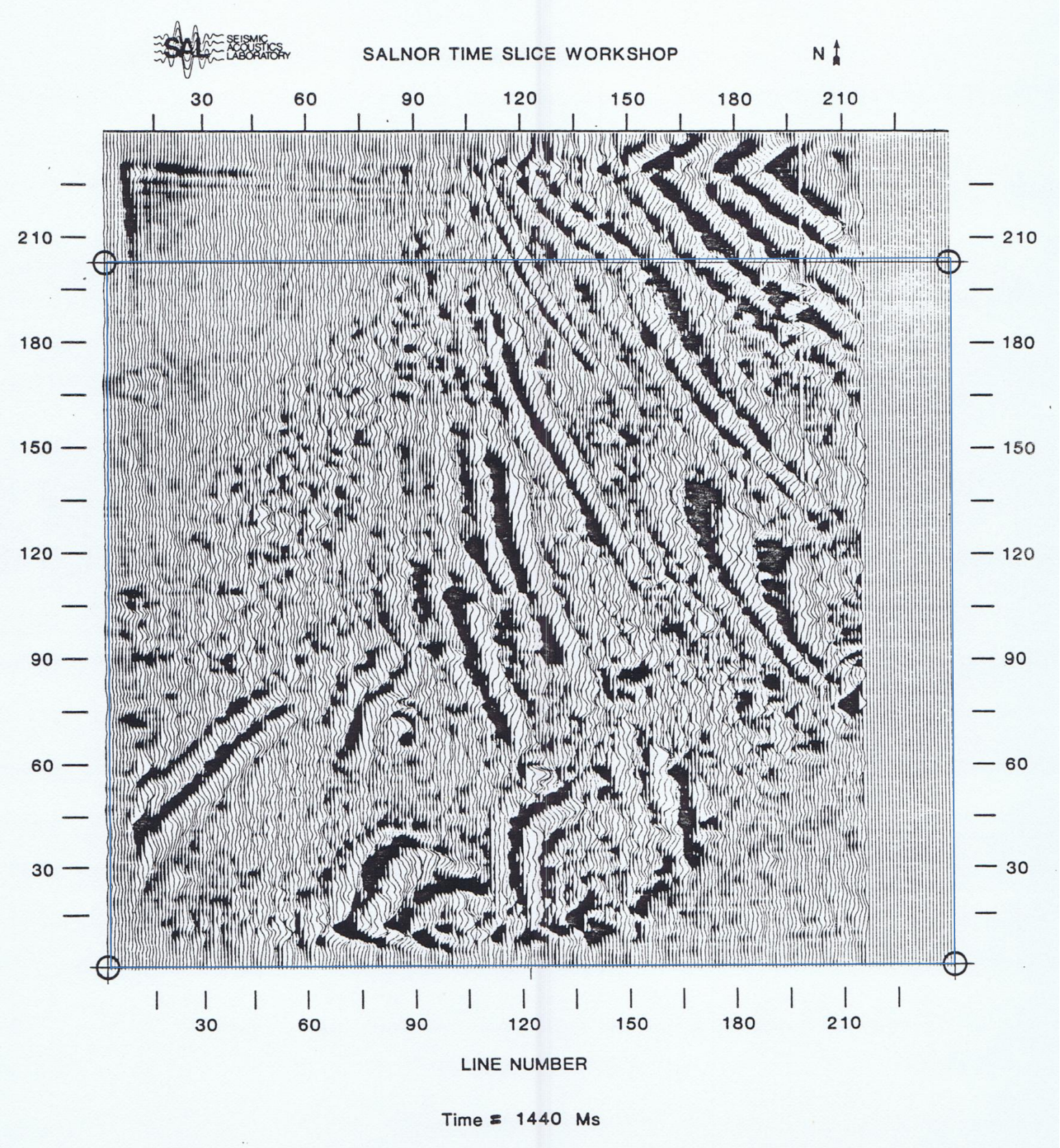

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