27. SURVEY AT SITES 346, 347, 348, 349, AND 350 THE AREA OF THE JAN MAYEN RIDGE AND THE ICELANDIC PLATEAU

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The area of the Jan Mayen Ridge and the Icelandic Plateau in which Sites 346 through 350 were located is shown in Figure 1. The division of this area into the eight provinces shown in Figure 1 has been made by Grønlie and Talwani (in preparation), principally on the basis of earlier work by many authors including Johnson et al. (1972) and Talwani and Eldholm (in press). Morphologically regions 1, 2, and 3 form the Jan Mayen Ridge. Region 1 is an area of a magnetic quiet zone; it is in this area that Johnson and Heezen (1967) described the presence of stratified sediments. Talwani and Eldholm (in press) suggest that area 2 is a structural continuation of the Jan Mayen Ridge even though the magnetic anomalies are somewhat more disturbed here. Although area 3 morphologically forms a part of the Jan Mayen Ridge, it is believed by Talwani and Eldholm (in press) to have been created by sea-floor spreading contemporaneously with the Norway Basin to the east. Area 5 contains the anomalies associated with the present center of spreading in this area, the Iceland-Jan Mayen Ridge (also known as the Kolbeinsey Ridge). Johnson et al. (1972) have suggested that an intermediate axis of spreading, now extinct, lies between the Iceland-Jan Mayen Ridge and the Jan Mayen Ridge. The magnetic anomalies associated with this extinct axis lie in the area 4. The anomaly identification shown in Figure 1 has been made by Chapman and Talwani (in preparation). The development of area 7 is not clearly understood at this time. Area 6 comprises Iceland and its shelf, and area 8 lies within the Norway Basin which was created by sea-floor spreading early in the development of the Norwegian Sea.

A bathymetric map ot the area is shown in Figure 2. This map has been constructed by Grønlie et al. (in preparation) and is a part of a larger map of the Norwegian Sea.

Figure 3 shows three single-channel seismic profiles made on *Vema*. The location of these profiles is given in Figure 1.

In preparation for Leg 38 the Russian scientists aboard *Academic Kurchatov* conducted detailed surveys in three areas. The areas N1, N2, and N3 are indicated in Figure 1. The area N1 principally covers the area of the intermediate spreading anomalies, area 4. Figure 4 gives the track locations of the *Kurchatov* survey. The depths are given in Figure 5, the magnetic anomalies in Figure 6, sediment thickness in Figure 7, depth to basement in Figure 8, and representative profiler sections in Figure 9. Area N2 covers the principal part of the Jan Mayen Ridge. Geophysical data obtained by *Kurchatov* in area N2 are given similarly in Figures 10 through 16. Area N3 covers the southern part of the Jan Mayen morphological ridge which comprises areas 2 and 3 of Figure 1. Geophysical data obtained aboard *Kurchatov* in area N2 are given in Figures 17 through 22.

Two points should be mentioned regarding sediment thickness. One, that in computing basement depth the velocity of 2.0 km/sec was used for the sediments. Secondly, sediment thickness was generally measured to an "opaque" layer. This opaque layer can be clearly seen in profile A-B and E-F in Figure 3. Note in profile E-F in the area marked 1 and 2, the opaque layer is interrupted between about 2300 and 0200 hours. In the literature these areas have been called "holes" and raise some questions about identification of opaque layers as basement and also make the measurement of total sediment thickness somewhat uncertain. Such factors should be considered in examining the sediment thickness maps in the various figures.

The bathymetric charts in Figures 2 and 11 emphasize the block-like nature of the northern part of the Jan Mayen Ridge in which Sites 346 and 347 were selected. Profile C-D in Figure 3 as well as profiles 6 and 7 in Figure 16 which lie close to Sites 346 and 347 also emphasize the block-like nature of the Jan Mayen Ridge. In profiles 6 and 7 of Figure 16 one can see sedimentary layers parallel to the top surface of the block. A rather prominent reflector marks the bottom of the sequence of these parallel layers. Below these, not very clearly shown in these photographs, lies a succession of dipping layers which are truncated by the nearly horizontal layers mentioned above. Sites 346 and 347 were located close to the western edge of the platform. Profiles such as 6 (Figure 16) suggest that the western edge of the platform was formed by igneous basement, although the surface of the igneous basement is clearly not seen under the ridge. It is presumed that igneous basement dips steeply from the western end of the platform down under the platform and that Sites 346 and 347 were located to drill into any basement ridge that might exist under the western part of the Jan Mayen Ridge.

Site 349, as can be judged from Figures 2 and 11, also lies on the main Jan Mayen Ridge platform, but nearly in the middle of the block rather than close to the

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western edge. Although it is not clearly seen in the photographic reduction, profile 14 in Figure 15 shows similar layering in this area as was seen in the area in which Sites 346 and 347 lie.

As mentioned earlier, the Jan Mayen structural ridge divided into a northern portion (area 1) and a southern portion (area 2), the area 2 being magnetically more disturbed. All three sites, 346, 347, and 349, lie in the northern block of the Jan Mayen Ridge.

Site 348 lies within area 4, the area containing magnetic lineations on either side of the extinct spreading axis of the Icelandic Plateau. The bathymetric setting of Site 348 can be gauged from Figure 2 and in more detailed fashion from Figure 5. The two scarp-like features which lie close to the boundaries of area 4 in Figure 1 are seen well in Figure 5. These scarp-like features can also be seen in profile A-B in Figure 3 just within the boundaries of the area marked area 4. Area 4 is characterized by sea-floor spreading-type anomalies which are clearly seen in Figures 1 and 6. Chapman and Talwani (in preparation) have correlated the magnetic anomaly sequence with a magnetic time scale given by Blakely (1974). A central anomaly corresponding to the extinct axis is identified as anomaly 5D. Site 348 lies on anomaly 6. While anomaly 5D has been identified as lying on the axis of magnetic symmetry, it can be seen from profile A-B in Figure 3 or from the contour map with depth to basement in Figure 8, that a similar axis of symmetry is not apparent in depths to basement. Actually, as seen in Figures 5 and 8, Site 348 lies closer to a high in topography as well as in basement, than the extinct axis of spreading.

For the purpose of the above discussion, the opaque layer as seen in profile A-B, as well as in the various seismic reflection profiles in Figure 9, has been taken to be basement.

Site 350 lies in area 3 of Figure 1. The bathymetric map in Figure 2 as well as in Figure 18 shows that Site 350 lies near the crest of a small northeast-southwest trending topographic ridge. On the reflection profiler records the site can be seen on profile E-F in Figure 3 and past 0824 hr in profile 5 of Figure 22. Talwani and Eldholm (in press) have made a distinction between the peaks seen in profile E-F that lie in areas 1 and 2, and the peak which forms Site 350 in area 3. In the areas 1 and 2 the peaks are characterized by absence of the opaque layer lying below them. They correspond to what earlier was termed "holes." However, in area 3 we see that for Site 350 the opaque layer lies below the peak. This is an important distinction because the peaks in areas 1 and 2 are considered to represent subsided continental material while the peaks in area 3 are thought to have been formed by some form of sea-floor spreading. The opaque layer has been considered to be basement in compiling the sediment thickness map in Figure 20 and the depth to basement map in Figure 21. We also note that a small magnetic anomaly exists at Site 350. In general the magnetic anomalies in area 3, in which Site 350 lies, are more subdued than in the areas definitely known to be associated with sea-floor spreading, areas 4 and 8, but are somewhat more disturbed than in the quiet zone which lies in area 1.

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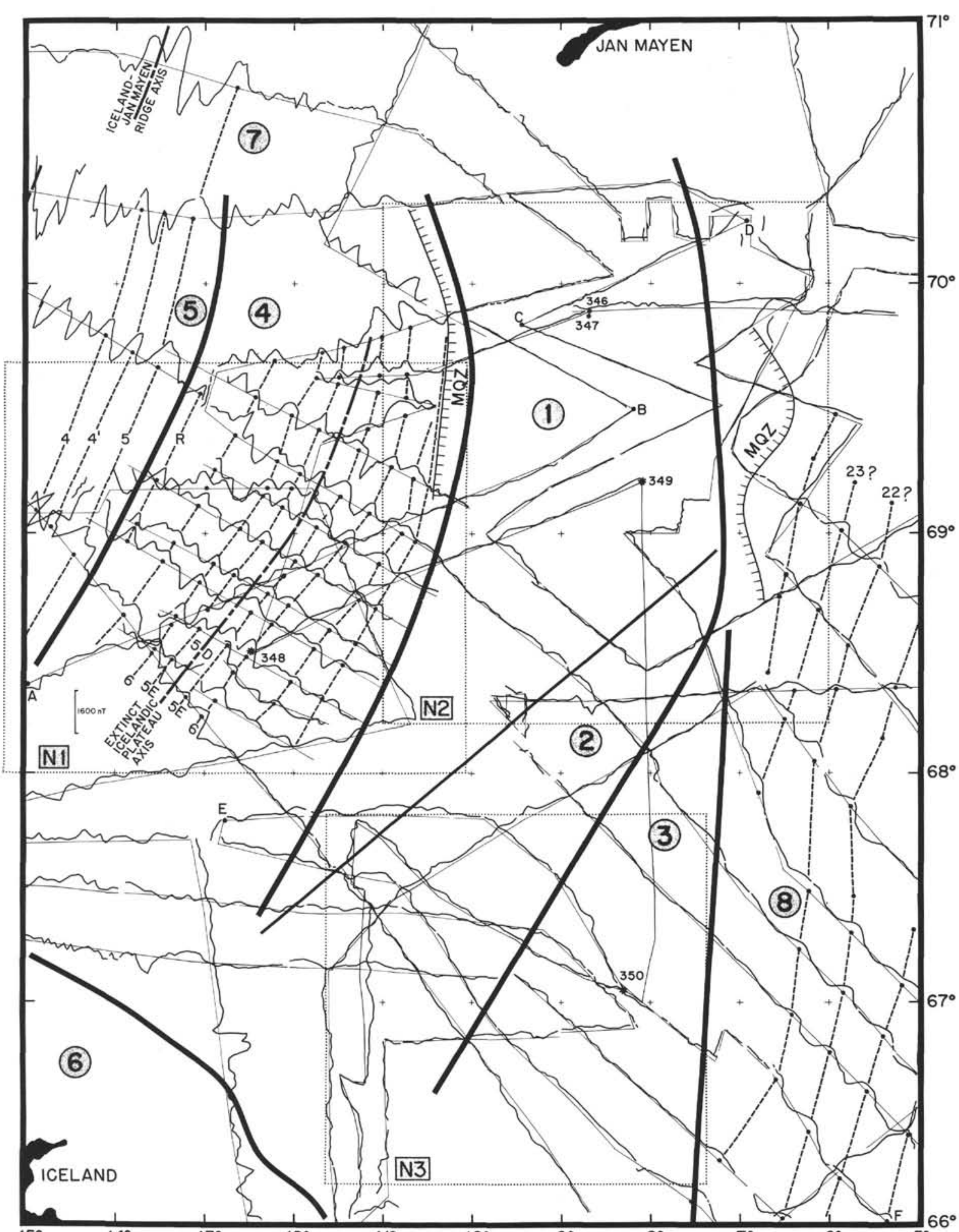

Figure 1. *Magnetic anomalies plotted along track in the area of the Jan Mayen Ridge and the Icelandic Plateau. The division into areas 1 through 8 is explained in the text.*

