Planning 3D Survey
-case study-

At designing of seismic survey application of full-wave modeling allows to solve following problems:

- Study influence of the upper part of a cross-section on static and dynamic parameters of seismic cross-sections.
- Estimate influence of various waves-hindrances, including, multiples.
- Choose optimum survey geometry.
- Estimate resolution of survey geometry
- Estimate and correct boundaries of the survey site according to a geologic structure of studied objects.
- Test key parameters of processing, etc.

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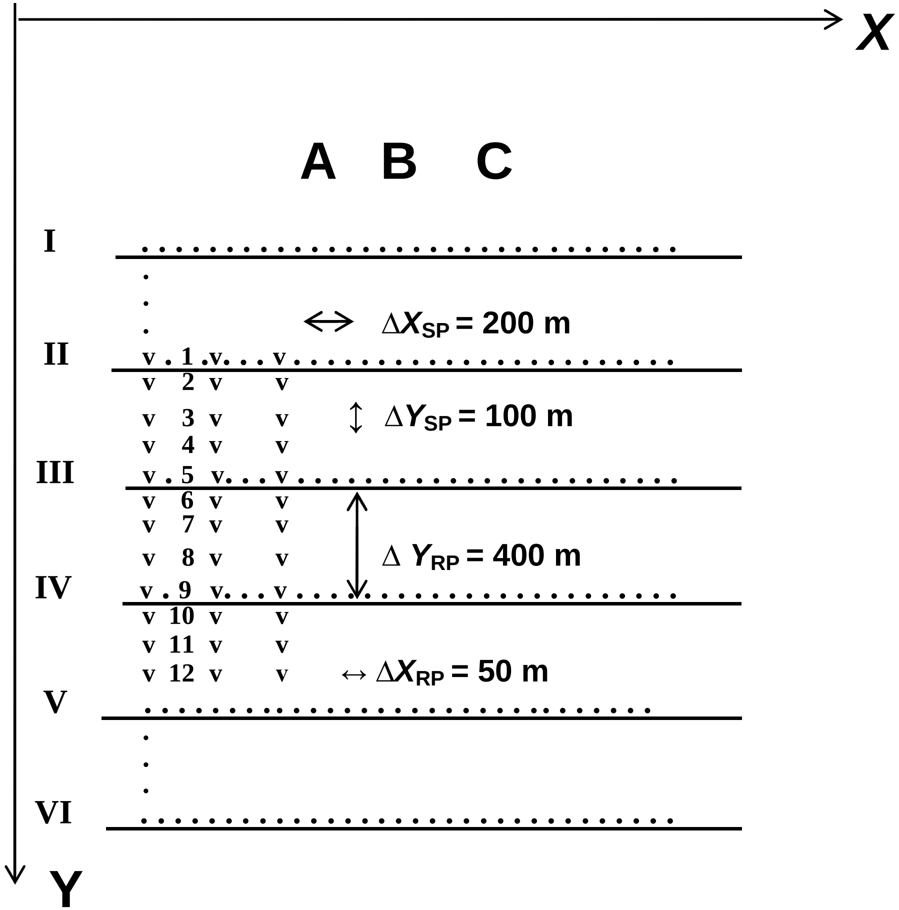
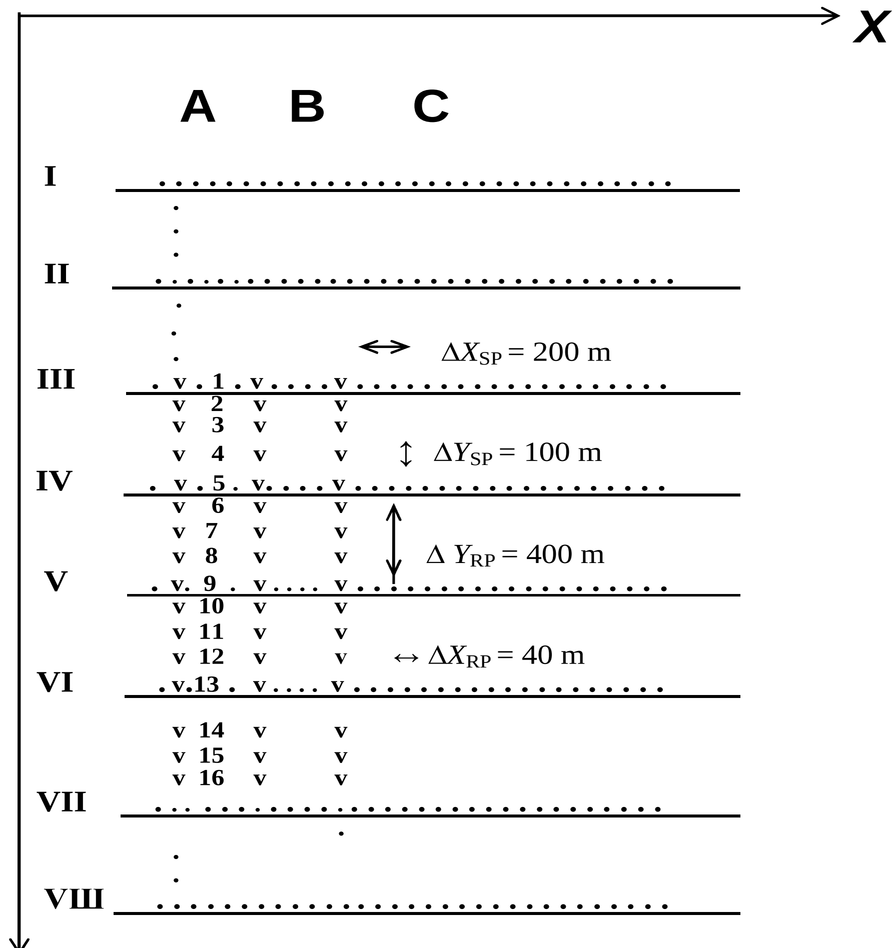


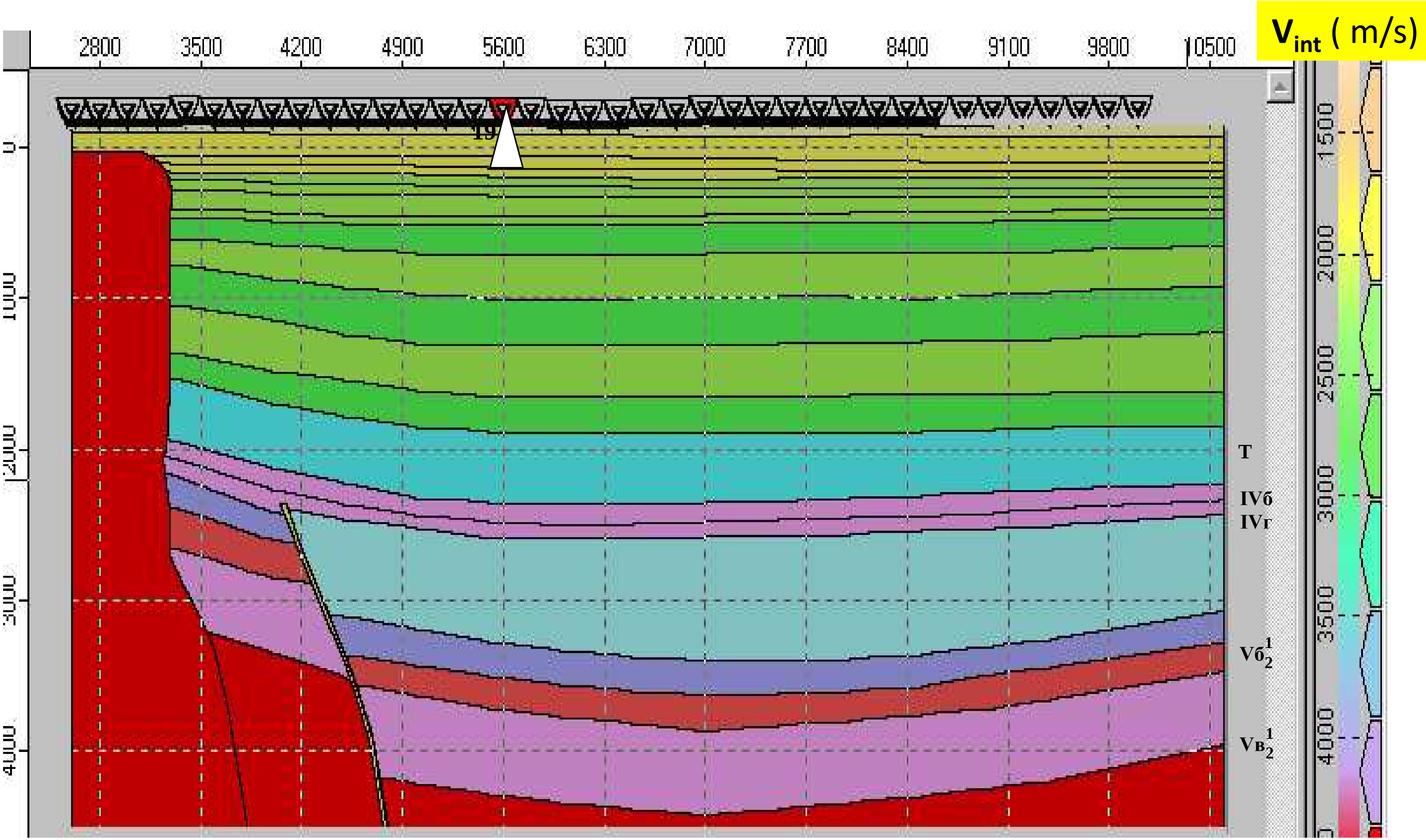
Legend:
v v v shot lines
. . . . . . receiver lines

