NORSAR

ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

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VI. SUMMARY OF SPECIAL TECHNICAL REPORTS/PAPERS PREPARED

VI.1 P and Lg Wave Attenuation within 15 Degrees in Selected Frequency Bands in the 1-5 Hz Range using NORSAR Short Period Records

NORSAR short period data from 7 subarrays for explosions and earthquakes within 15 degrees (Fig. VI.1.1) have been analyzed to determine attenuation characteristics and signal-to-noise ratios for P and Lg waves at various frequencies. The earthquakes are either felt or classified as earthquakes by various reporting agencies, and the explosions are associated with refraction profiling investigations or reported mining/hydroelectrical power plant activity.

Fig. VI.1.2 shows the logarithm of the Lg to P ratio for subarray average amplitude values as a function of epicentral distance for five frequency windows. It is found that Lg is generally larger than P up to about 10 degrees. However, the assessment of the full detection potential of the Lg phase is left for further study. Dominant frequency of P is almost always higher than that of Lg, the differences being most pronounced beyond 10 degrees. Typical dominant frequencies are 3-5 Hz or higher for P and 1-3 Hz for Lg. These points are illustrated in Fig. VI.1.3, where records for two subarrays are shown for an explosion at a distance of 11.7 degrees.

Discrimination on the basis of Lg to P amplitude ratio seems difficult. The explosions in our data base generate surprisingly large Lg waves, and no clear separation between P to Lg amplitude ratios for earthquakes on one side and explosions on the other can be found in any of the five frequency bands.

The data base is presently being extended and also events in or near the U.K. are considered. This allows a study of Lg propagation characteristics also outside Fennoscandia, and the conclusion so far is that propagation efficiency is far less for paths including substantial parts of the North Sea. This observation is related to the existence of sediments exhibiting strong lateral heterogeneity, which is known to cause large attenuation of Lg phases.

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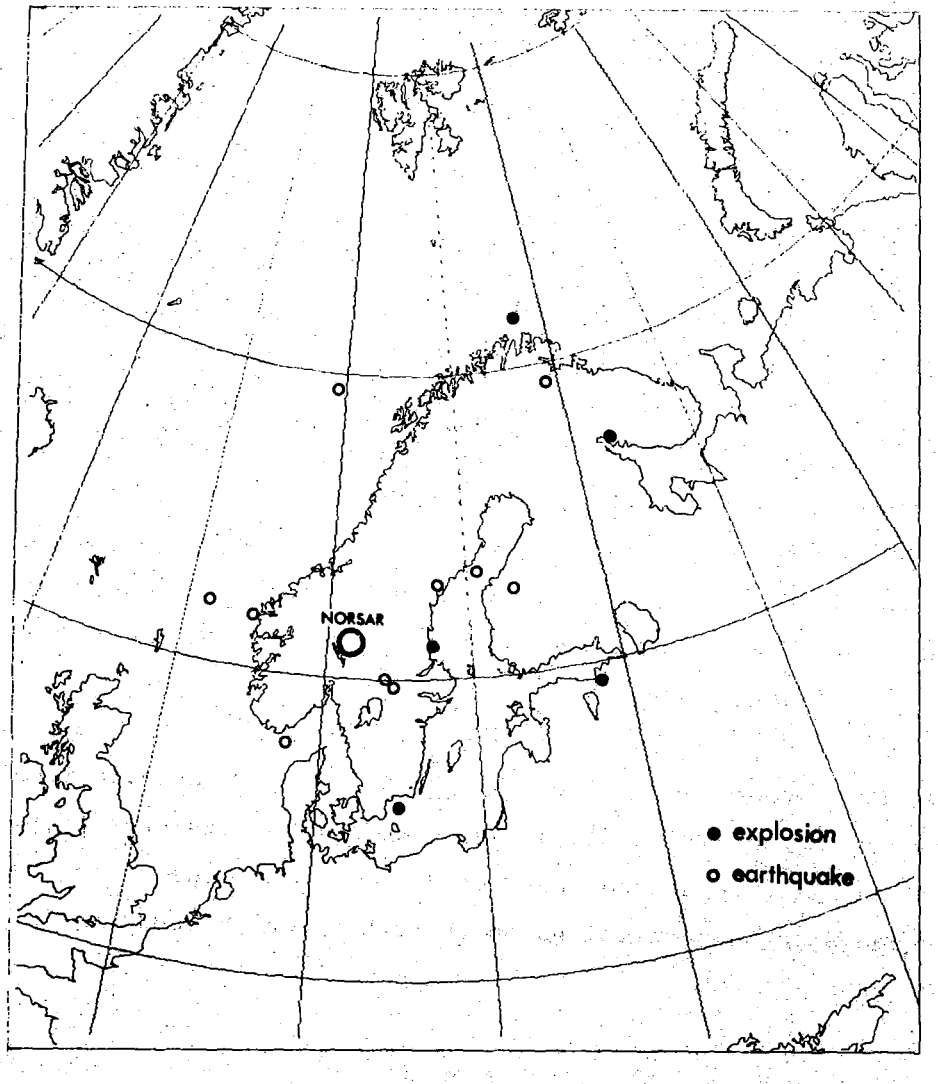