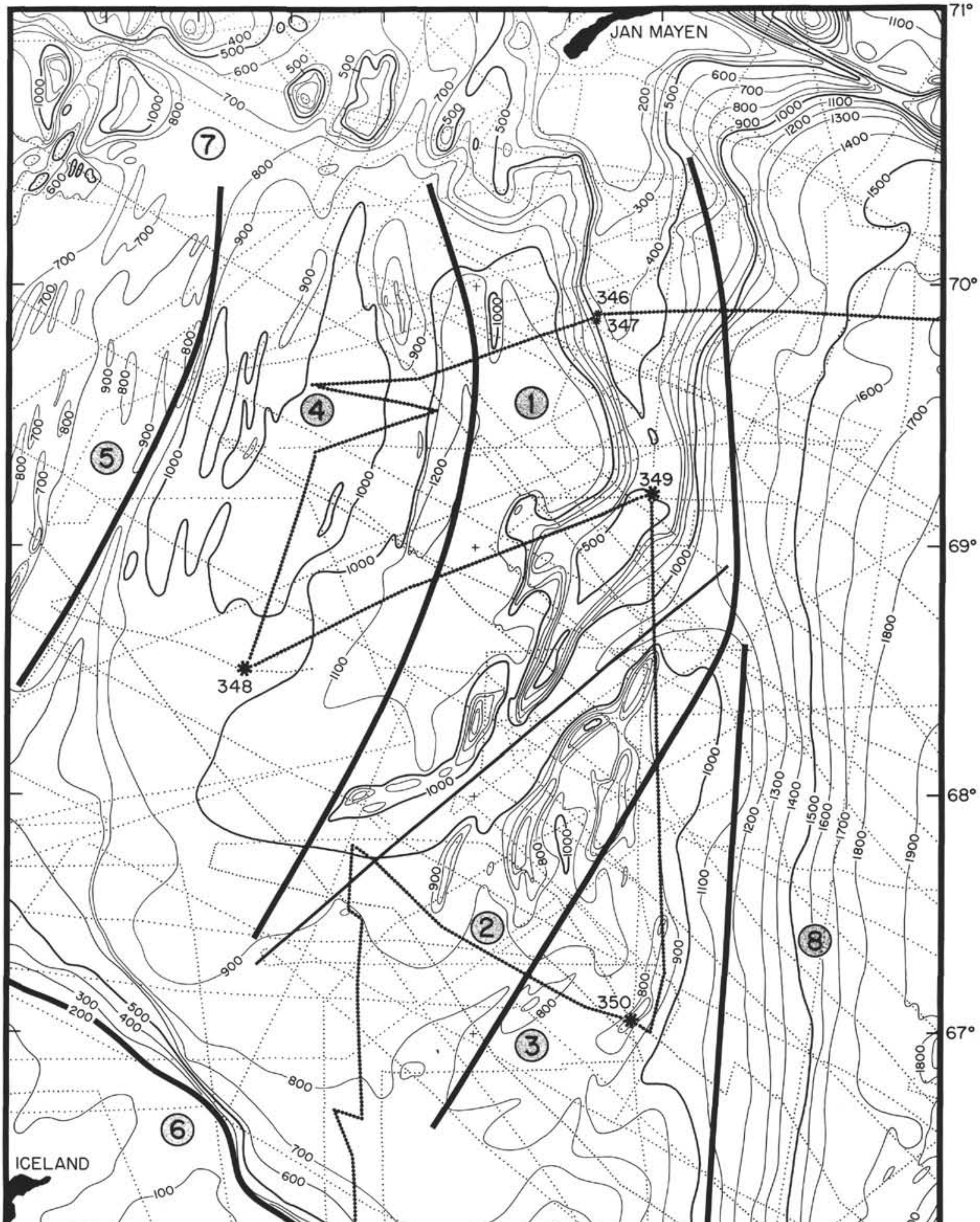

Figure 2. *Bathymetric chart of the area of Jan Mayen Ridge and Icelandic Plateau taken from a map of the Norwegian Sea (Gronlie et al., in preparation). Track of* Glomar Challenger *is indicated by heavy lines.*

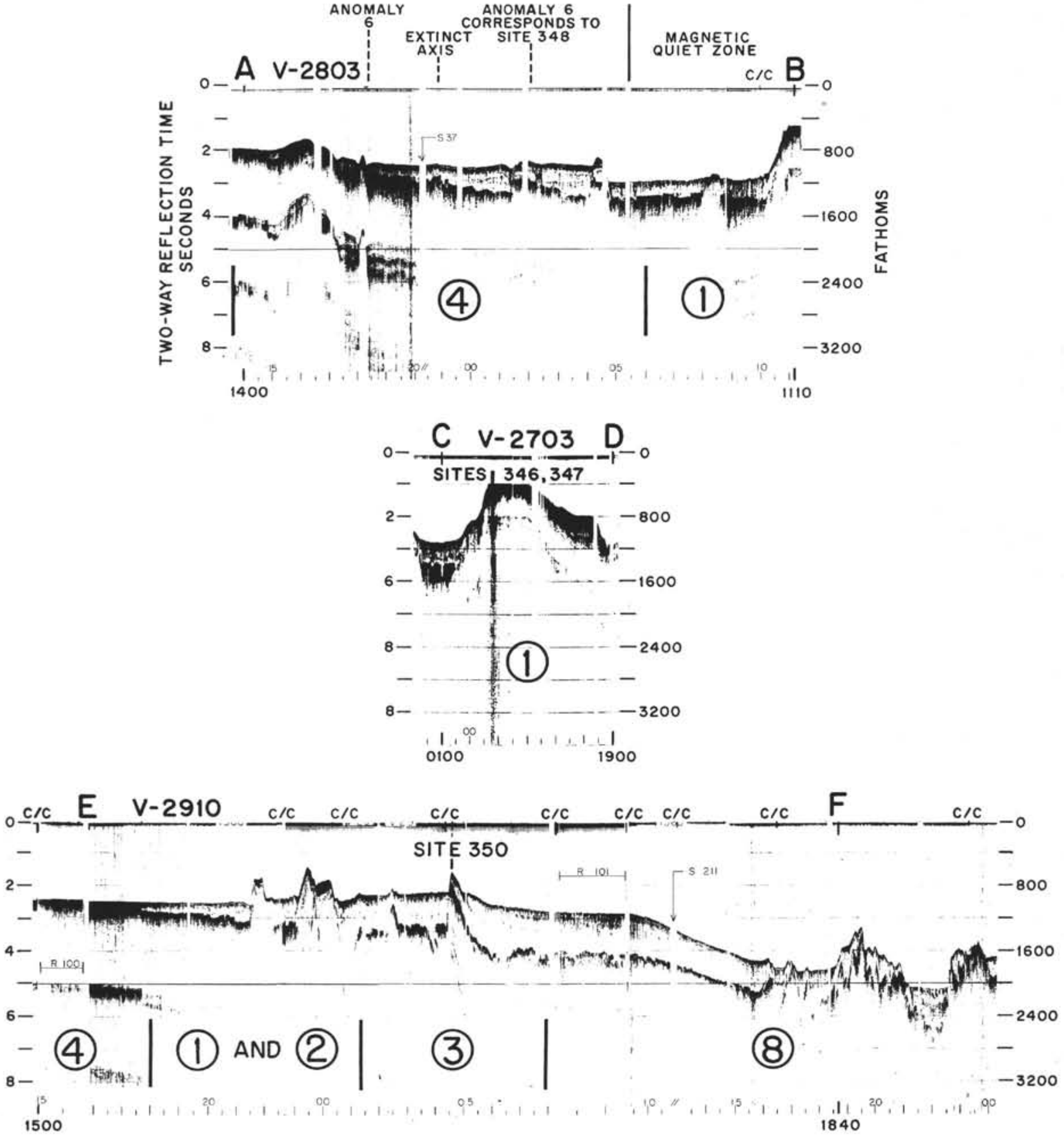

Figure 3. *Single channel* Vema *seismic reflection profiles in the area of the Jan Mayen Ridge and the Icelandic The location of these lines is indicated in Figure 1.*