Variant 1. Survey geometry of “cross” type with 6 lines in the swath



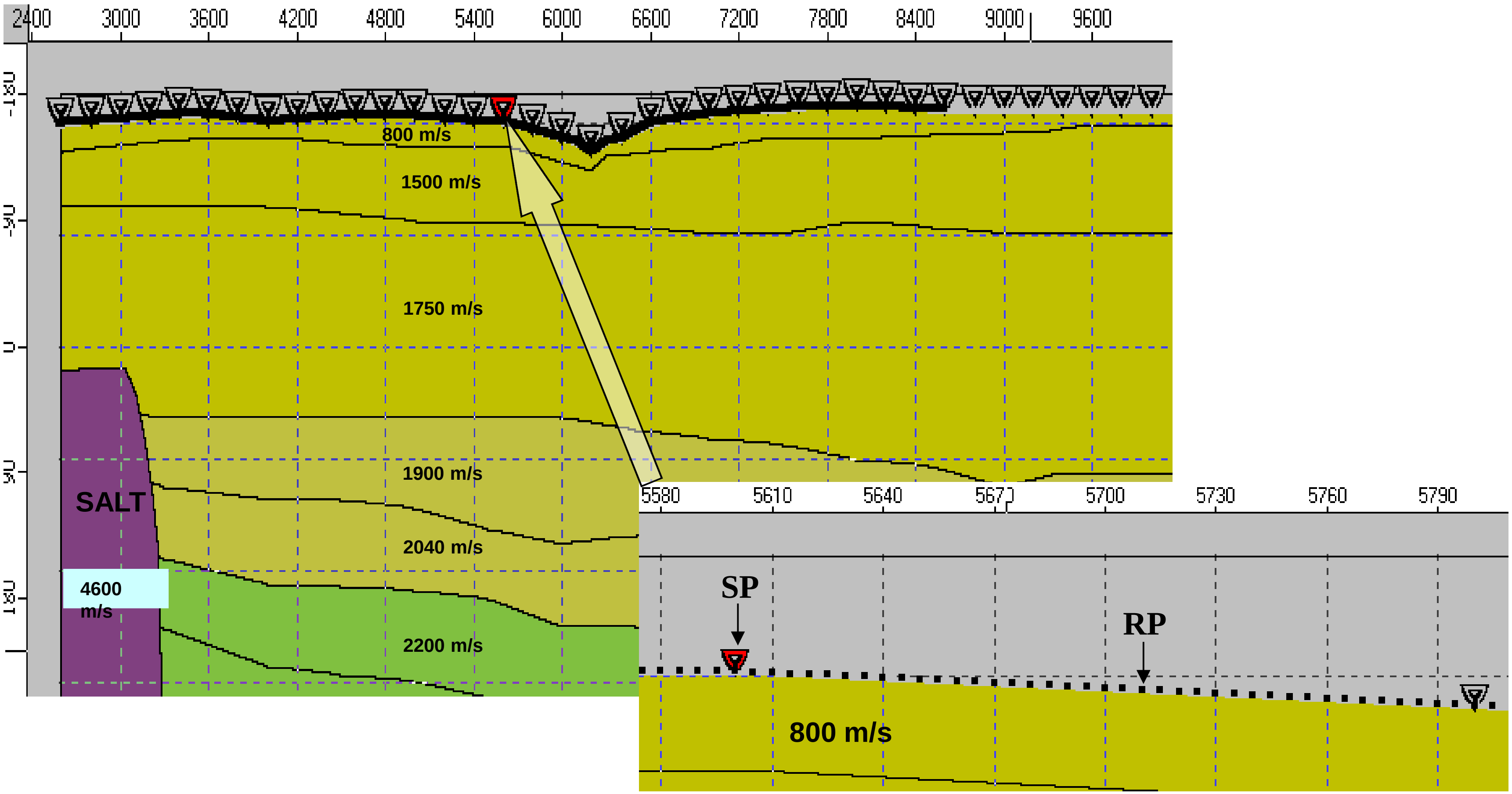
Legend:
v v v shot lines
. . . . . . receiver lines

Variant 2. Survey geometry of “cross” type with 8 lines in the swath

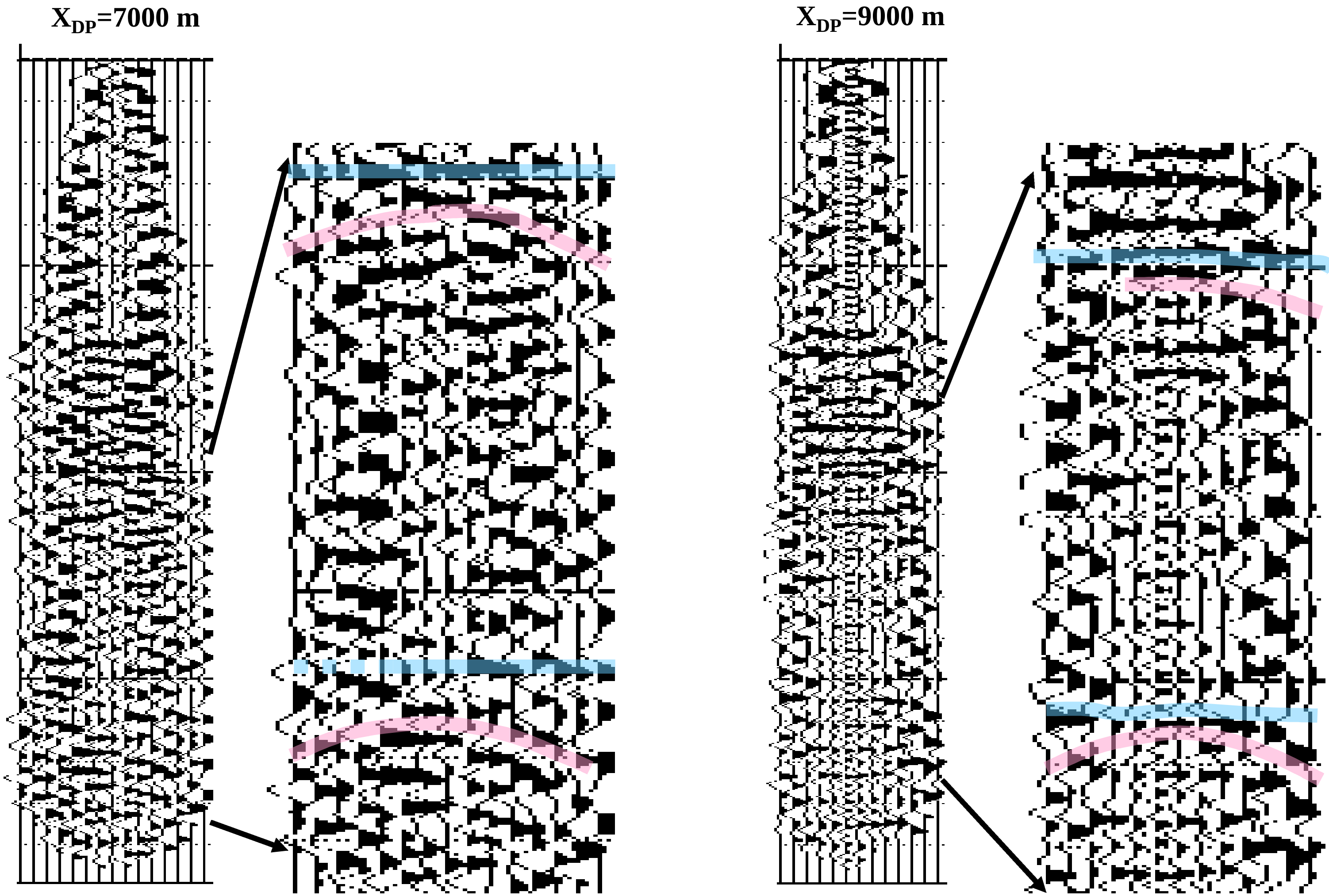


Typical velocity model for this survey site

What is effect of surface waves?



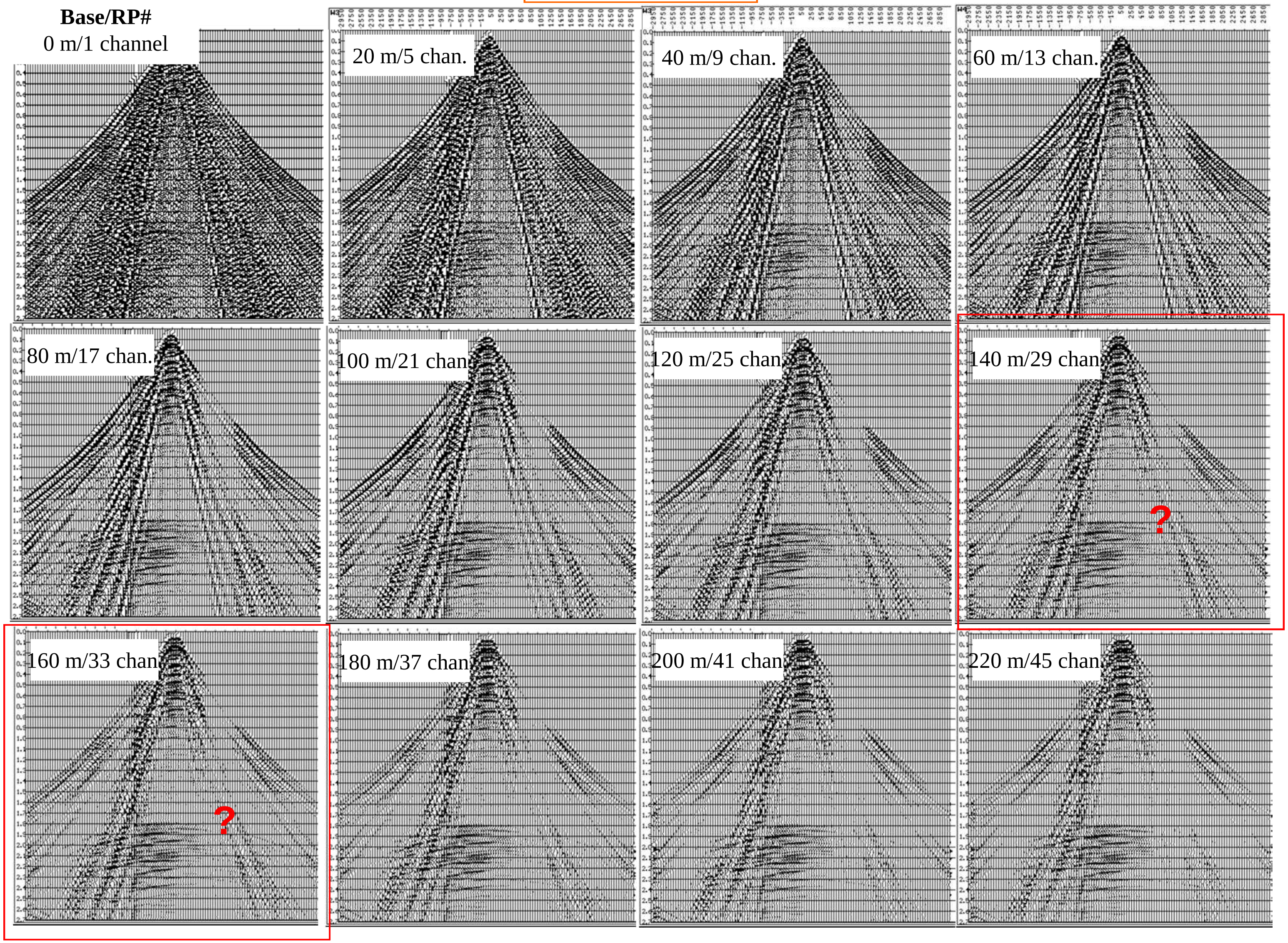
Detailed model of low velocity zone (LVZ) for this survey site