Fig. VI.1.1 Earthquake and explosion locations for events analyzed.

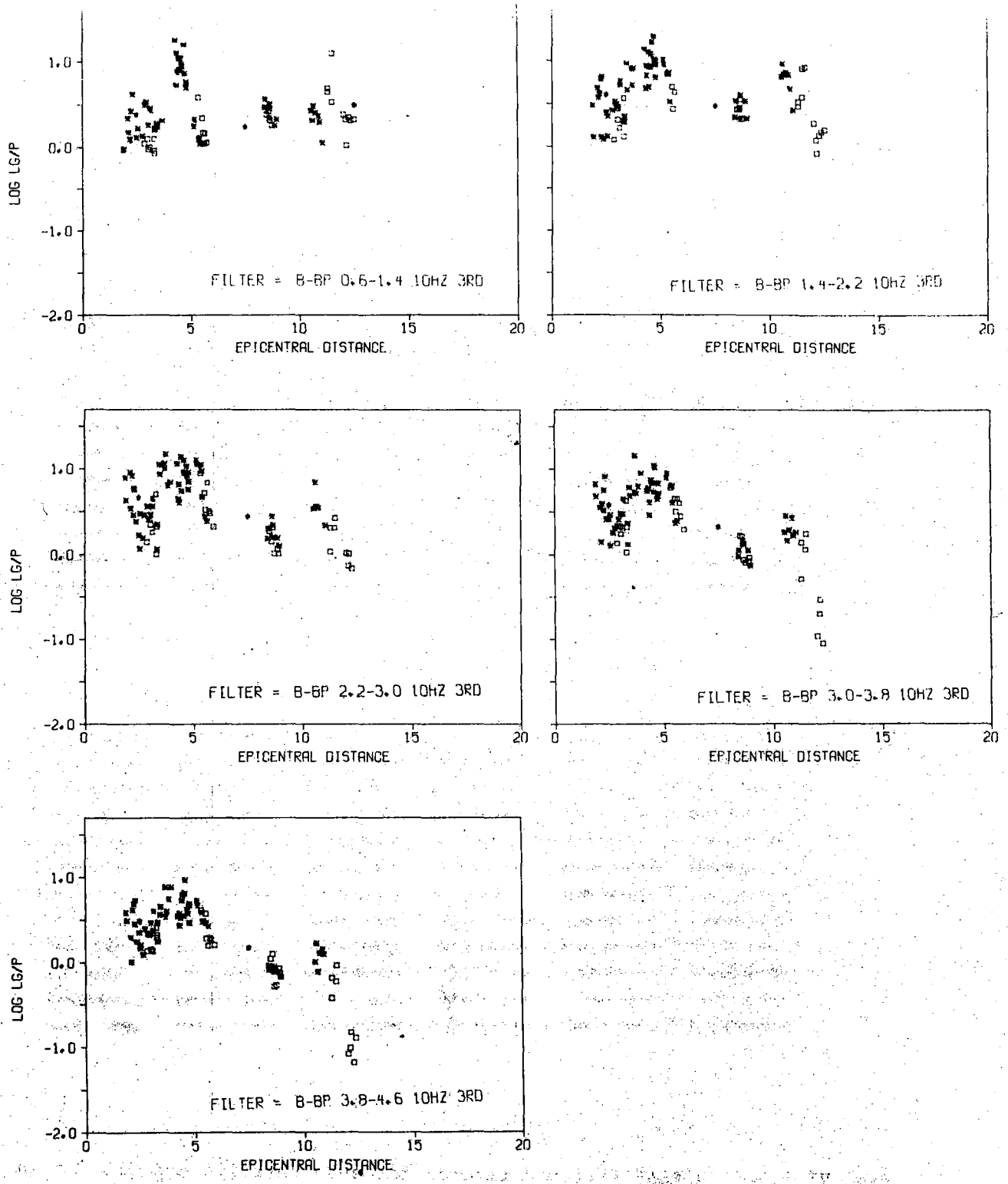

Fig. VI.1.2 Lg to P amplitude ratios for five frequency intervals as a function of epicentral distance. Squares indicate explosions, stars denote earthquakes. Each symbol represents an average subarray value.