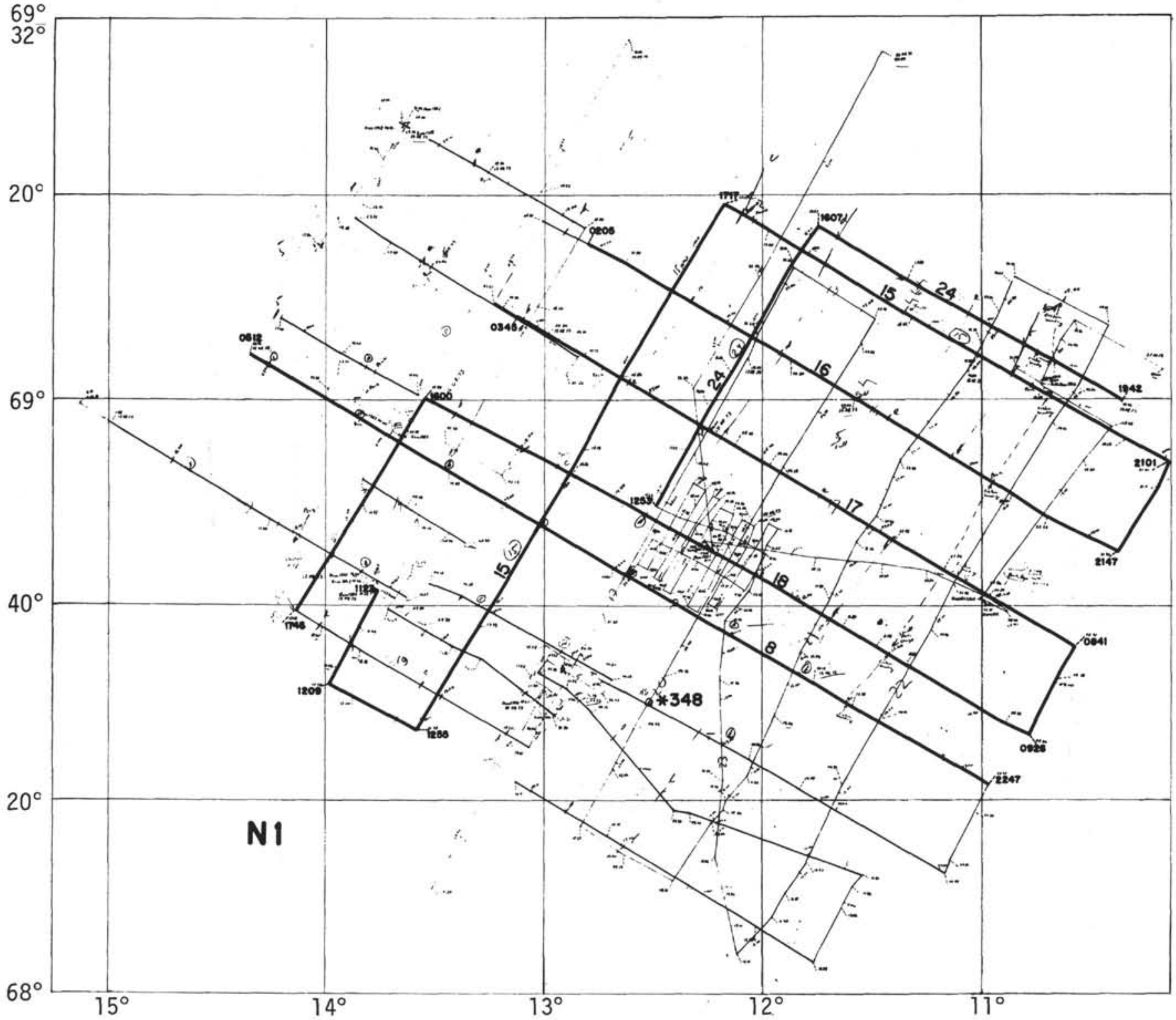

Figure 4. *Track of* Academic Kurchatov *in area N1.*

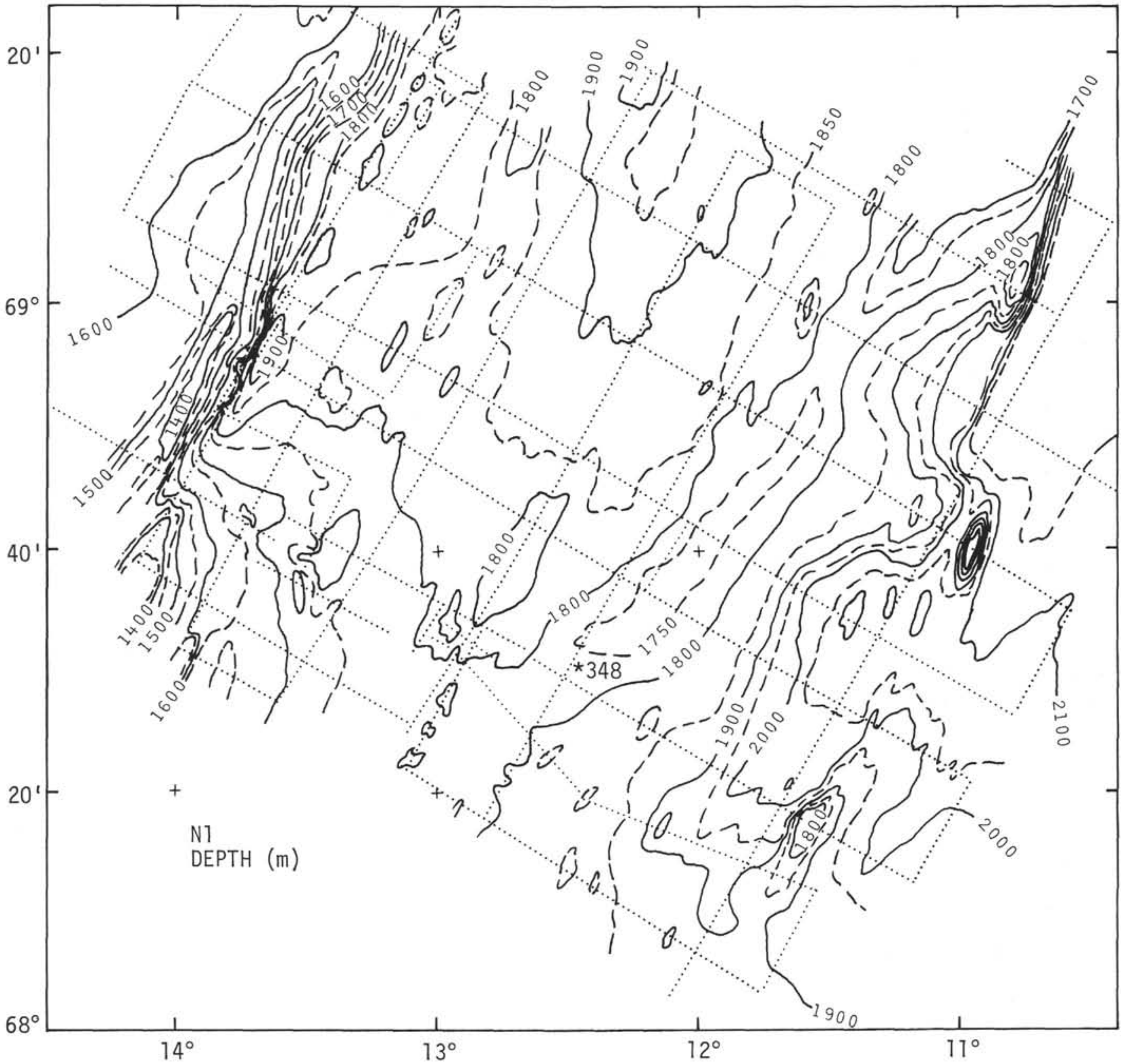

Figure 5. *Bathymetric chart of the area N1 based on soundings made by* Academic Kurchatov.

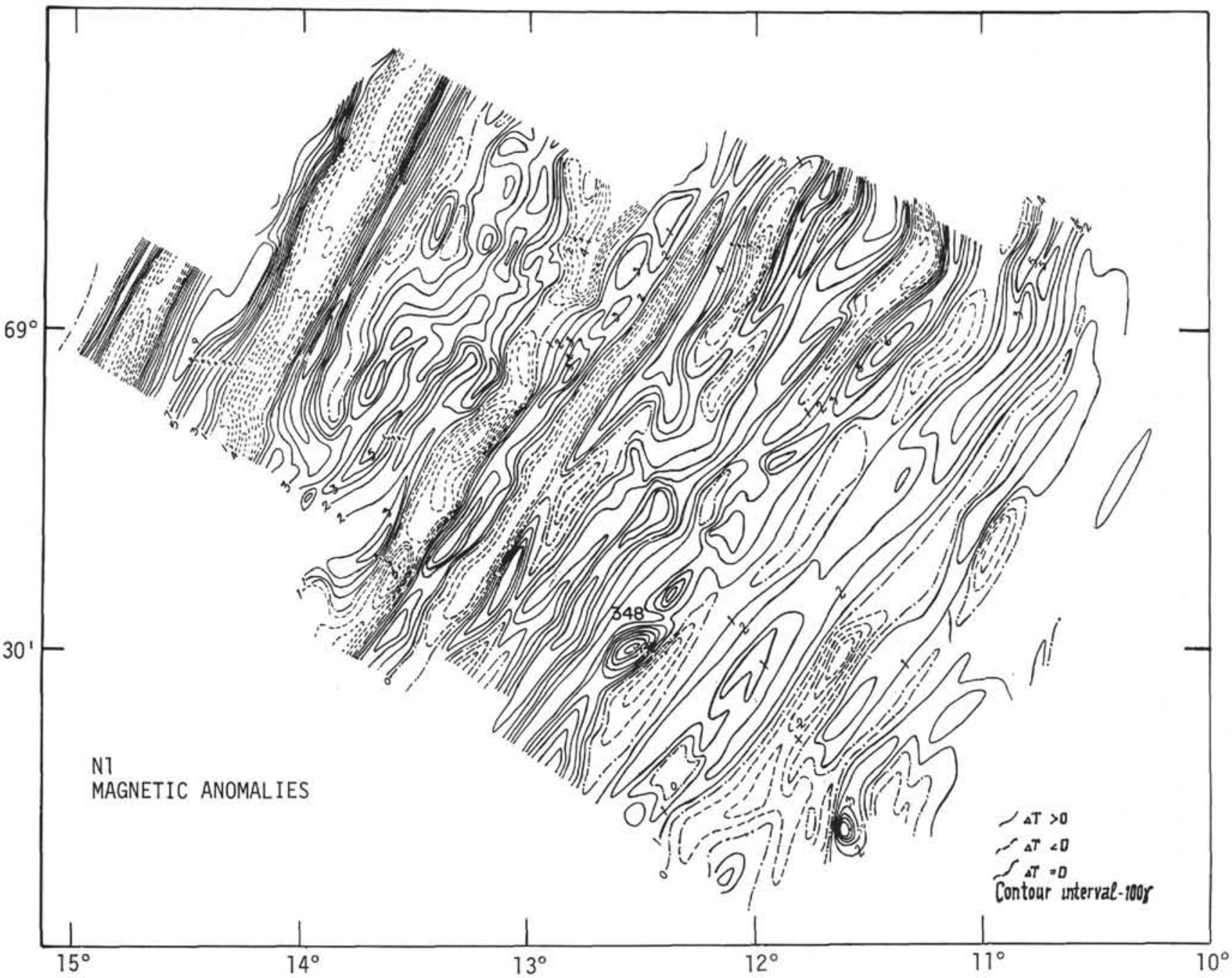

Figure 6. *Magnetic anomaly lineations in area N1 obtained aboard* Academic Kurchatov. *Map constructed by E. Mirlin.*

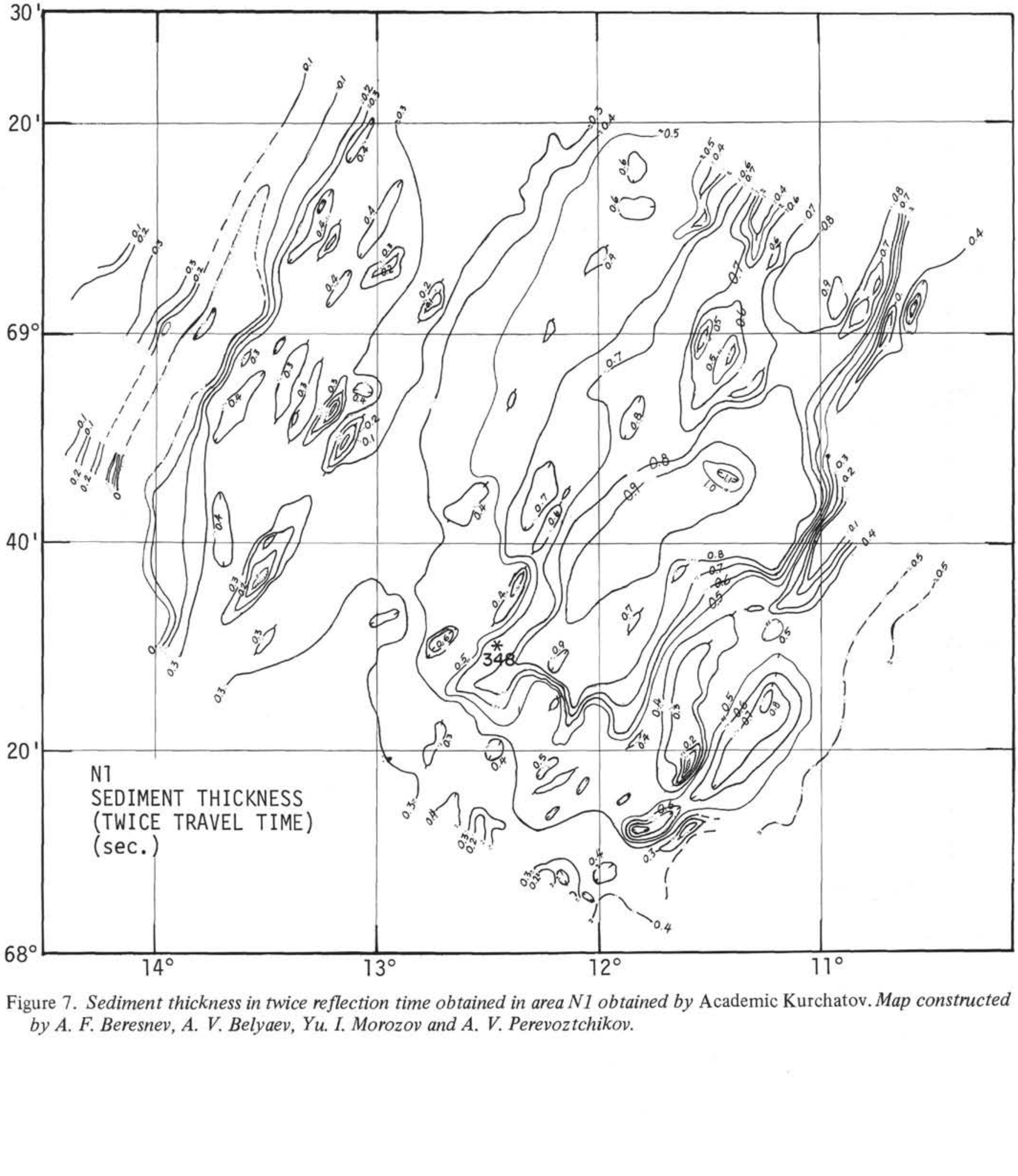

Figure 7. *Sediment thickness in twice reflection time obtained in area N1 obtained by* Academic Kurchatov. *Map constructed by A. F. Beresnev, A. V. Belyaev, Yu. I. Morozov and A. V. Perevoztchikov.*

