NORSAR

ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

Scientific Report No. 4-73/74

SEMIANNUAL TECHNICAL REPORT

NORSAR PHASE 3

1 July–31 December 1973

Prepared by
Hilmar Bungum
(Editor)

Kjeller, 11 January 1974

P. EXPERIMENTAL ANALOG STATIONS AT NORSAR

Short Period Analog

A short period analog station was installed at NORSAR in January 1973. The seismometer is of the same type as those used in the array (Hall Sears HS-10-1), and it is physically located in the long period vault of the subarray 05C. The data is transmitted in analog form (FM) on a special line to the NORSAR Data Processing Center, with a standard drum recording on paper (Helicorder). Fig. P1 shows the response curve for the instrument as it has been for most of the year 1973. The magnification at 1 Hz is controlled daily by inserting a calibration signal to the calibration coil of the seismometer, and it has usually been operated around 35000, with values up to 50000 during the summer. The main problem in the operation of the seismometer has been the quality of the communication line, which has caused relatively frequent breaks and repeated damage to the recording instrumentation.

The main reasons for installation of the SP analog station have been the following:

- to provide a continuous recording also covering time periods lacking in the digital recording.
- to get a recording of events causing saturation in the digital system. This frequently happens for events above m_b=5.5.
- to assist in the identification of local events.
- to provide the EP analysts with an overview of the larger events of the day, later phases, etc.

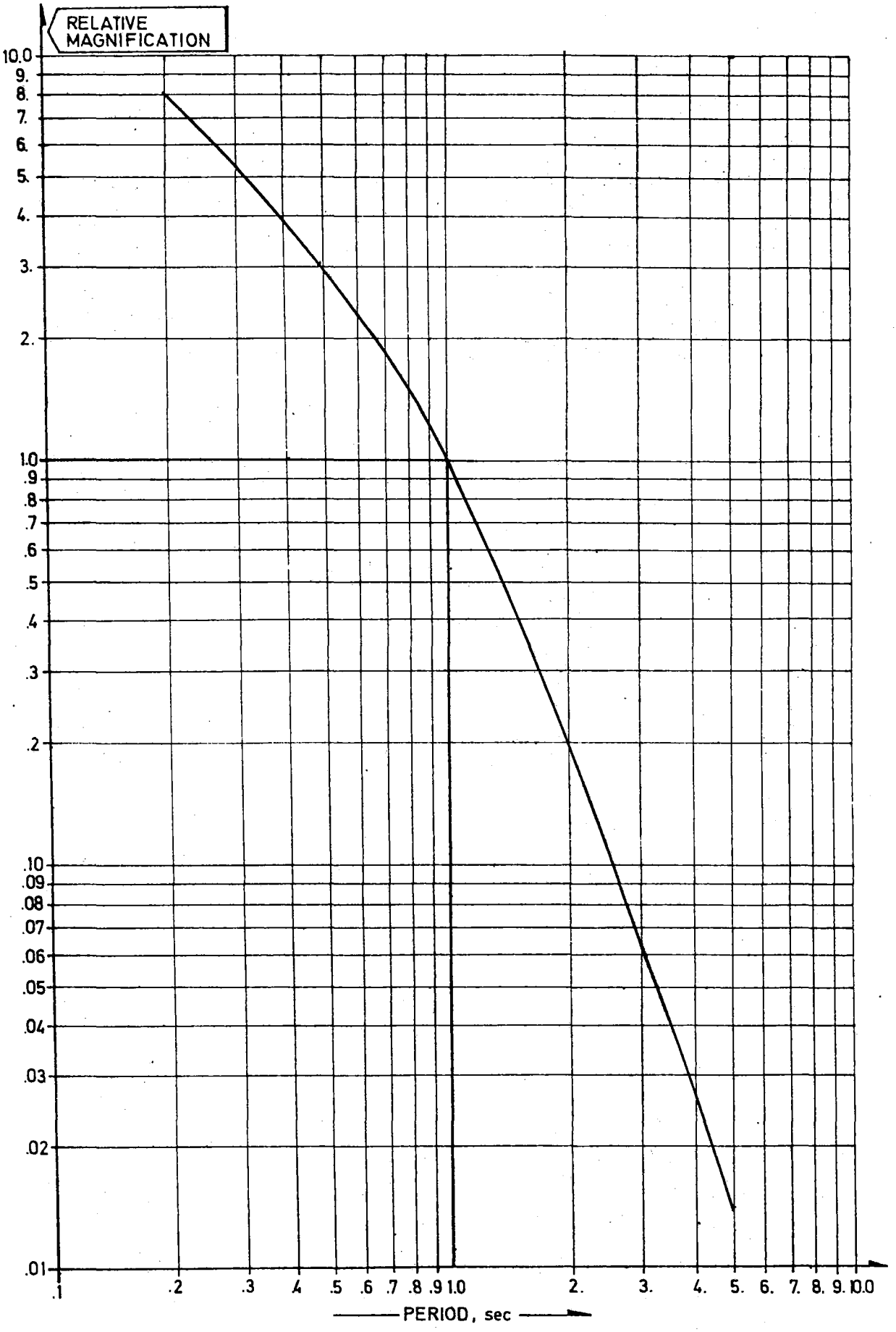

Fig. P1 Magnification of NORSAR SP Analog Station relative to magnification at 1.0 sec period.