Examples of synthetic CDP gathers used in calculation of parameters of multiples.
Highlighted: blue lines – possible primary reflections, red lines – possible multiples

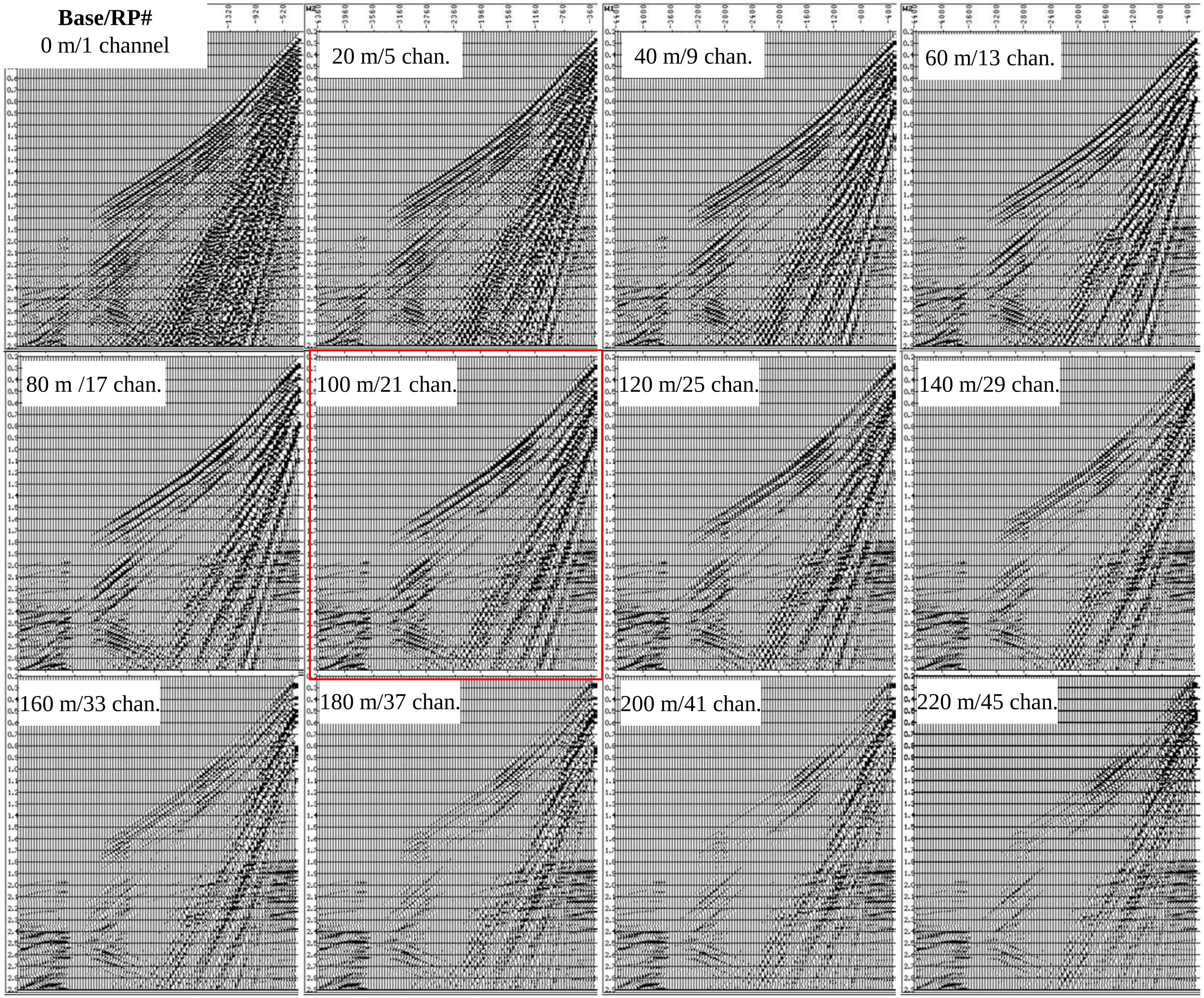
Effect of surface wave Z-component in surface observation data

ELASTIC



Samplings of receiver grouping base for **the central** scheme (Elastic medium model)

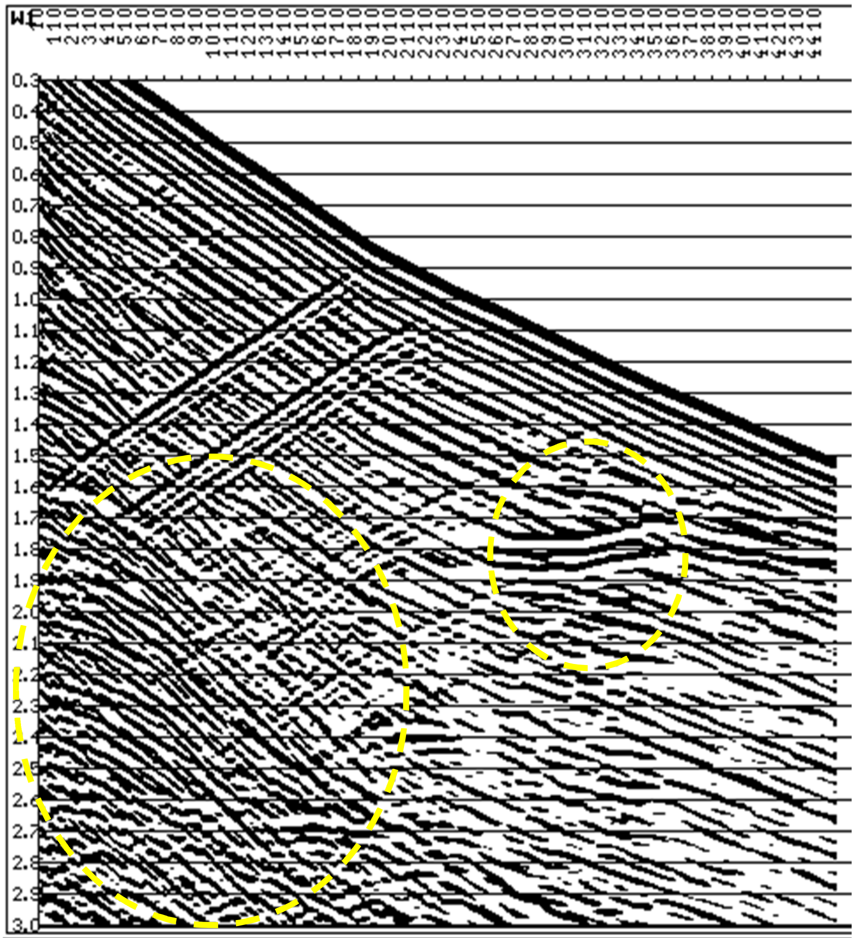
ELASTIC



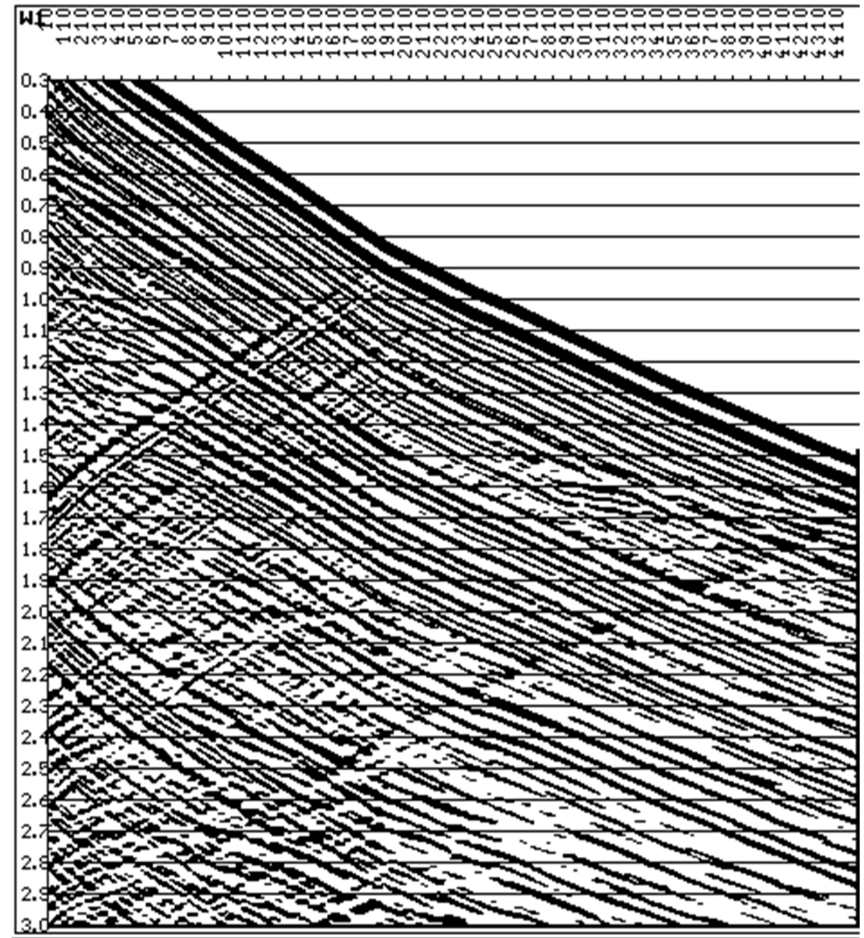
Samplings of receiver grouping base for **the flank** scheme (Elastic medium model)