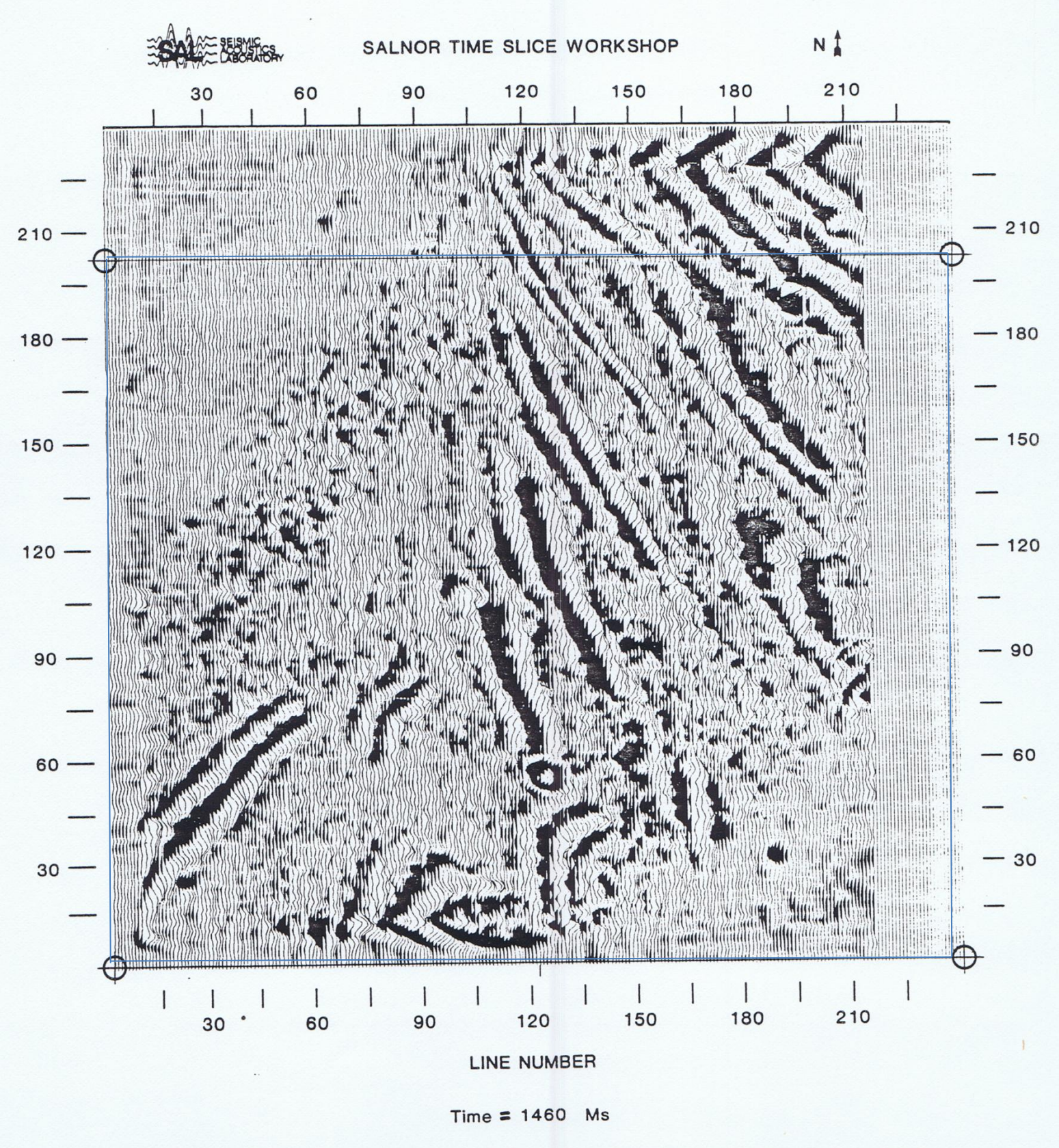

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