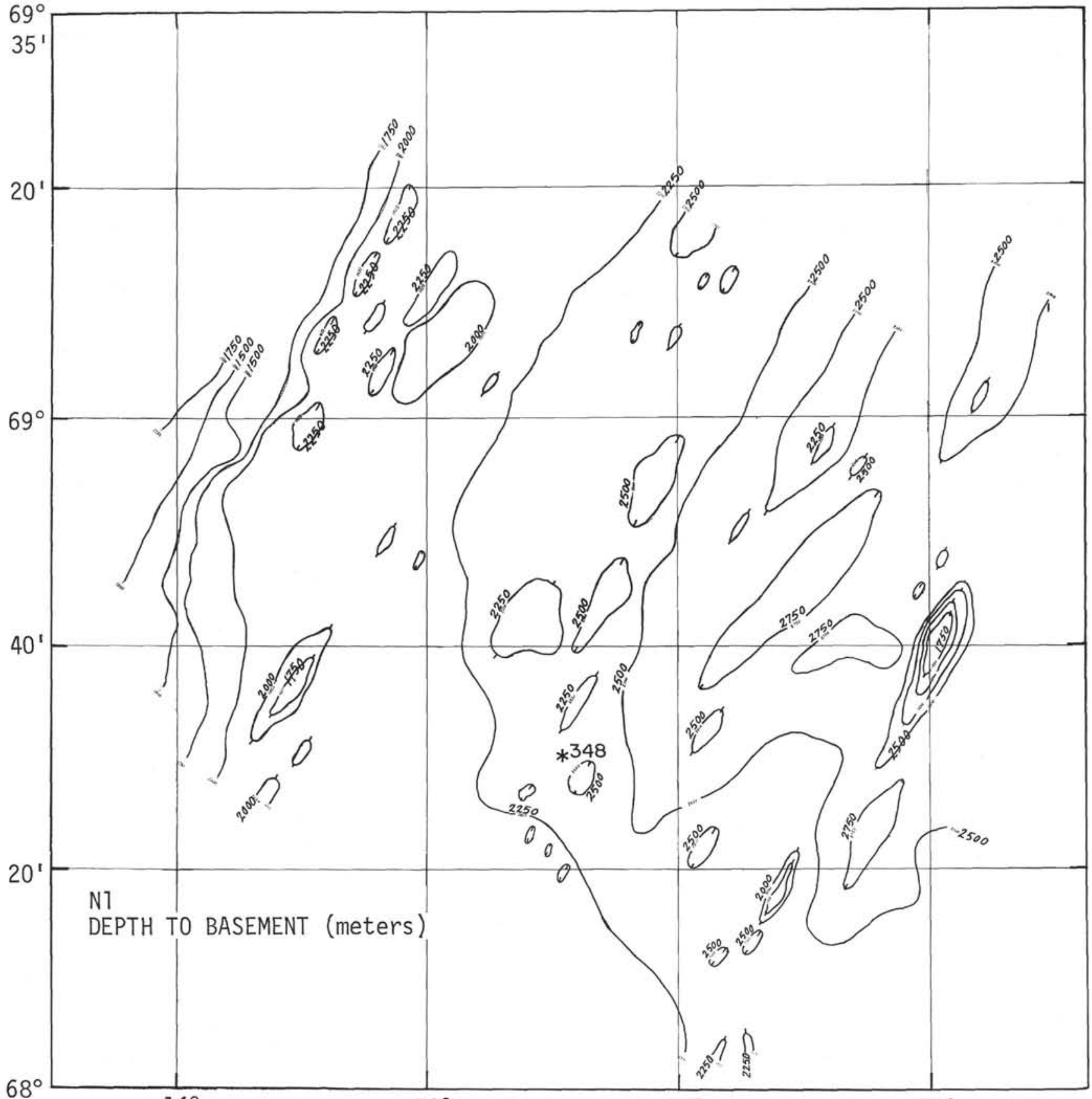

Figure 8. *Depth to basement in area N1 from data obtained aboard* Academic Kurchatov. *Map constructed by V. F. Kanayev, N. A. Marova, and M. V. Rudenko. Velocities of 2 km/sec were assumed in the sediments to make this map.*

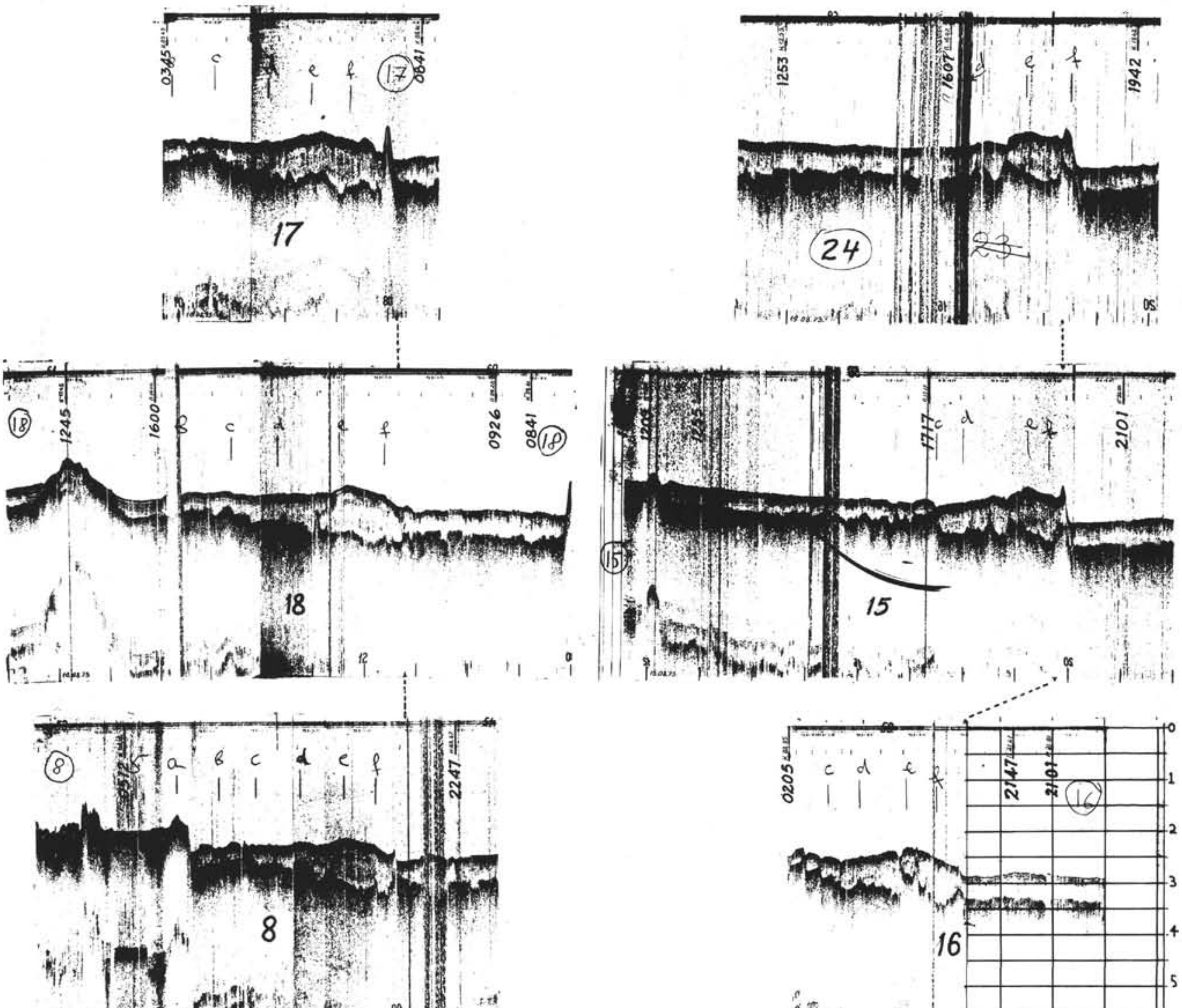

Figure 9. *Selected seismic profiles in area N1 obtained by* Academic Kurchatov. *The location of these single-channel lines is given in Figure 4.*

