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VII.4 An Analysis of Rayleigh Waves from Novaya-Zemlya Explosions

The Russian test sites on Novaya-Zemlya are located in the middle of the island (azimuth $\approx 35^\circ$ at NORSAR) and on the southern end of it (azimuth $\approx 42^\circ$). NORSAR has recordings with strong Rayleigh waves of 6 events from the northern test site and 3 from the southern. For all these events a beam made of the 22 long period vertical instrument recordings has been analyzed for dispersion characteristics. The analysis is done by means of multiple narrow band filtering in the frequency domain. The main output of the program is a map of power distribution in the frequency time domain. Fig. VII.4.1 shows such a map for an event in the northern test site. The thick line on the figure connects points of maximum energy. The most notable effect on the figure is the low group velocity observed, say around 2.5 km/sec for waves with period less than 20 seconds. On Fig. VII.4.2 is then shown the same type of figure for an event from the southern test site, and a much more complicated pattern arises. First it is noted that for waves with period less than 20 seconds the main (first) arrival now has a group velocity of approximately 2.9 km/sec. Secondly it is noted that two later arrivals may be observed with group velocity 2.5 km/sec and 2.2 km/sec respectively. Checking the azimuth for the different arrivals (this has been done both with an ordinary time domain beam power program and with a high resolution program), it is found that the event on Fig. VII.4.1 has an azimuth close to the correct one. For the data on Fig. VII.4.2, the first and third arrivals have an azimuth close to the correct one for this event, while the second arrival has an azimuth which is roughly the same as that for the event on Fig. VII.4.1. These preliminary studies indicate that the extremely low group velocities observed for events from the northern test site are caused by thick sediment layers in the Barents Sea on this path, while the southern path has somewhat thinner sediment layers. The multipathing (arrival 2 and 3 on Fig. VII.4.2) is believed to be caused by discontinuities within the Barents Sea, the details of these will be studied further.

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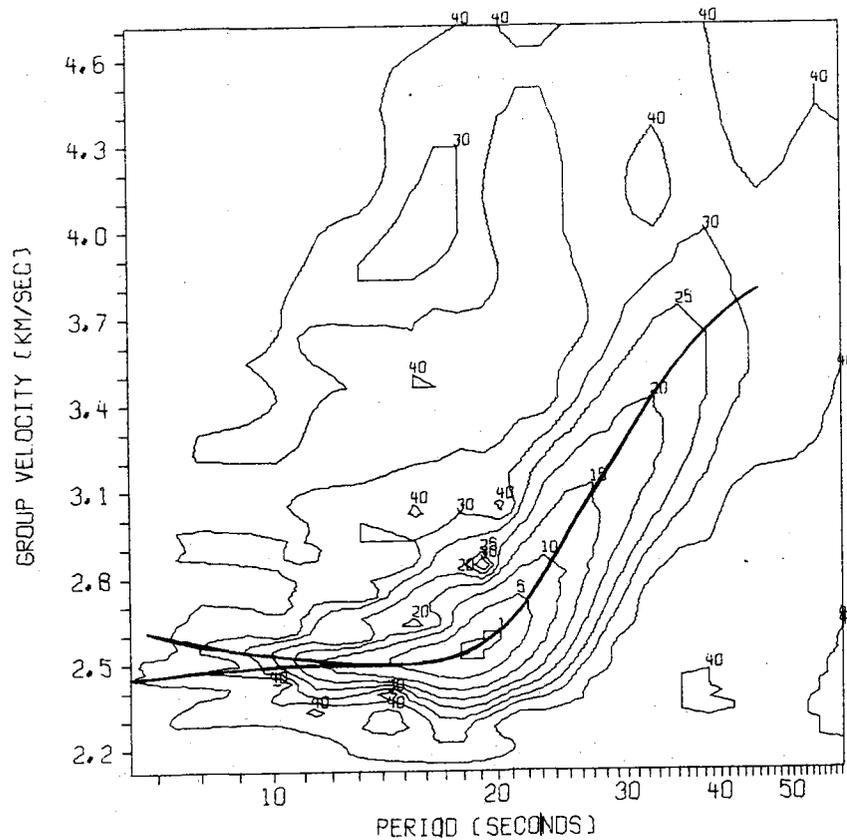


Fig. VII.4.1 Power as a function of group velocity and period for Novaya-Zemlya event of August 29, 1973. Distance= 20° , Azimuth= 35° . The thick line connects points of maximum energy.

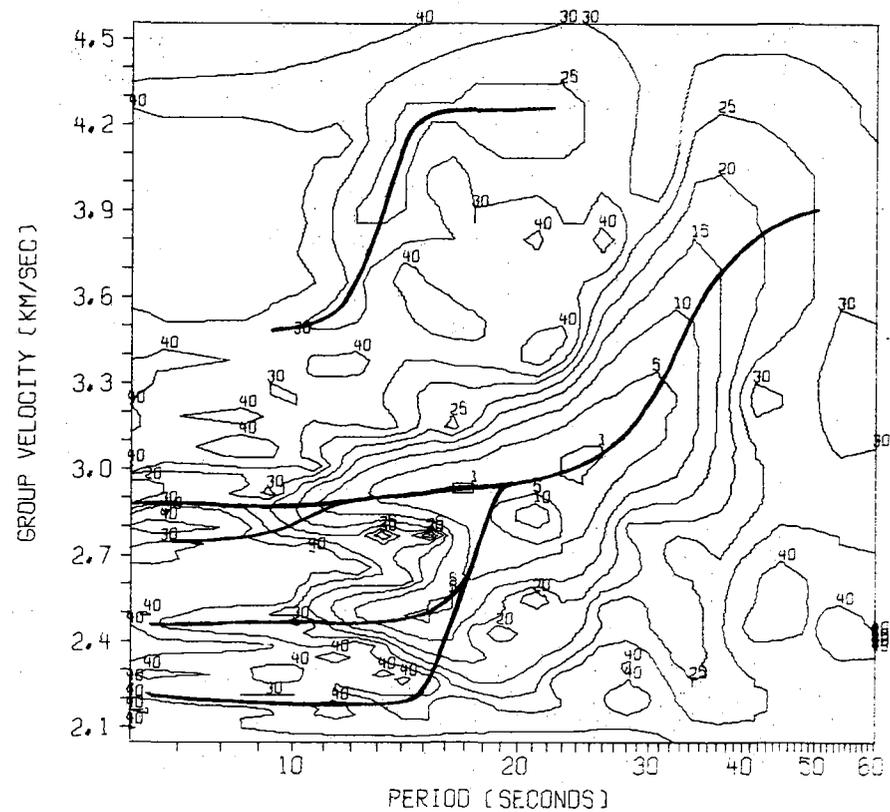


Fig. VII.4.2 Same as Fig. VII.4.1 for Novaya-Zemlya event of October 27, 1973. Distance= 20° , Azimuth= 35° .