In the evaluation of the analog station the seismograms have been read regularly and m_b values computed. Fig. P2 shows a comparison between NORSAR analog and digital m_b, where it appears that the analog values are usually between 0.1 and 0.2 m_b units above the digital (EP) estimates. This can be satisfactorily explained by a beamforming loss in the digital system, combined with the effect of the fact that 05C is a better than average subarray.

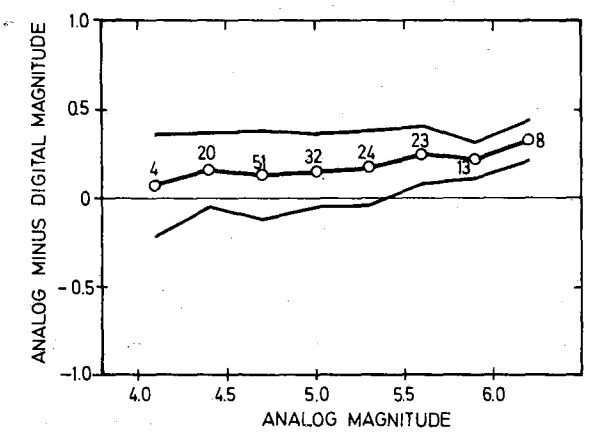

Fig. P2 Analog minus digital m_b at NORSAR as a function of m_b. The data is averaged over intervals of 0.3 m_b units, and the number of events and standard deviations used are indicated.

As part of the effort to localize local (and near-regional) events, a high pass filter with cutoff at 2.0 Hz was installed in the analog channel in October 1973. The frequency response of the system after the implementation of this filter is shown in Fig. P3. The many outages due to poor communication lines have so far prevented a full evaluation of the filter change.

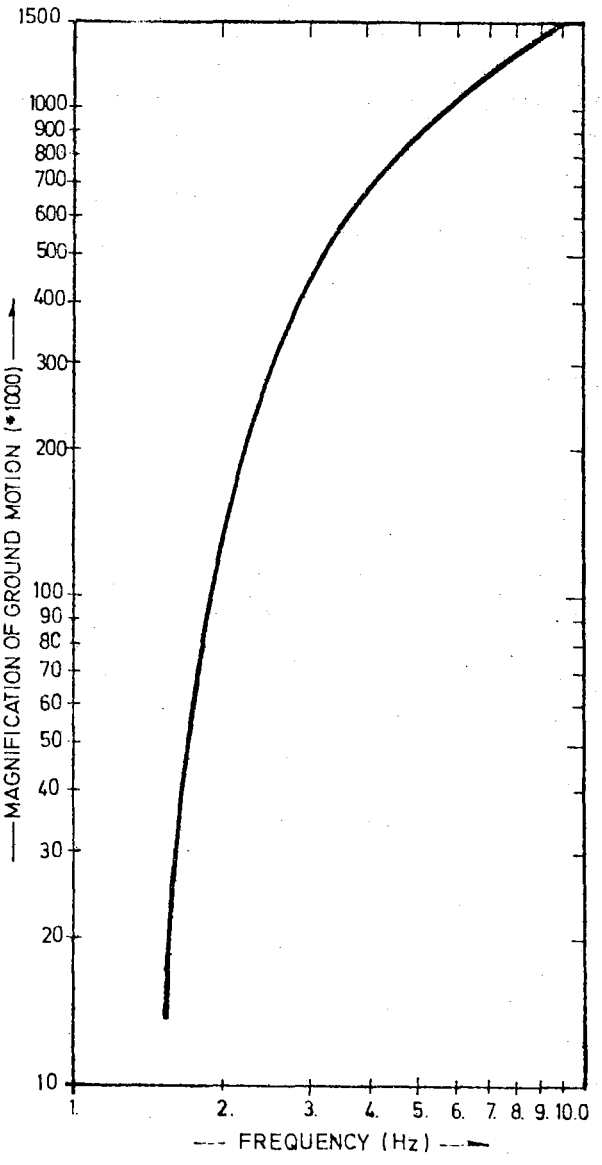

Fig. P3 Frequency response of NORSAR Analog SP station with high pass filter.