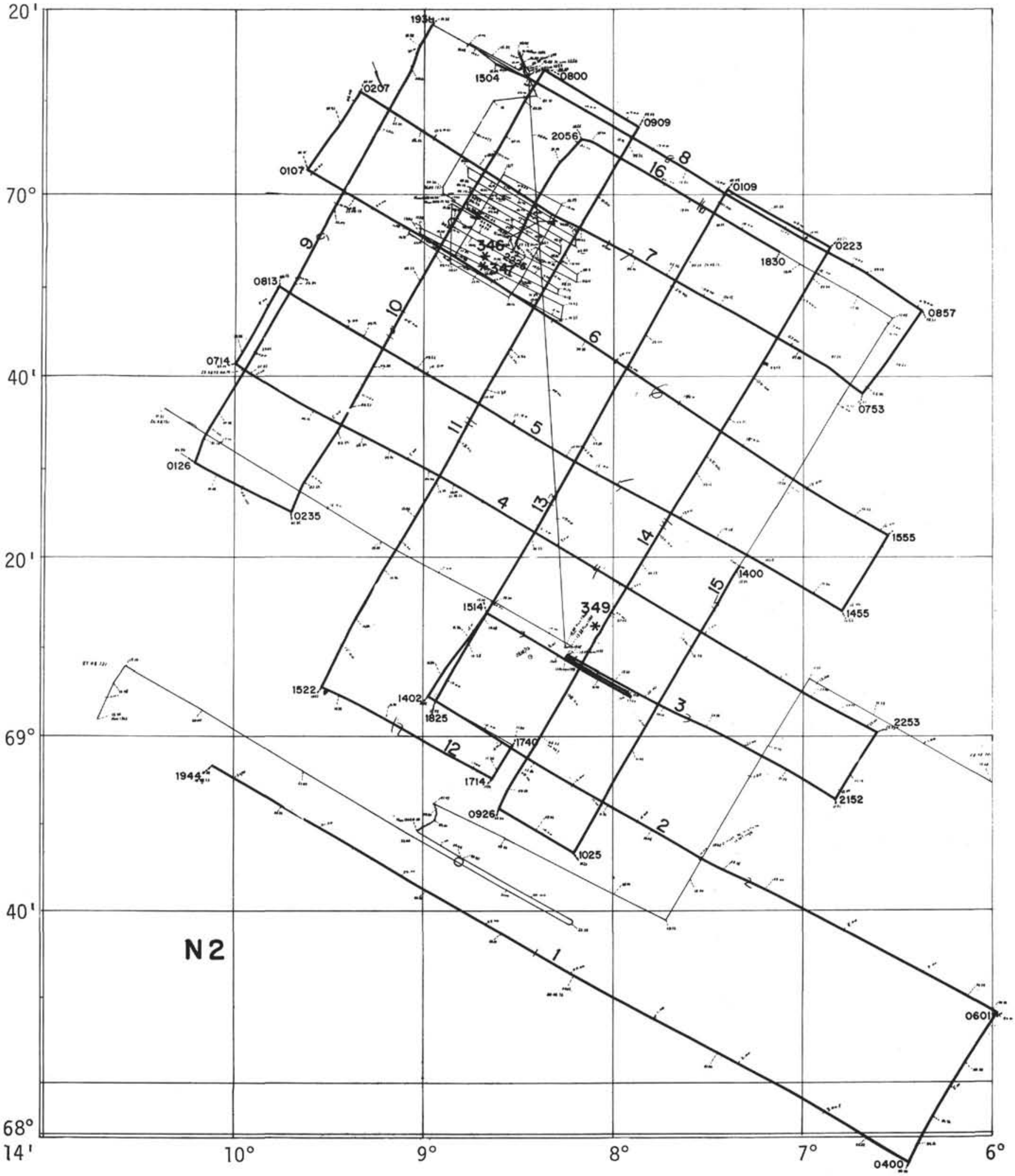

Figure 10. *Track of* Academic Kurchatov *in area N2.*

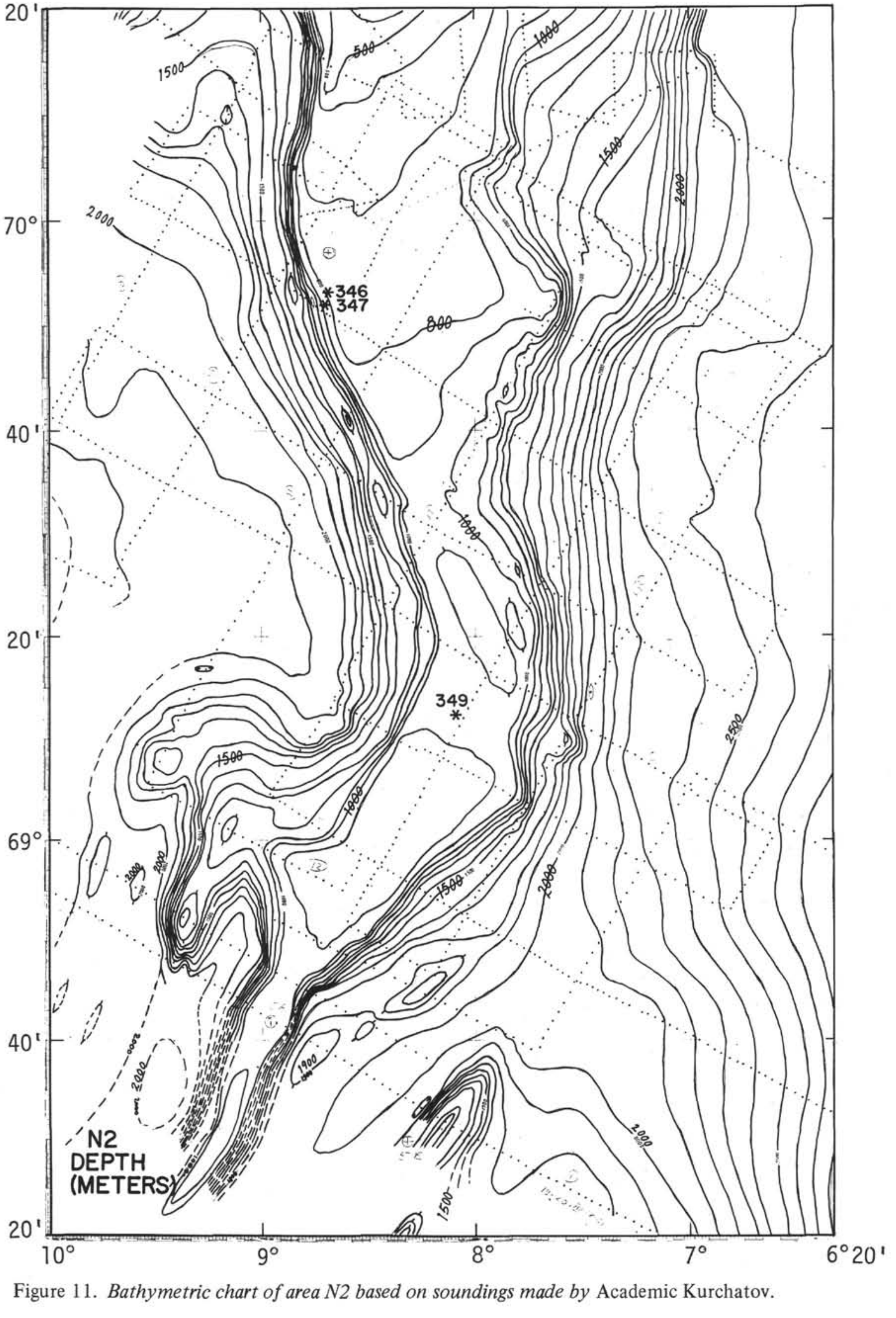

Figure 11. *Bathymetric chart of area N2 based on soundings made by* Academic Kurchatov.

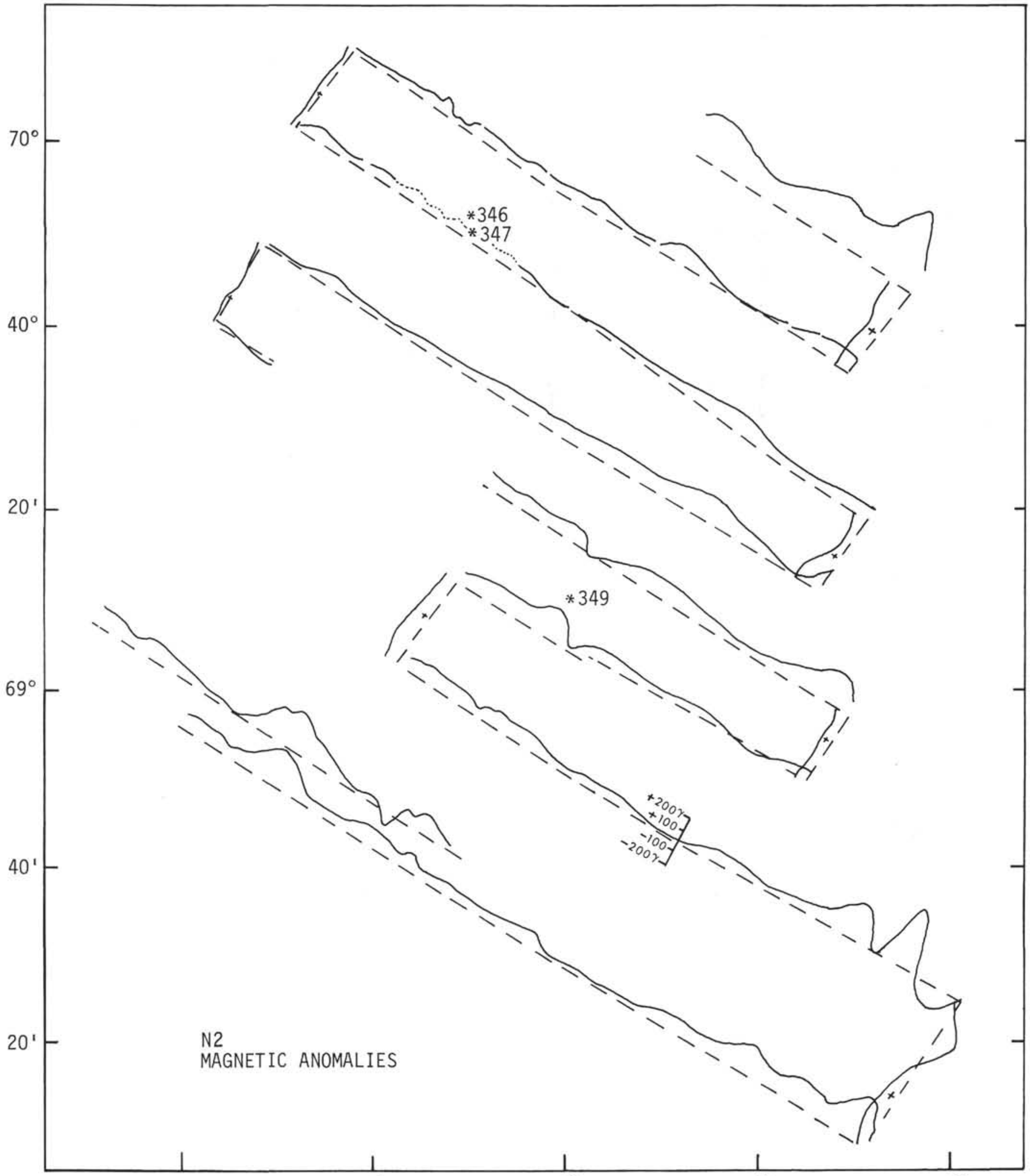

Figure 12. *Magnetic anomalies across selected profiles in Area N2 obtained onboard* Academic Kurchatov. *Map constructed by E. Mirlin.*

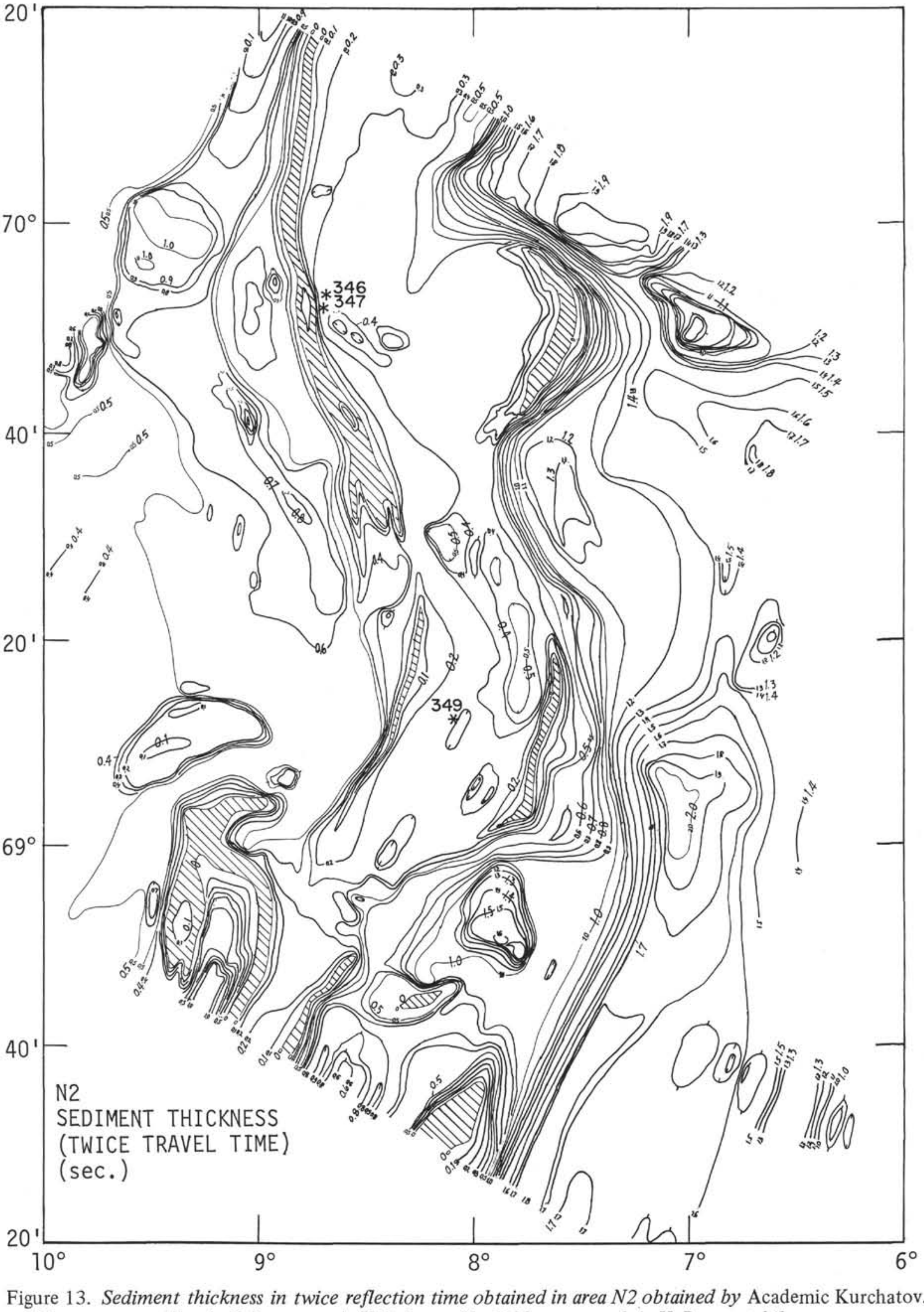

Figure 13. *Sediment thickness in twice reflection time obtained in area N2 obtained by* Academic Kurchatov. *Map constructed by A. F. Beresnev, A. V. Belyaeu, Yu. I. Morozov, and A. V. Perevoztchikov.*