Effect of surface wave **Z-component** in VSP data

ELASTIC

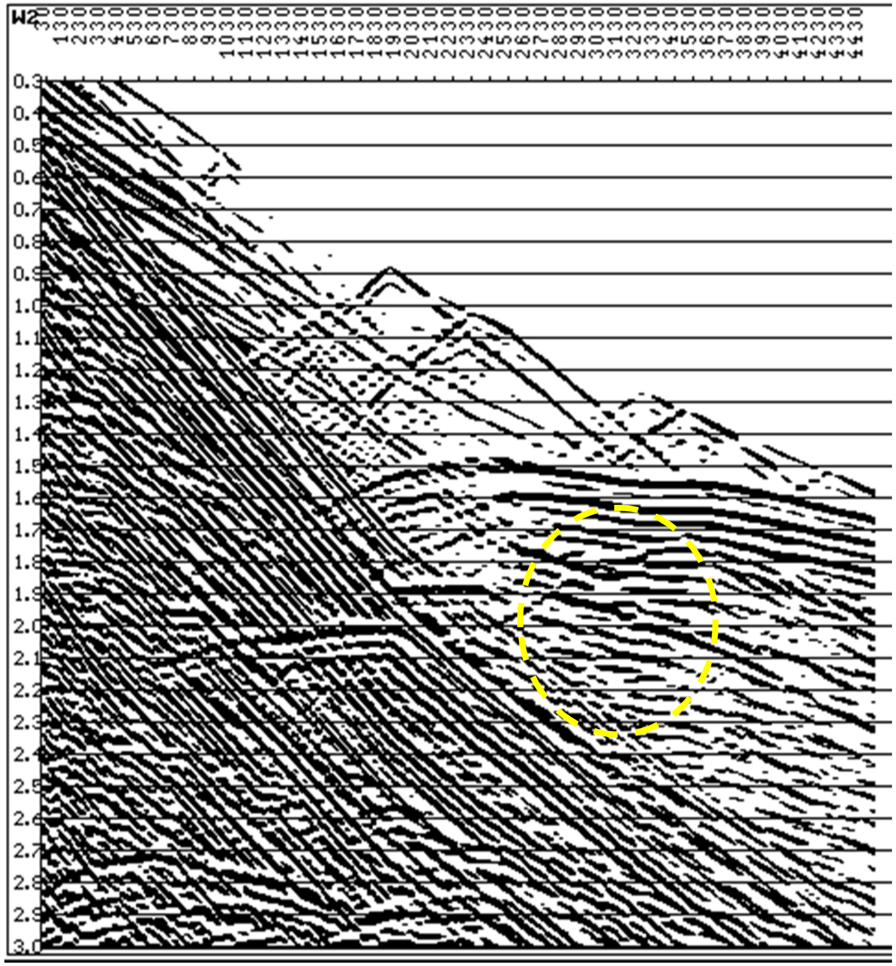


ACOUSTIC



Effect of surface wave **X-component** in VSP data

ELASTIC



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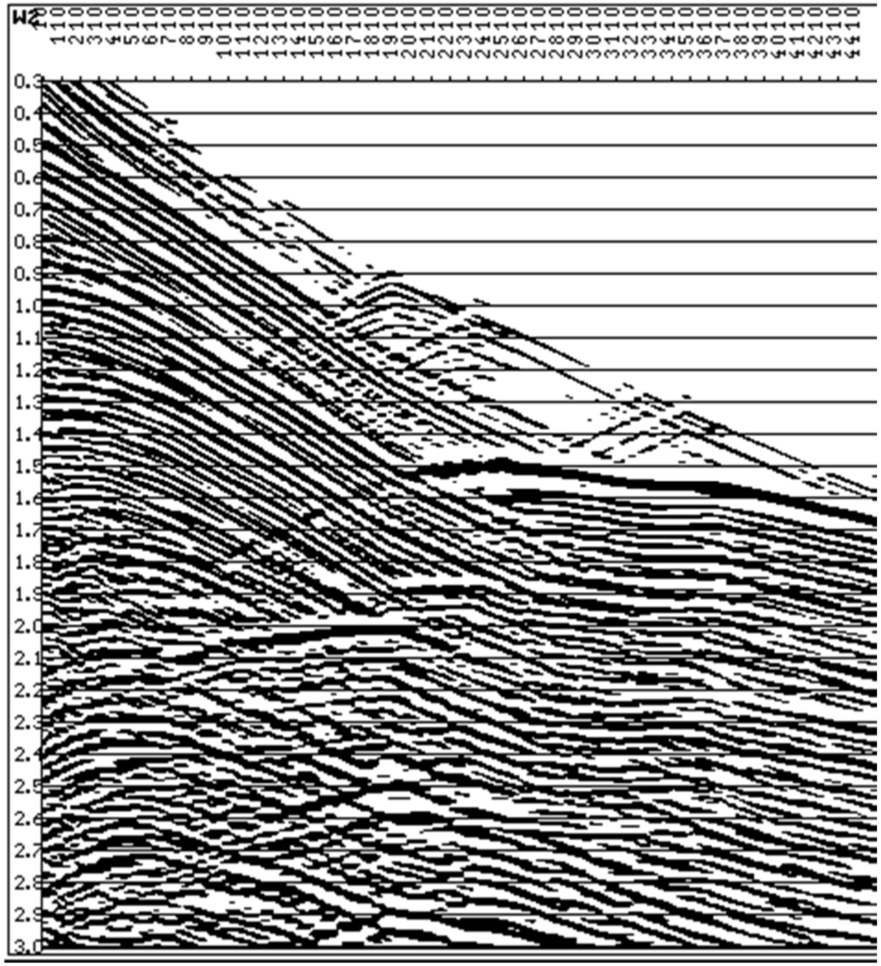
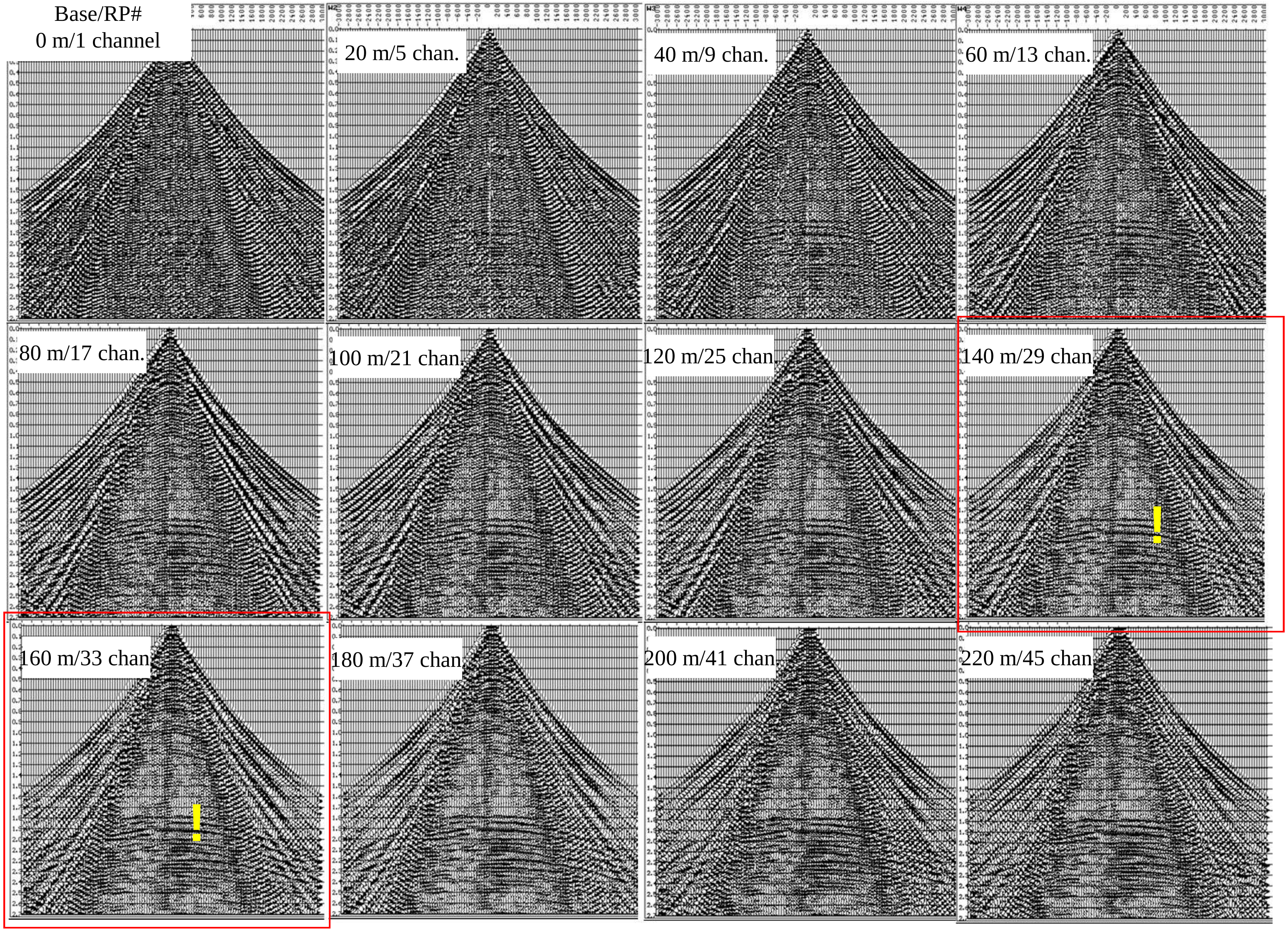
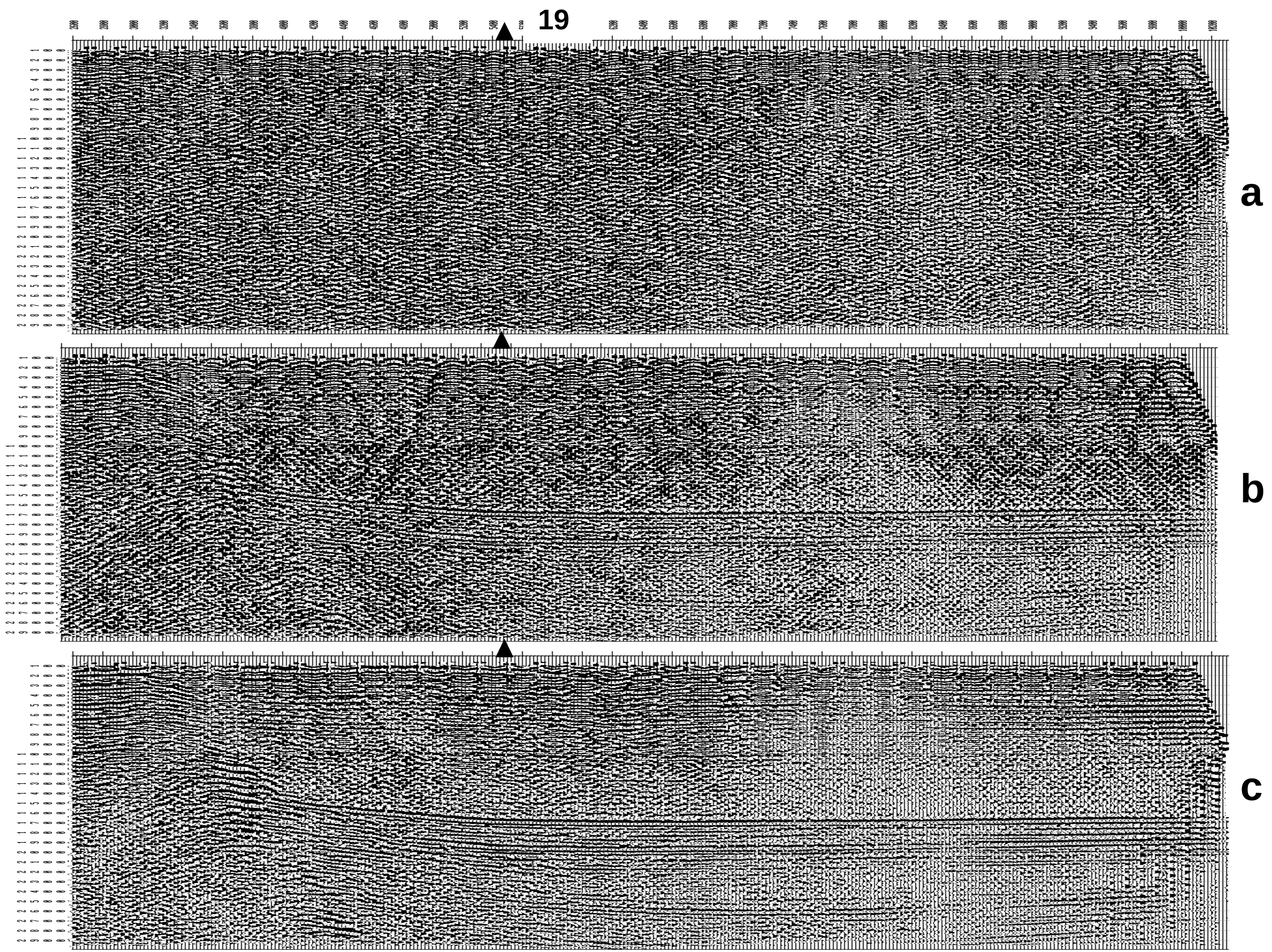