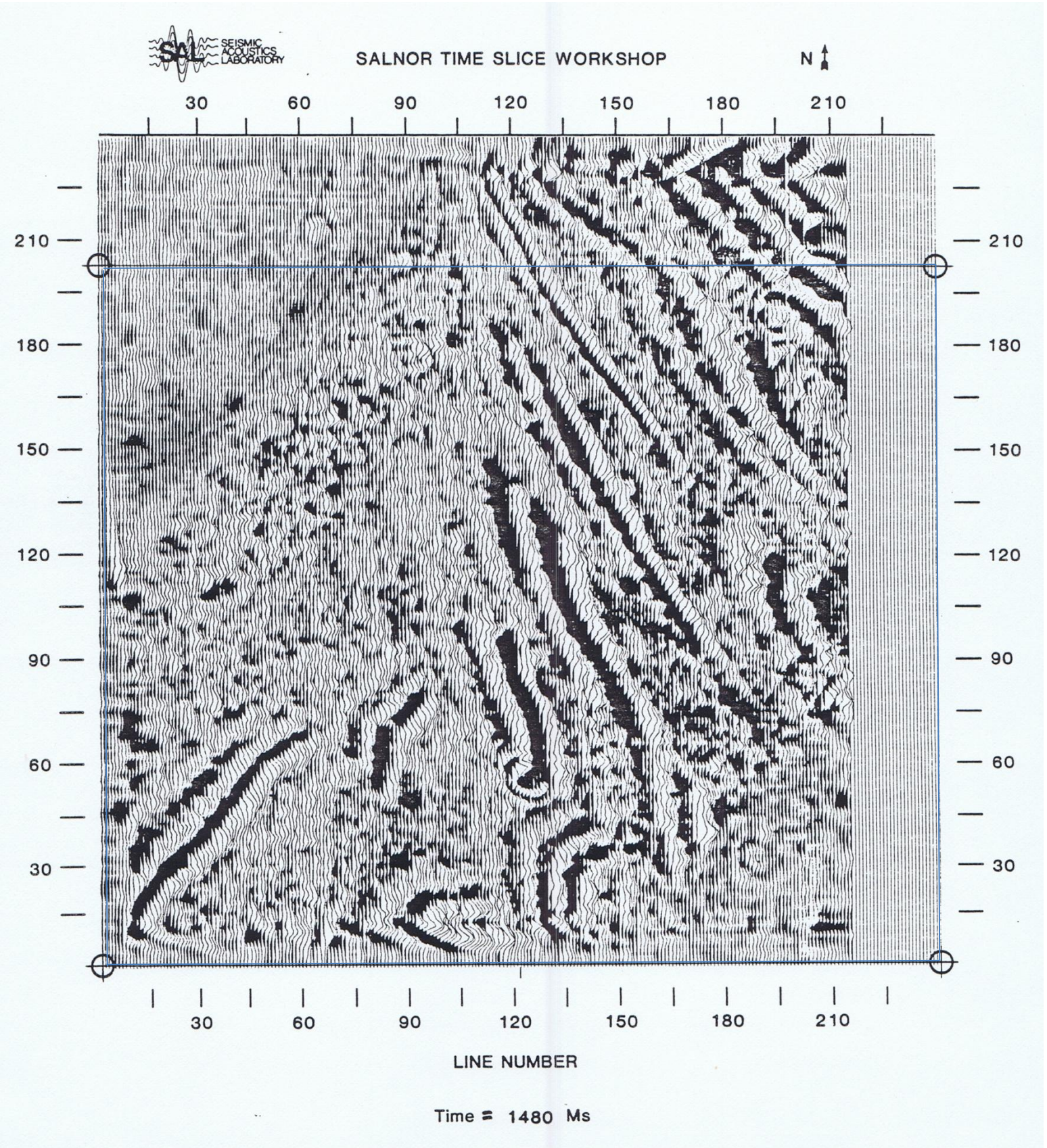
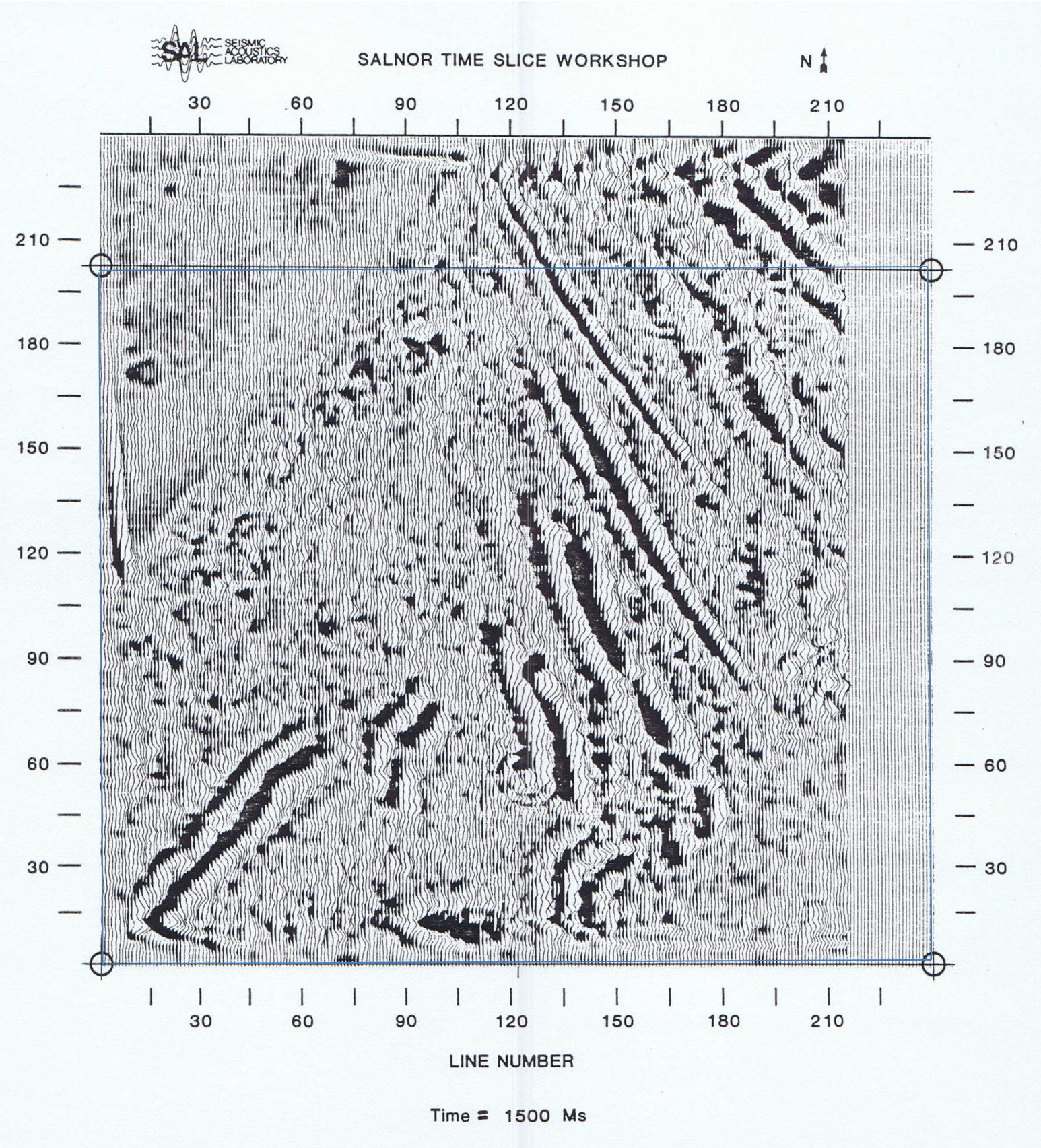