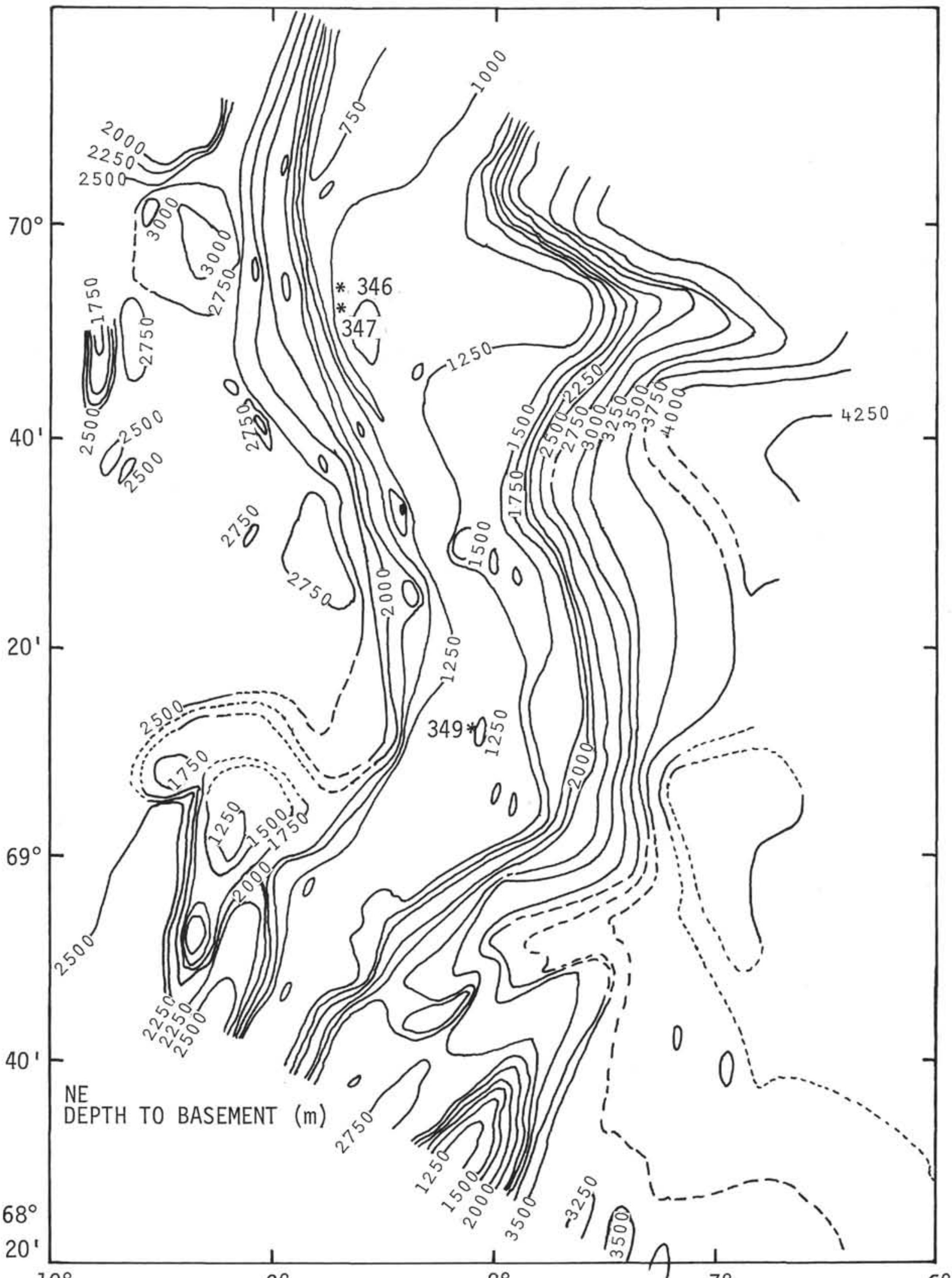

Figure 14. *Depth to basement in area N2 from data obtained aboard* Academic Kurchatov. *Map constructed by V. F. Kanayev, N. A. Marova, and M. V. Rudenko. Velocities of 2 km/sec were assumed in the sediments to make this map.*

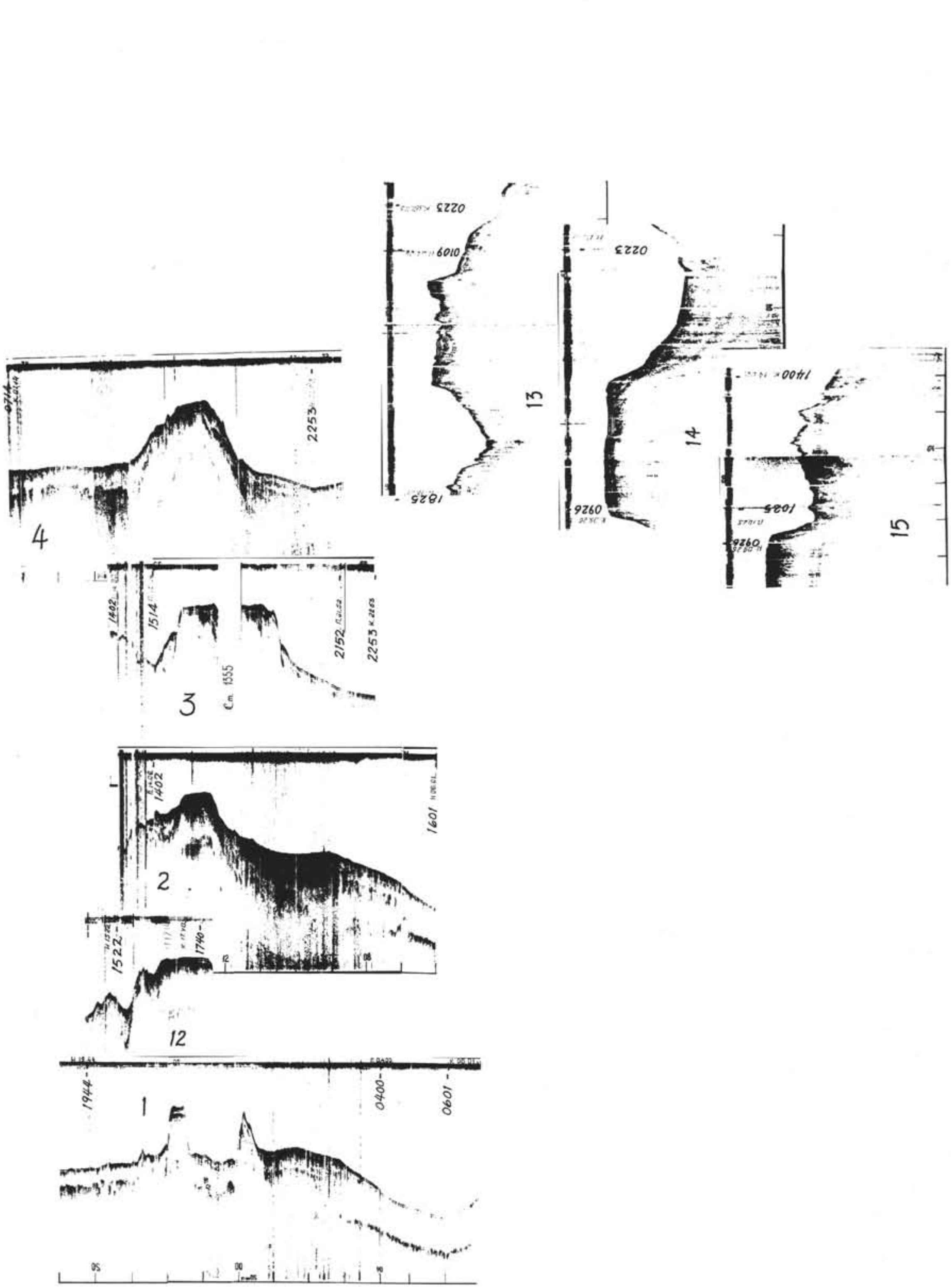

Figure 15. *Selected seismic profiles in area N2 obtained by* Academic Kurchatov. *The location of these single-channel lines is given in Figure 4.*

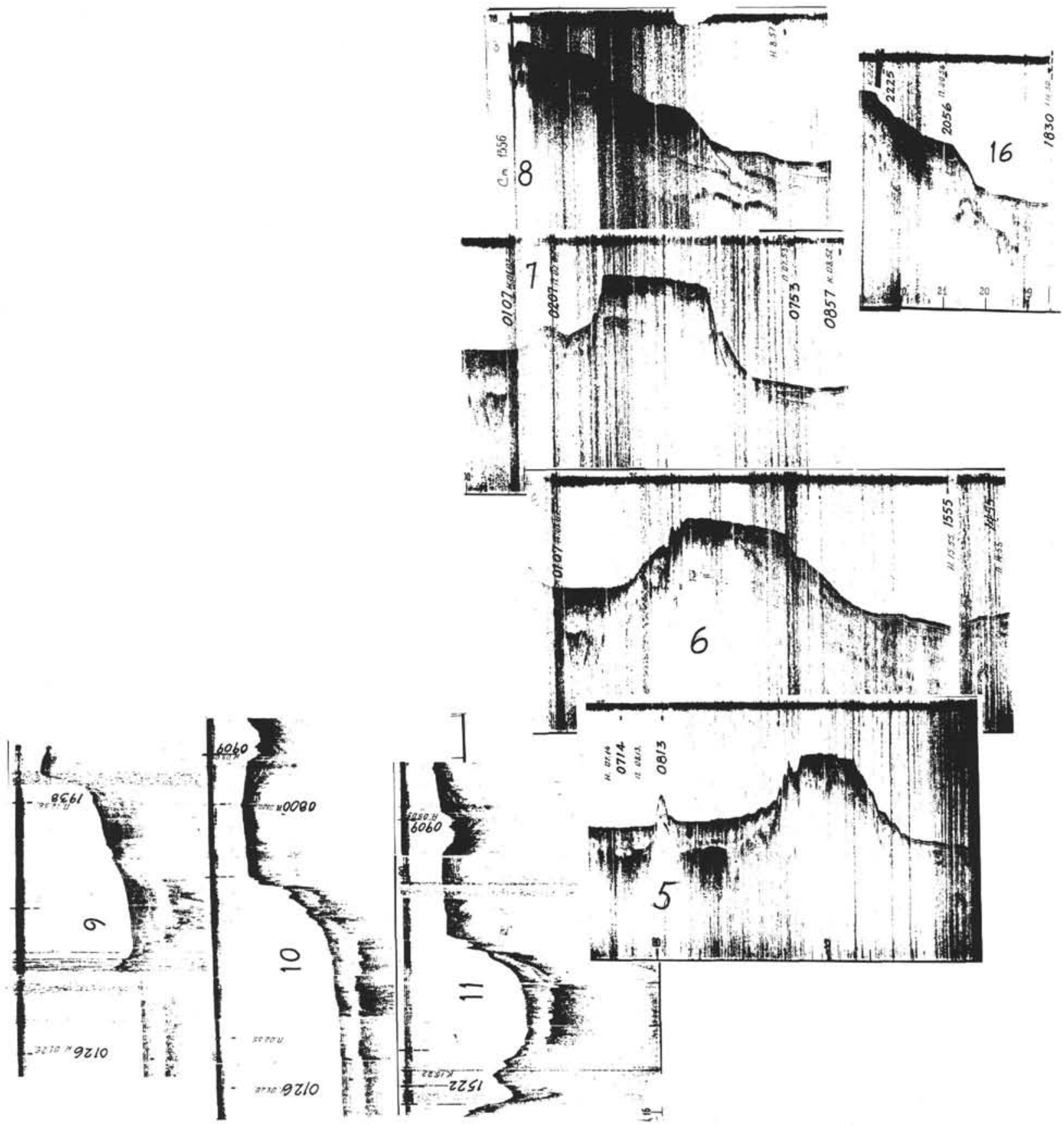

Figure 16. *Selected seismic profiles in area N2 obtained by* Academic Kurchatov. *The location of these single-channel lines is given in Figure 4.*