Effect of surface wave **Z-component** in surface observation data

ACOUSTIC

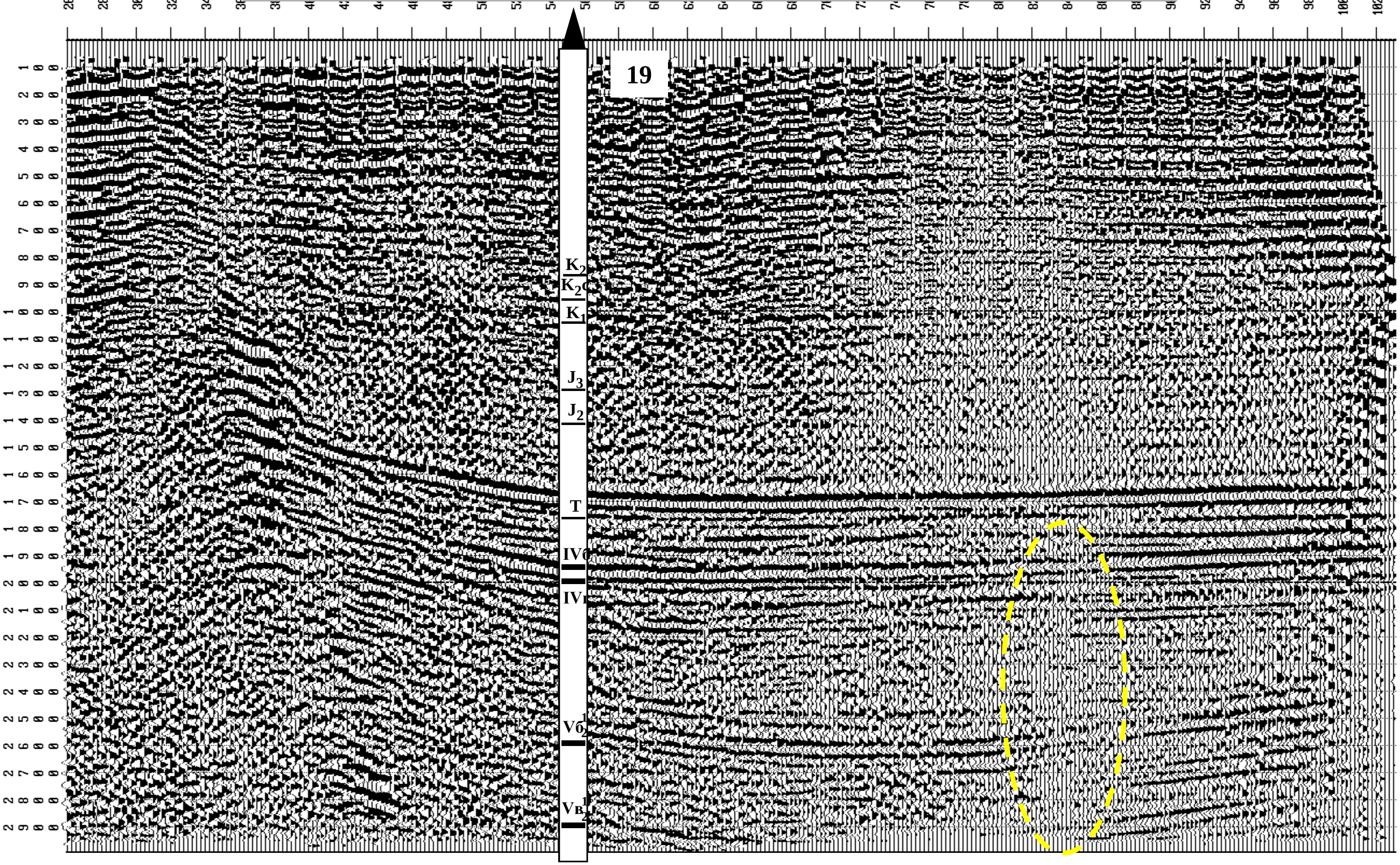


Samplings of receiver grouping base for **the central** scheme (Acoustic medium model)