Time-Slice 1500 ms



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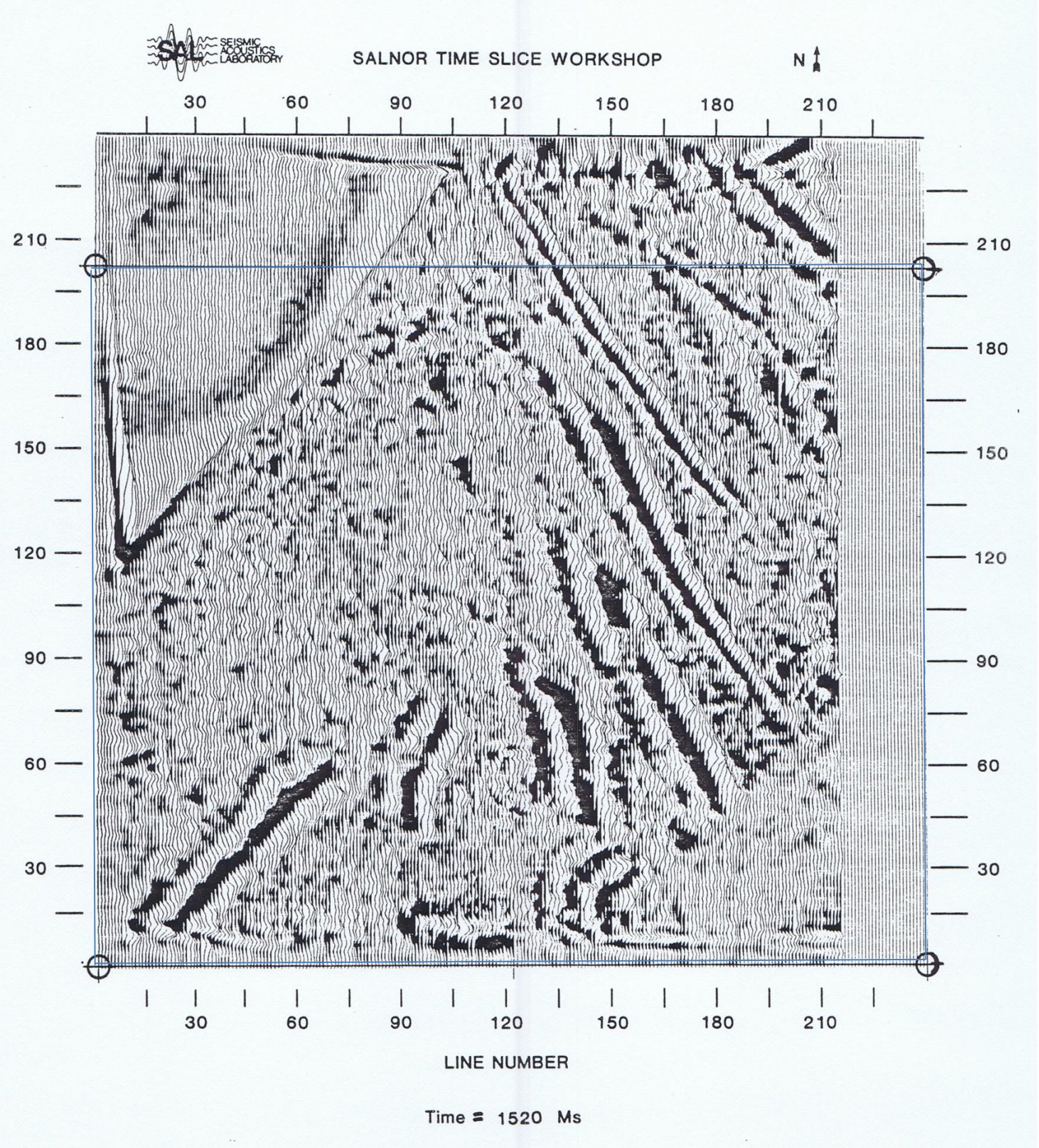