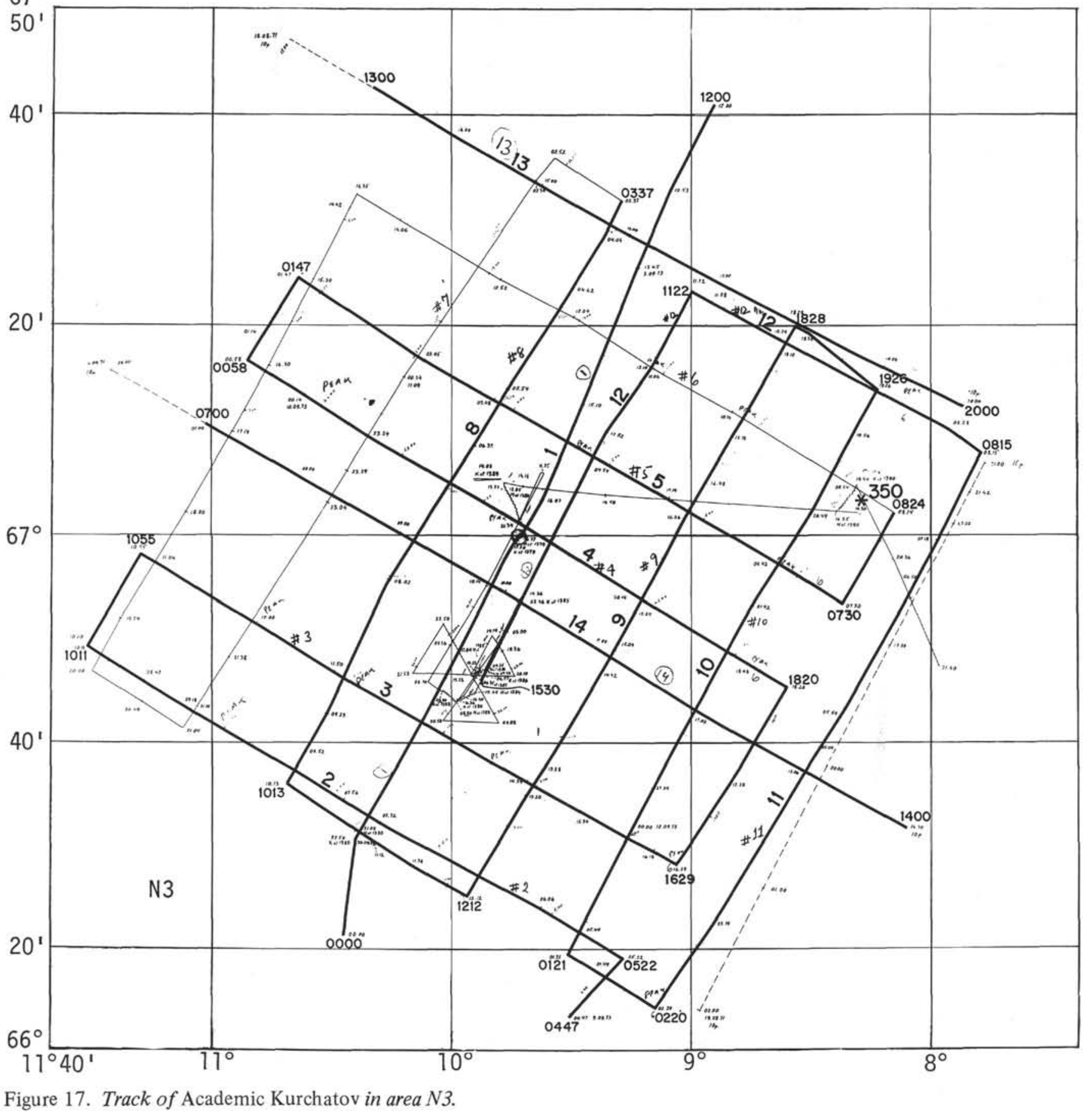

Figure 17. *Track of* Academic Kurchatov *in area N3.*

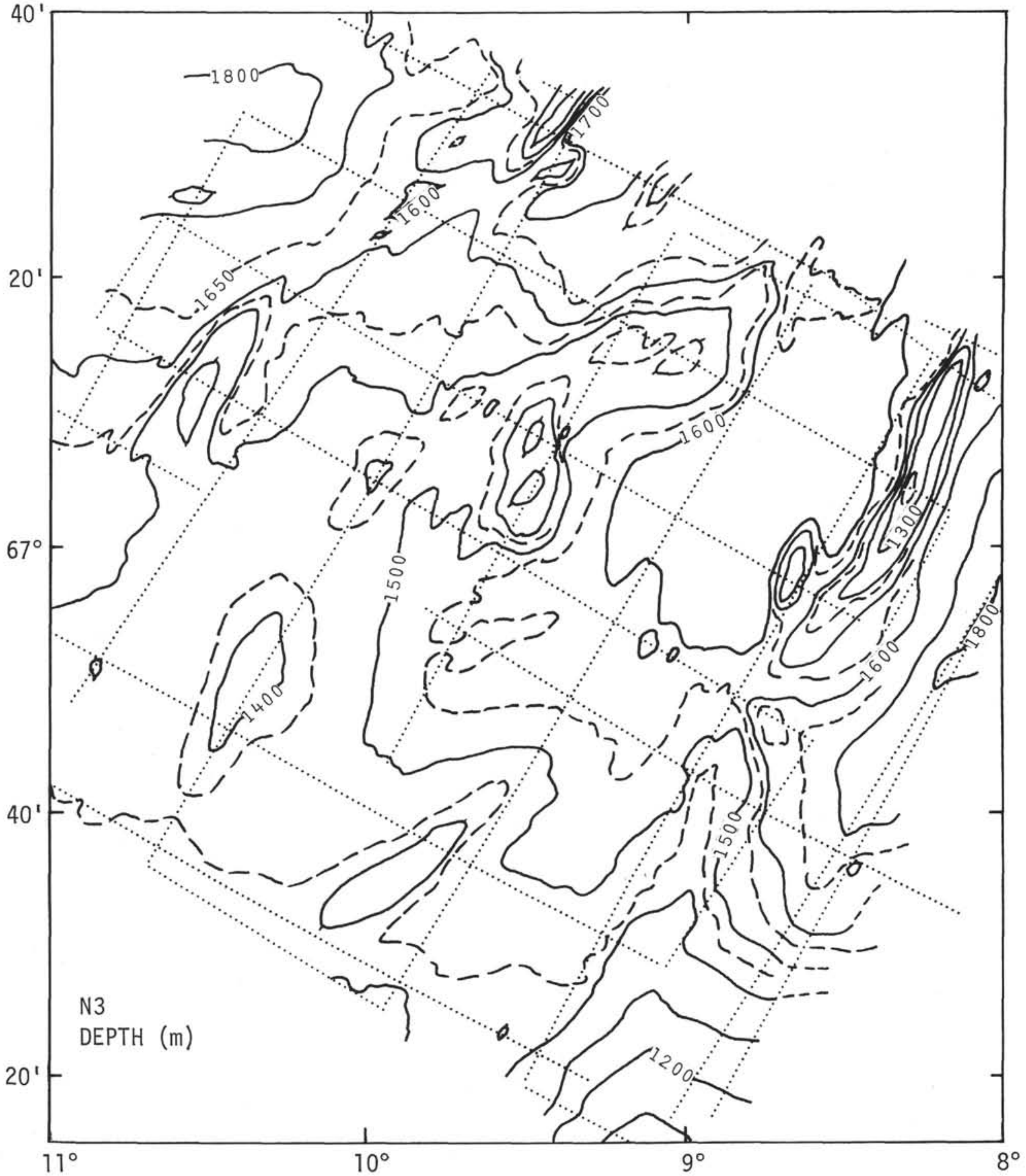

Figure 18. *Bathymetric chart of area N3 based on soundings made by* Academic Kurchatov.

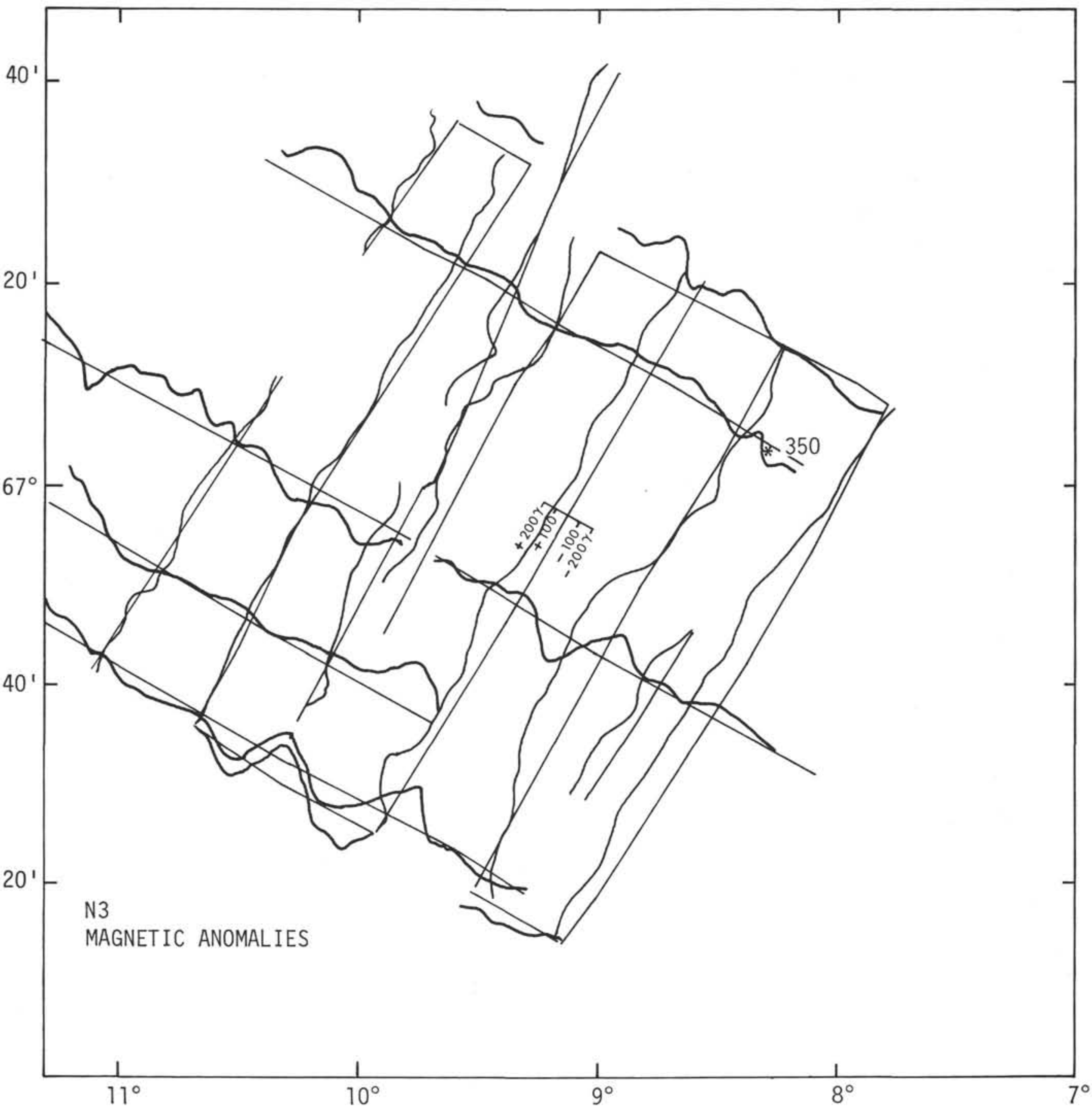

Figure 19. *Magnetic anomalies across selected profiles in area N3 obtained aboard* Academic Kurchatov. *Map constructed by E. Mirlin.*