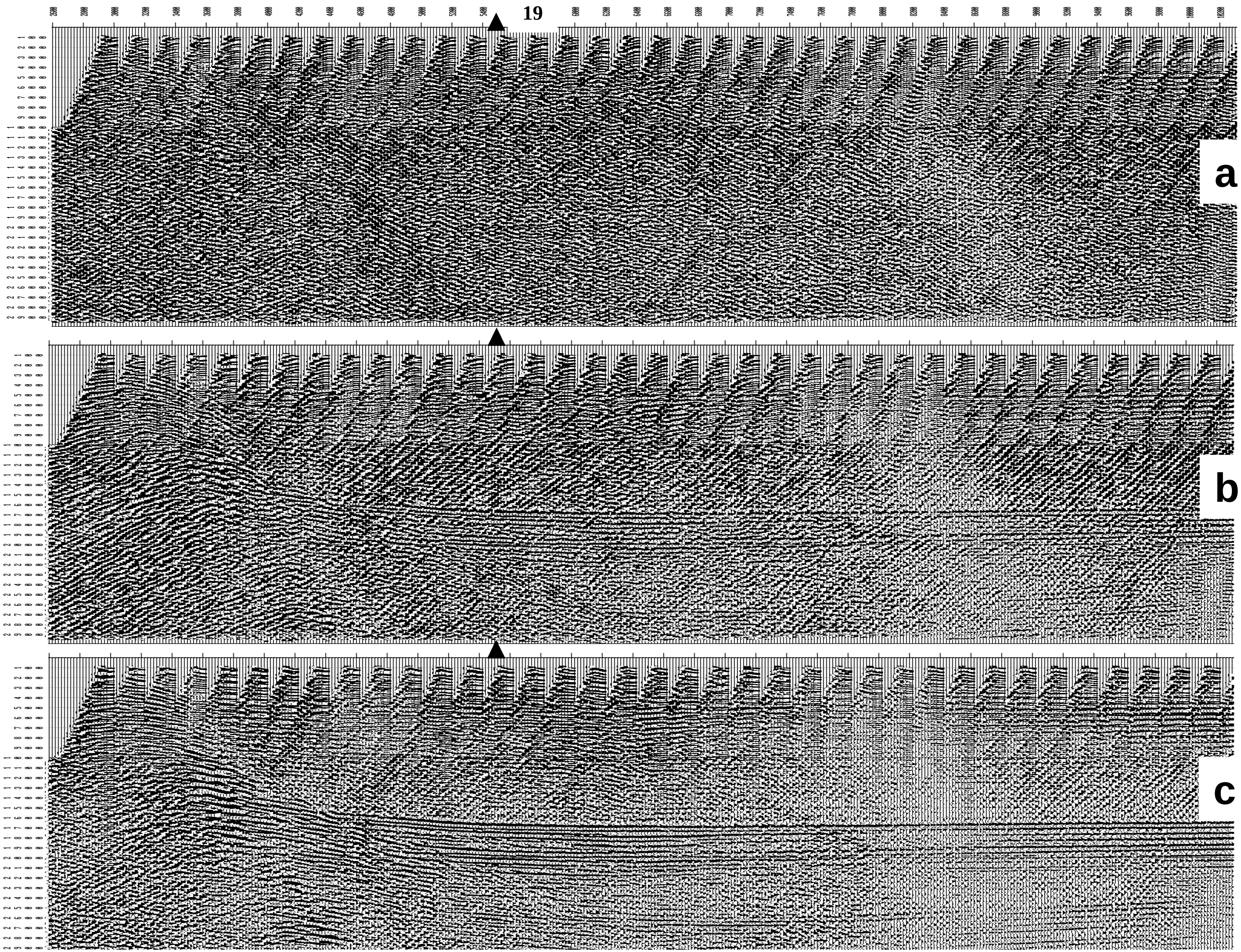
Comparison of synthetic time cross-sections obtained for **the central scheme** with step between centers of groups ΔX_{RP}=40 m: a – without receivers grouping; b – grouping of receivers on base l_G=50 m; c - grouping of receivers on base l_G=150 m.

Effect of surface waves on CDP data imaging

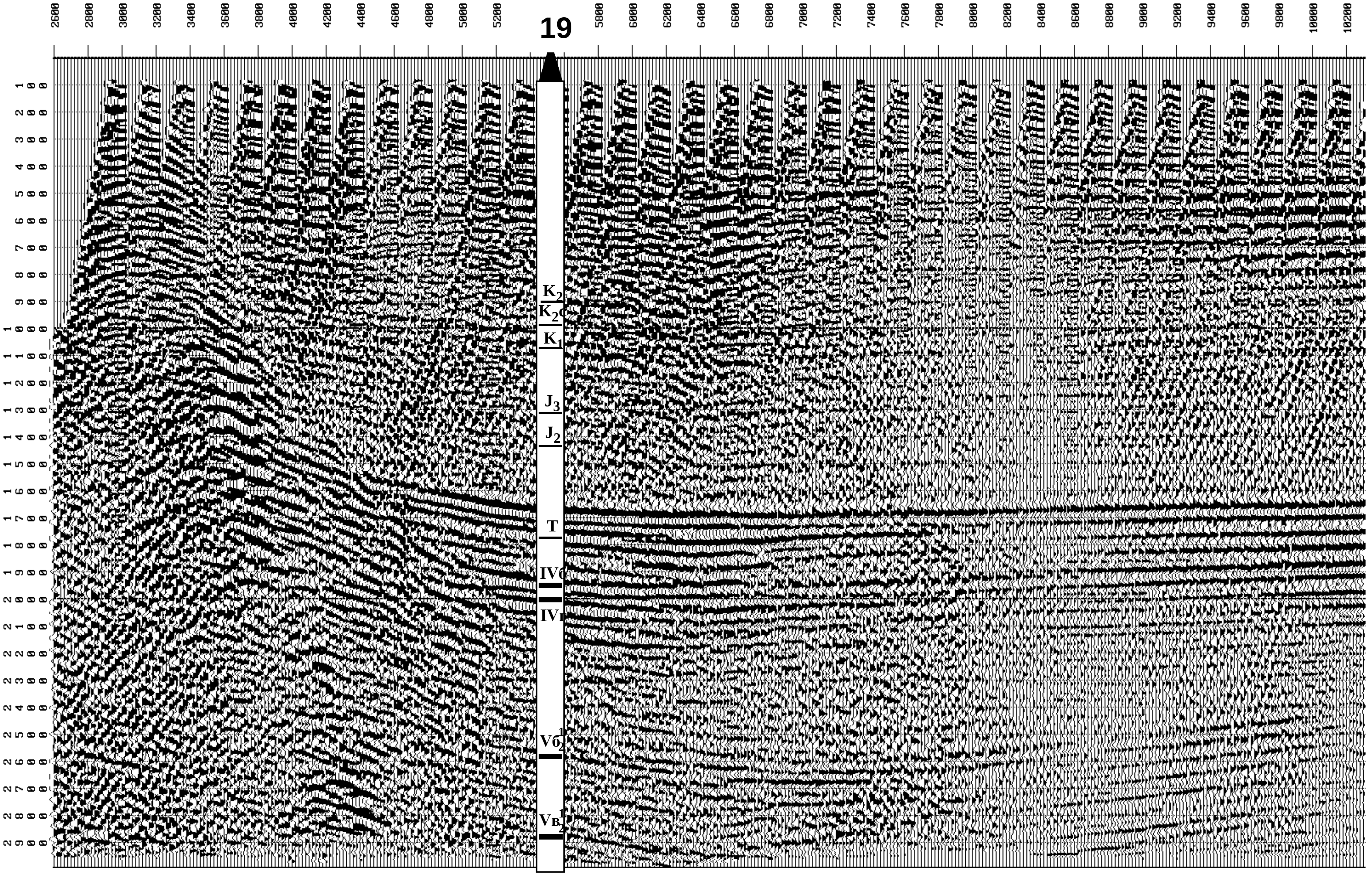


Synthetic time cross-section obtained for **the central scheme** with receiver grouping on base l_G=150 m and interval between centers of a group ΔX_{RP}=50 m (magnified scale).

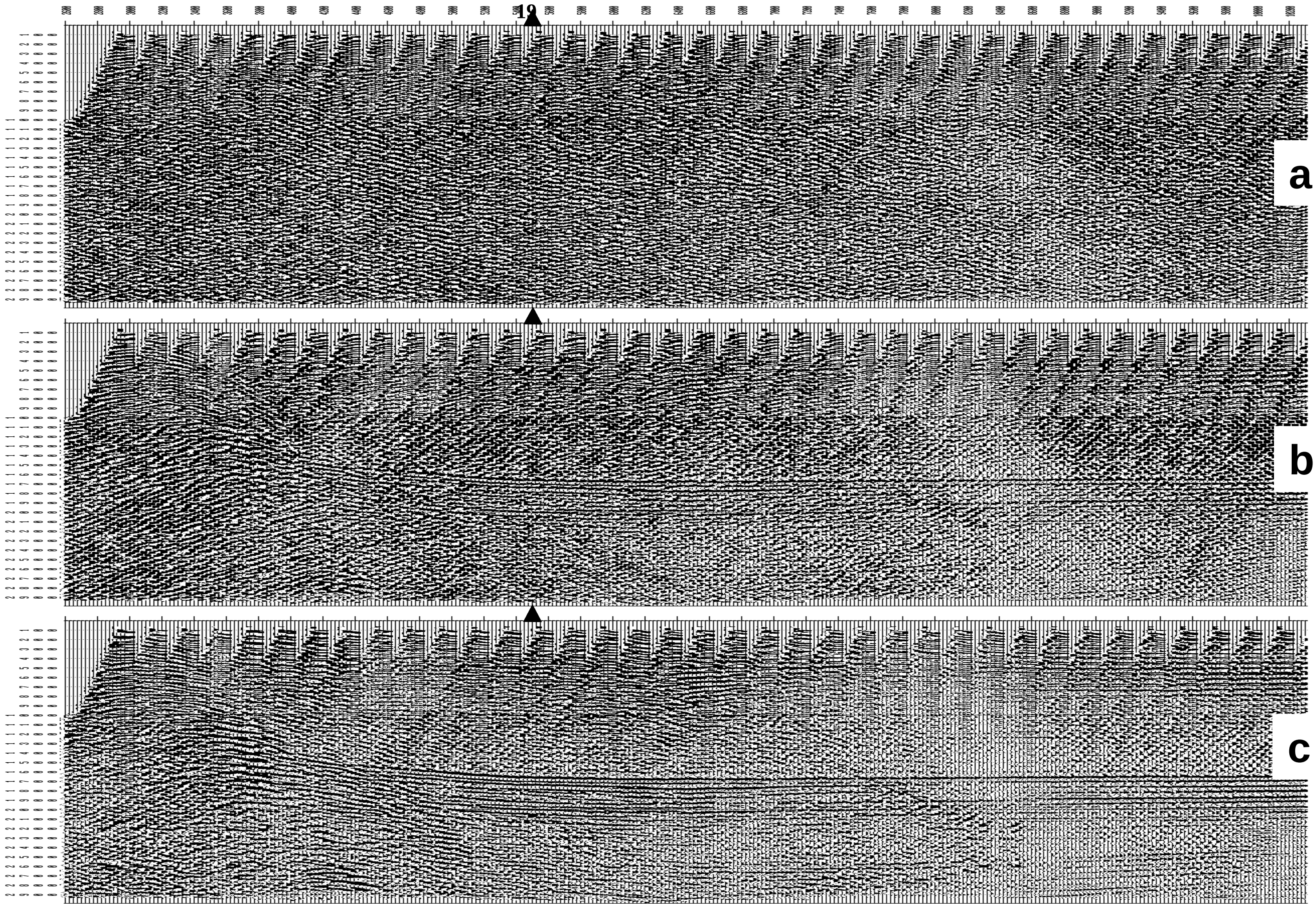
With ellipse is shown site with miscorrelation in imaging, connected with complexities in upper part of the cross-section, but having appearance of a fault.