Broadband Analog (KIRNOS)

A research project has been initiated on a Nordic basis in which the aim is to compare magnitude measurements using U.S. and U.S.S.R. instrumentation, and to look at the detectability of different waves at different periods using these instruments. As a part of this project, the University of Helsinki provided NORSAR with a full KIRNOS instrumentation, type SVK-2, which was installed in the long period vault of subarray 04B in December 1973 (Pettersen 1973). The galvanometer, type GK-VIIM, and the recording drum are installed in a mobile hut located nearby. Fig. P4 gives the magnification of the Kirnos system as a function of period, and the characteristics are shown in Table P1.

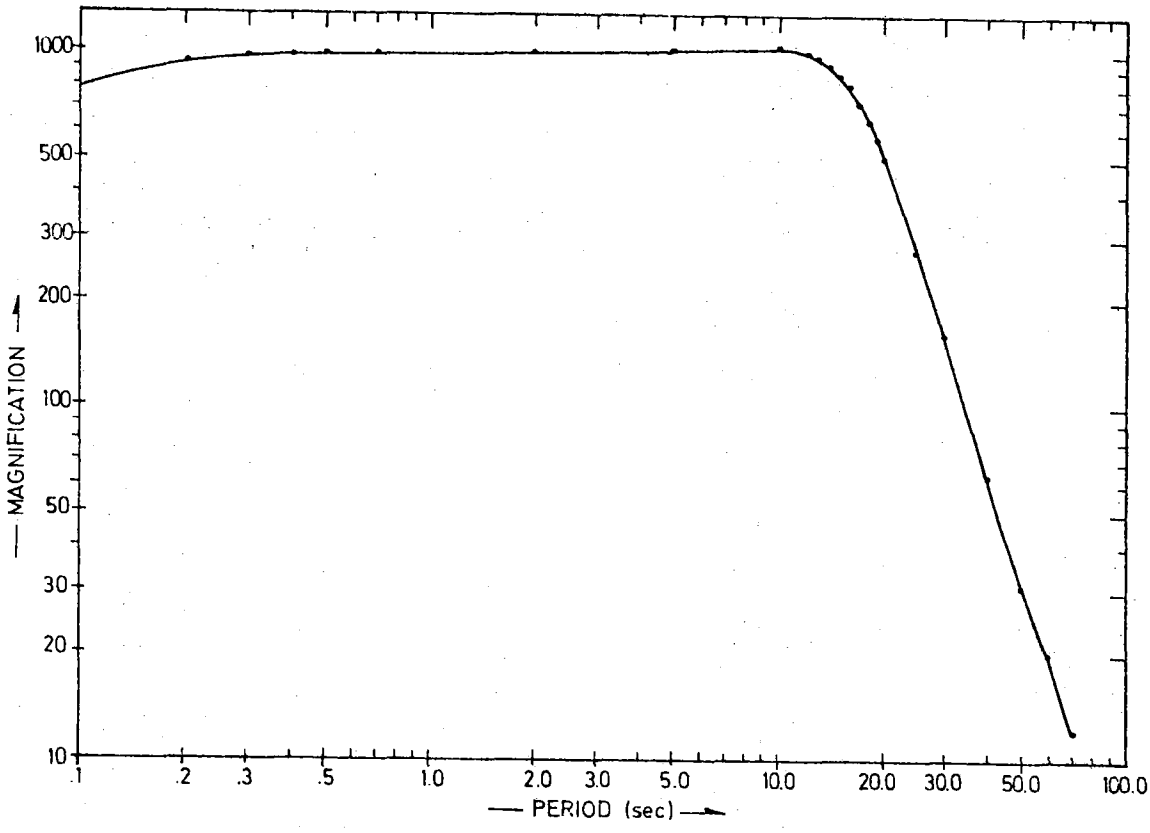

Fig. P4 KIRNOS seismograph response.

Table P1

Characteristics of KIRNOS seismometer and galvanometer.

Seismometer		Galvanometer		Coupling Coefficient (σ^2)
Natural Period (sec)	Damping	Natural Period (sec)	Damping	
15.0	0.4	1.2	8.0	0.18

Only a few seismograms have been obtained from the KIRNOS so far, and no real evaluation has therefore started. However, it is obvious from the records that they are completely dominated by the 6-second microseisms, and to the extent that there are several days between each time there is an identifiable seismic signal. Also, surface waves from really large events tend to contaminate the records for hours. Better performance should be expected during the summer season.

H. Bungum
A. K. Nilsen
O. Steinert

REFERENCES

Pettersen, R.: Report on a visit to Finland related to the KIRNOS project at NDPC, NORSAR Internal Report No. 4-73/74, 1973.