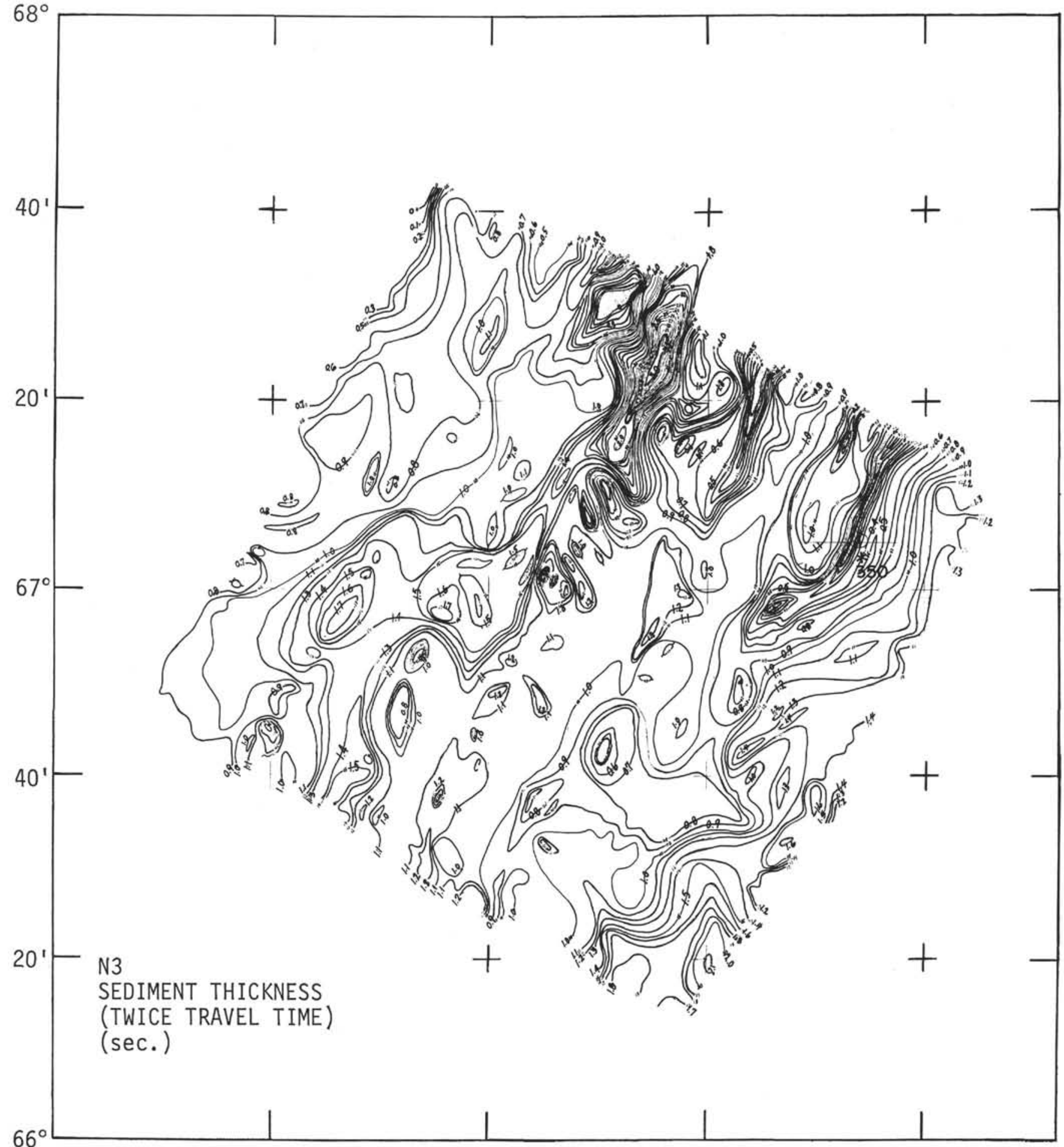

Figure 20. *Sediment thickness in twice reflection time obtained in area N3 obtained by* Academic Kurchatov. *Map constructed by A. F. Beresnev, A. V. Belyaeu, Yu. I. Morozov, and A. V. Perevoztchikov.*

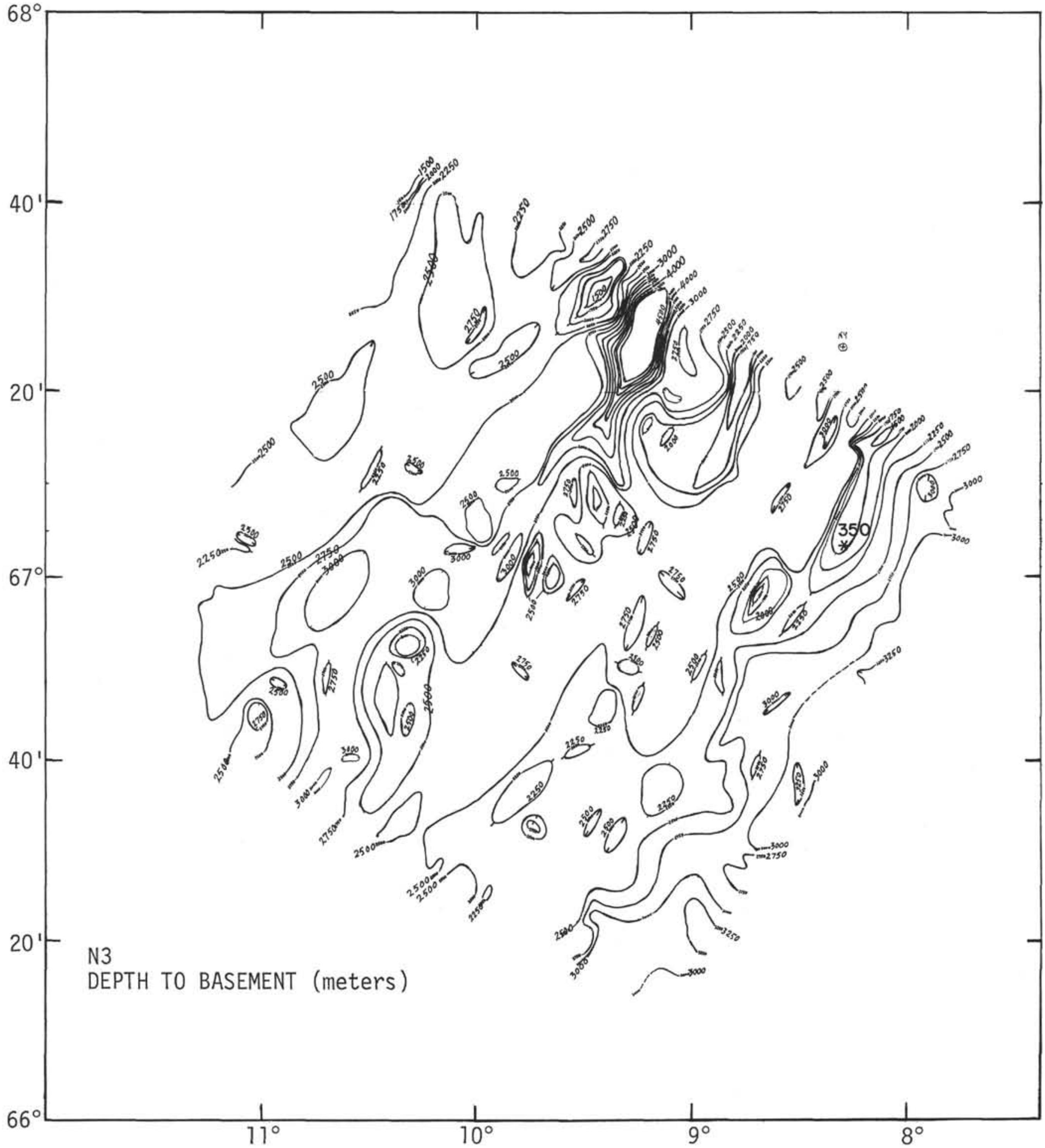

Figure 21. *Depth to basement in area N3 from data obtained aboard* Academic Kurchatov. *Map constructed by V. F. Kanayev, N. A. Marova, and M. V. Rudenko. Velocities of 2 km/sec were assumed in the sediments to make this map.*

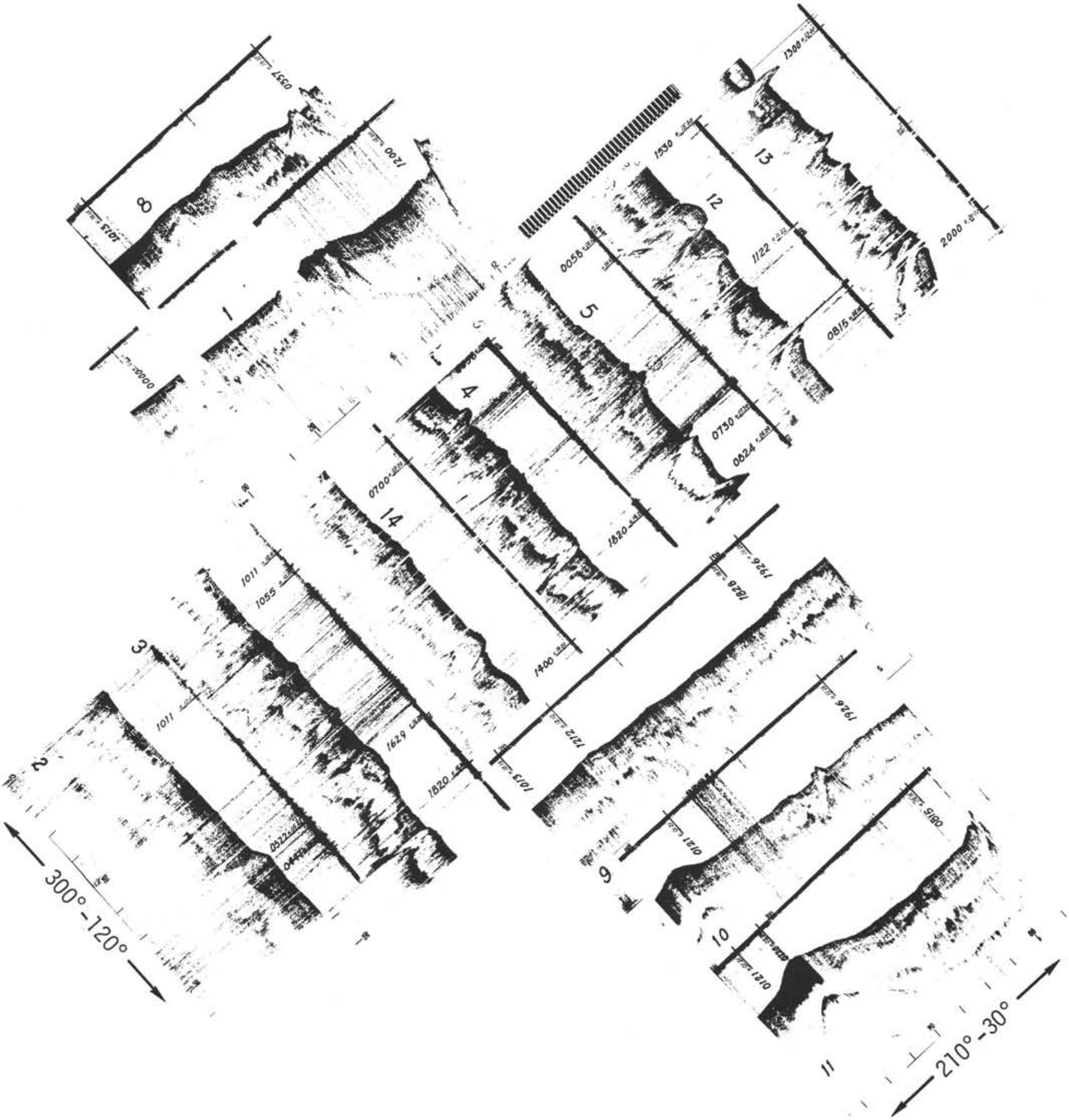

Figure 22. *Selected seismic profiles in area N3 obtained by* Academic Kurchatov. *The location of these single-channel lines is given in Figure 4.*