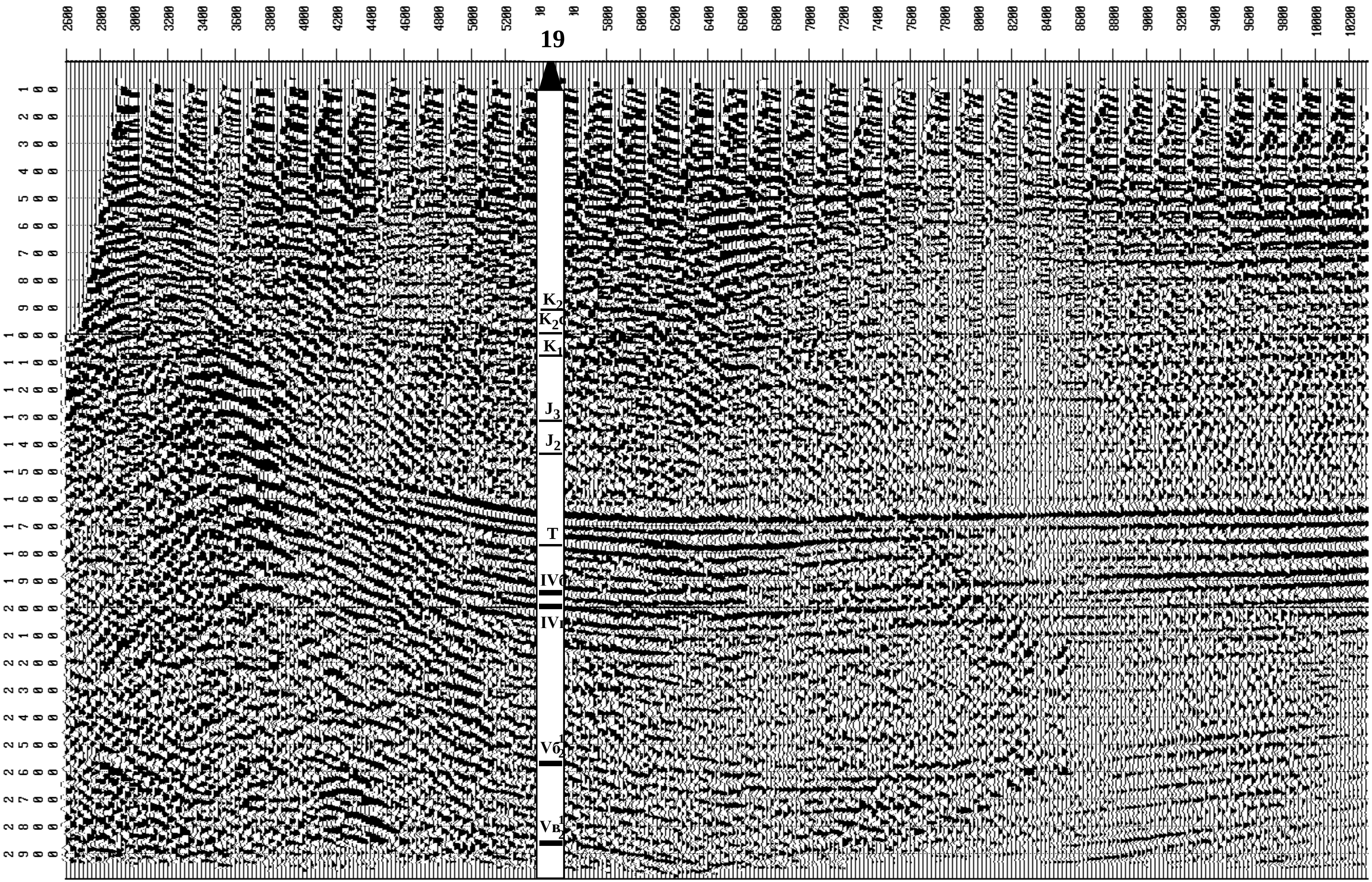
Comparison of synthetic time cross-sections obtained **for the flank scheme** with step between centers of groups ΔX_{RP}=40 m: a – without receivers grouping; b – grouping of receivers on base l_G=80 m; c - grouping of receivers on base l_G=120 m.



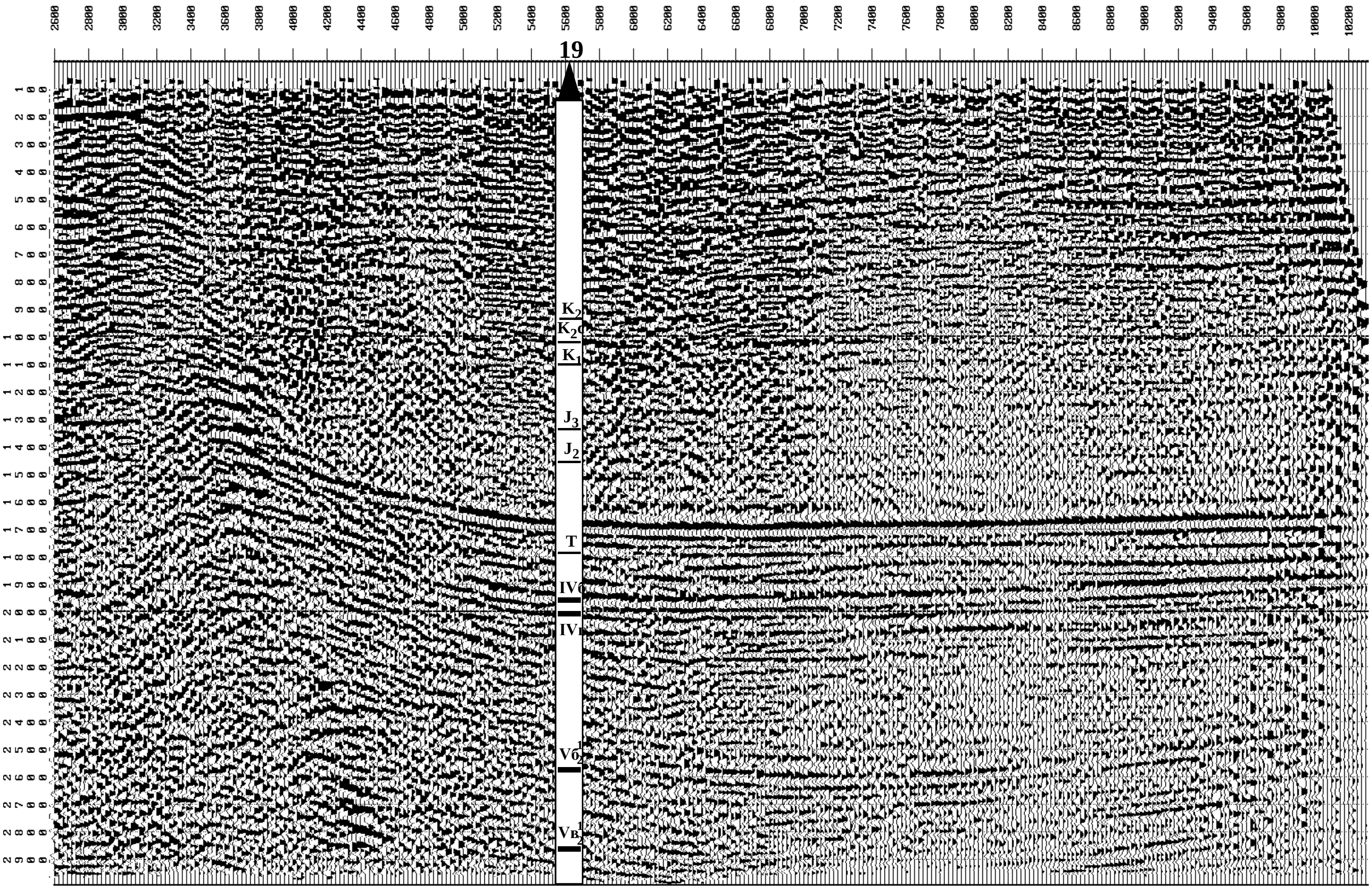
Synthetic time cross-section obtained for **the flank scheme** with receiver grouping on base l_G=120 m and interval between centers of a group ΔX_{RP}=40 m (magnified scale).