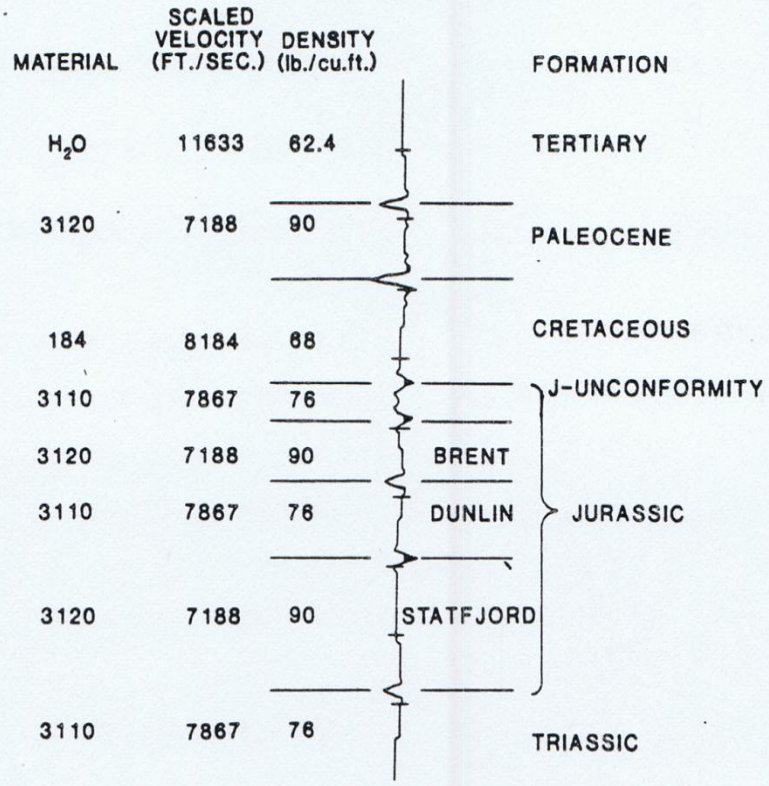
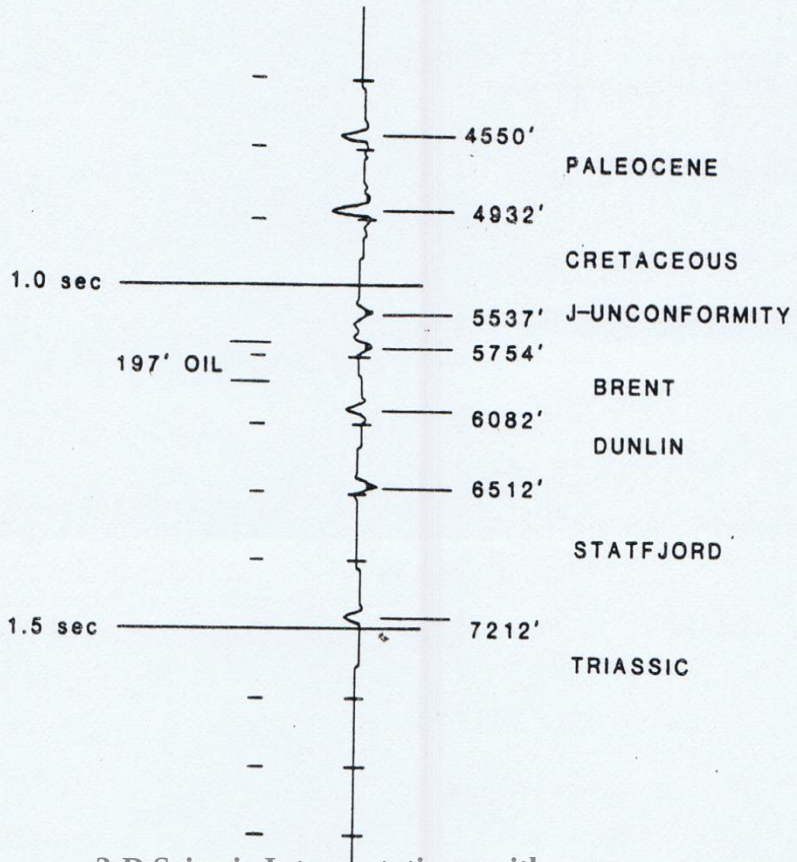


SYNTHETIC WELL LOG SEISMIC TRACE
GENERALIZED GEOLOGIC SEQUENCE



WELL 16 DISCOVERY



Thank You