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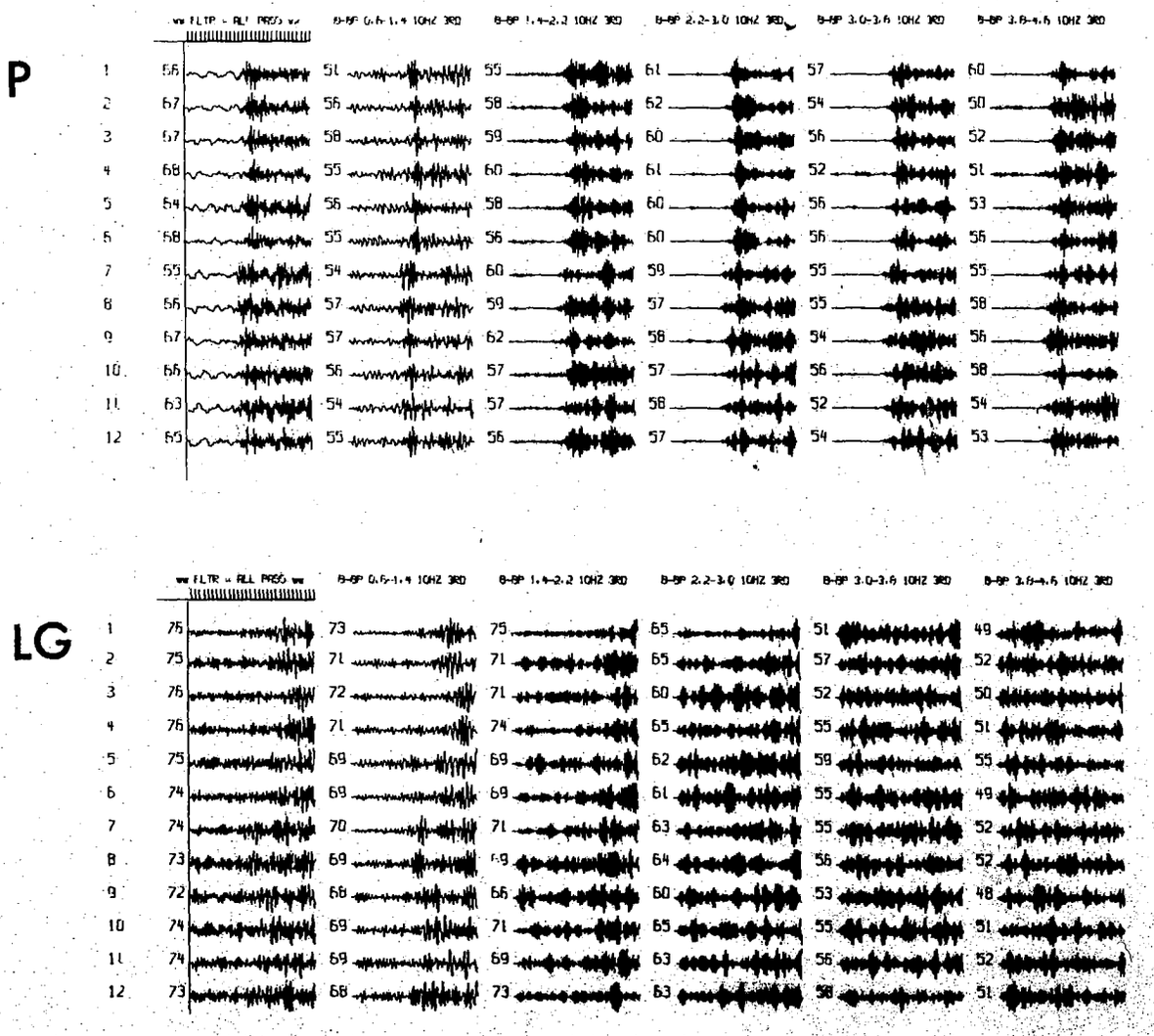

Fig. VI.1.3 NORSAR filtered records for subarrays 01A and 01B for an explosion in the Kola peninsula, distance 11.7 degrees from NORSAR. A 30 s interval is covered for both P and Lg wave main arrivals, and the number in front of each trace represents its maximum amplitude in dB relative to 1 quantum unit. Note the rapid falloff of signal-to-noise ratio with increasing frequency for the LG phase, as compared to P.