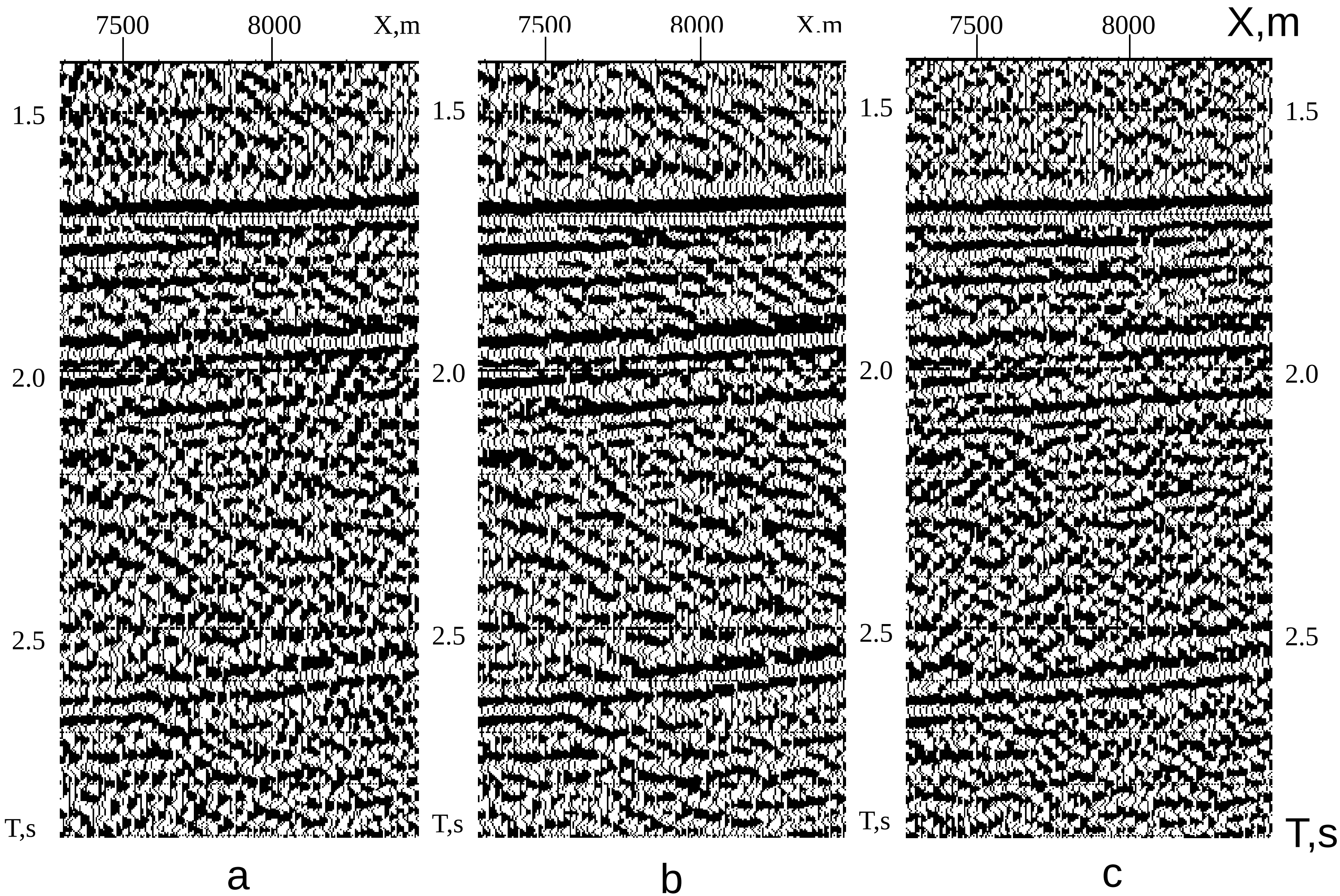
Comparison of synthetic time cross-sections obtained for **the flank scheme** with step between centers of groups ΔX_{RP}=50 m: a – without receivers grouping;
b – grouping of receivers on base l_G=50 m; c - grouping of receivers on base l_G=150 m.



Synthetic time cross-section obtained for **the flank scheme** with receiver grouping on base l_G=150 m and interval between centers of a group ΔX_{RP}=50 m (magnified scale).

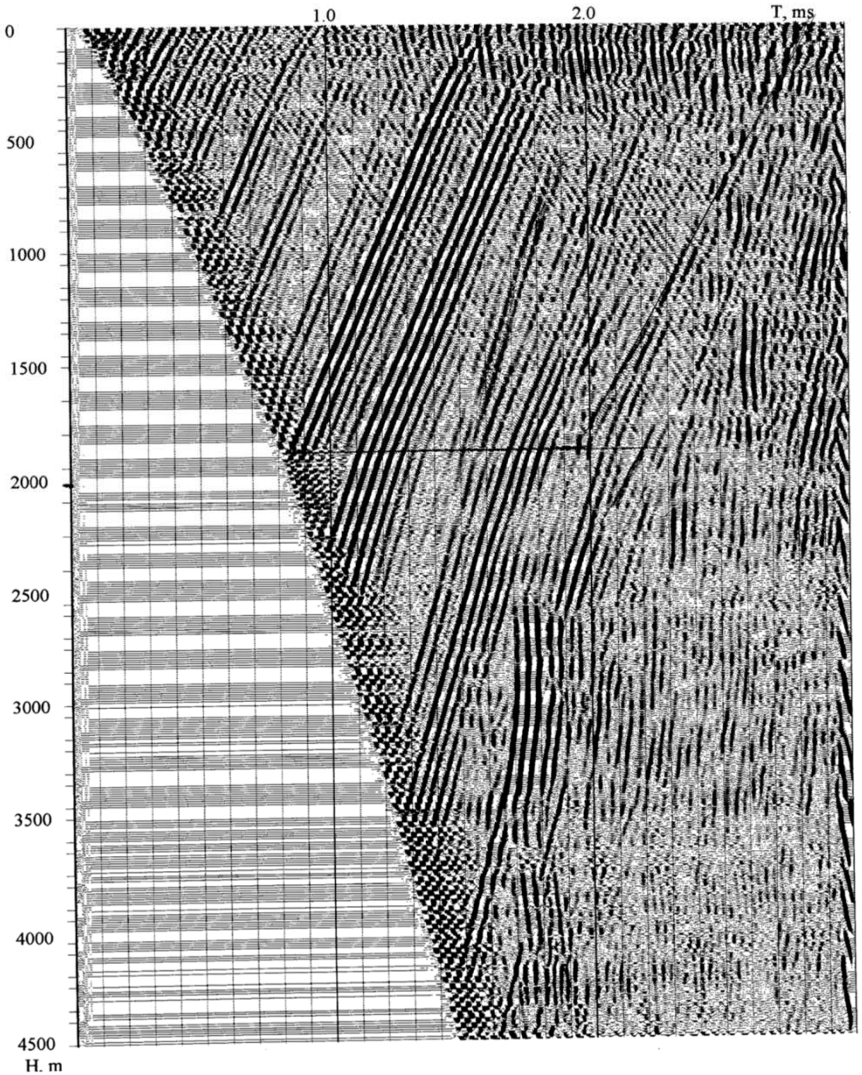


Synthetic time cross-section obtained after subtraction of multiples by Berchhaut algorithm. **The central scheme** with receiver grouping on base l_G=150 m and interval between centers of a group ΔX_{RP}=50 m is used (magnified scale).

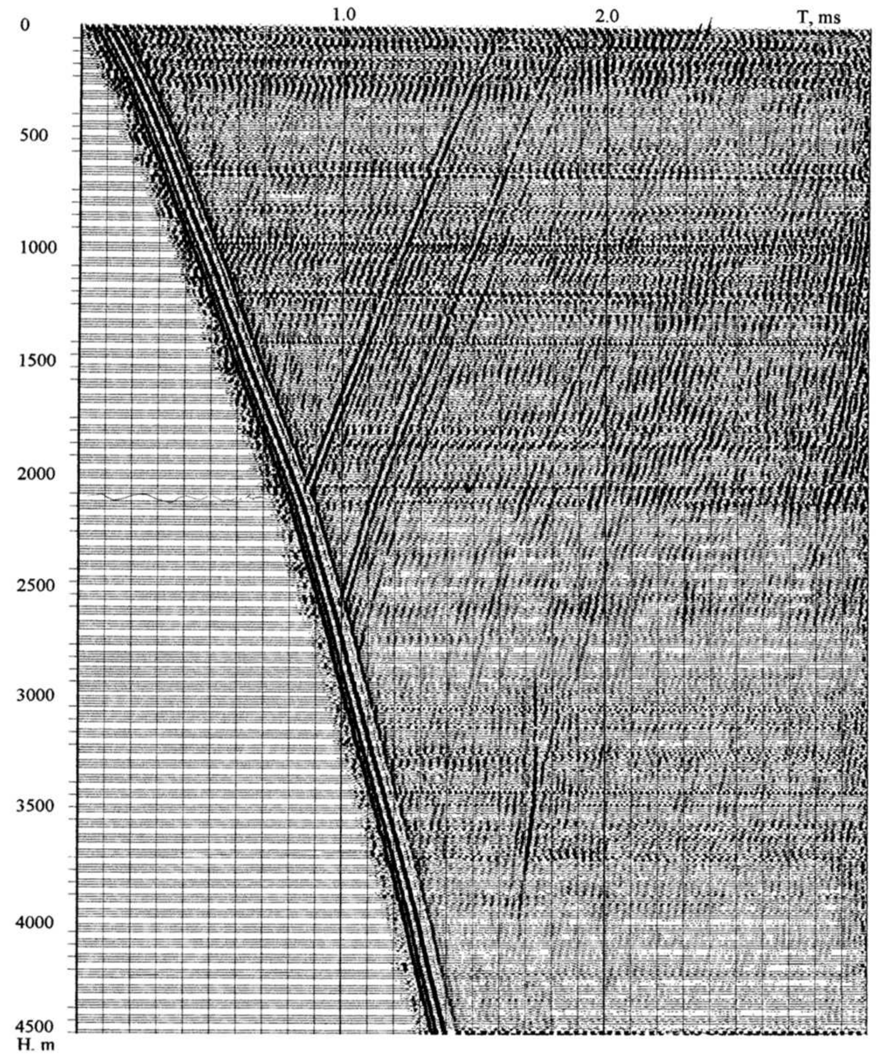


Testing of program of surface waves-hindrances suppression: **a** – time cross-section without surface waves-hindrances suppression; **b** –time cross-section with suppression of surface waves-hindrances basing on the F-K filtration; **c** – time cross-section with suppression of surface waves-hindrances basing on a singular decomposition.

Synthetic VSP shotgather (Z-component) for well #19



after subtraction of incident waves in a band filter interval F=15 – 60Hz



after application of deconvolution in a band filter interval F=15 – 60Hz

End of Presentation