NORSAR

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NORSAR PHASE 3

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Prepared by
Hilmar Bungum
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B. THE EFFECT OF THE SLOWNESS AND TRAVEL TIME ANOMALIES ON ARRAY PERFORMANCE

The current data base of the NORSAR location calibrations and time delay corrections were implemented 30 November 1972 (Berteussen 1974). An analysis of the influence of these on the NORSAR event location and detection capabilities has been made.

On Fig. B1 the cumulative distribution of the length (measured in real space) of the location calibration vectors for P-phases is plotted. The 90 per cent level is 1100 km while the median is 450 km. For the period from April 1972 until March 1973 Bungum and Husebye (1974) have reported a median location difference between NOAA and NORSAR epicenter solutions of 145 km for P-phases, while the 90 per cent level was 490 km. Without calibrations the location errors thus would be something like a factor of three greater.

The SNR gain from applying regional corrections and location calibrations has been calculated by analyzing 479 events randomly selected in the period November 1972 until September 1973. The results obtained are presented in Fig. B2. It is seen (curve I) that if no time delay corrections are used, 10 per cent of the events would have a loss of 0.7 dB or less while 10 per cent would have a loss of 9.5 dB or more in DP. The median for this data set is 4.5 dB and the mean value is 5.2 dB. Based on Steinberg's formula (Steinberg 1965) the theoretical expected mean value is found to be 5.3 dB.

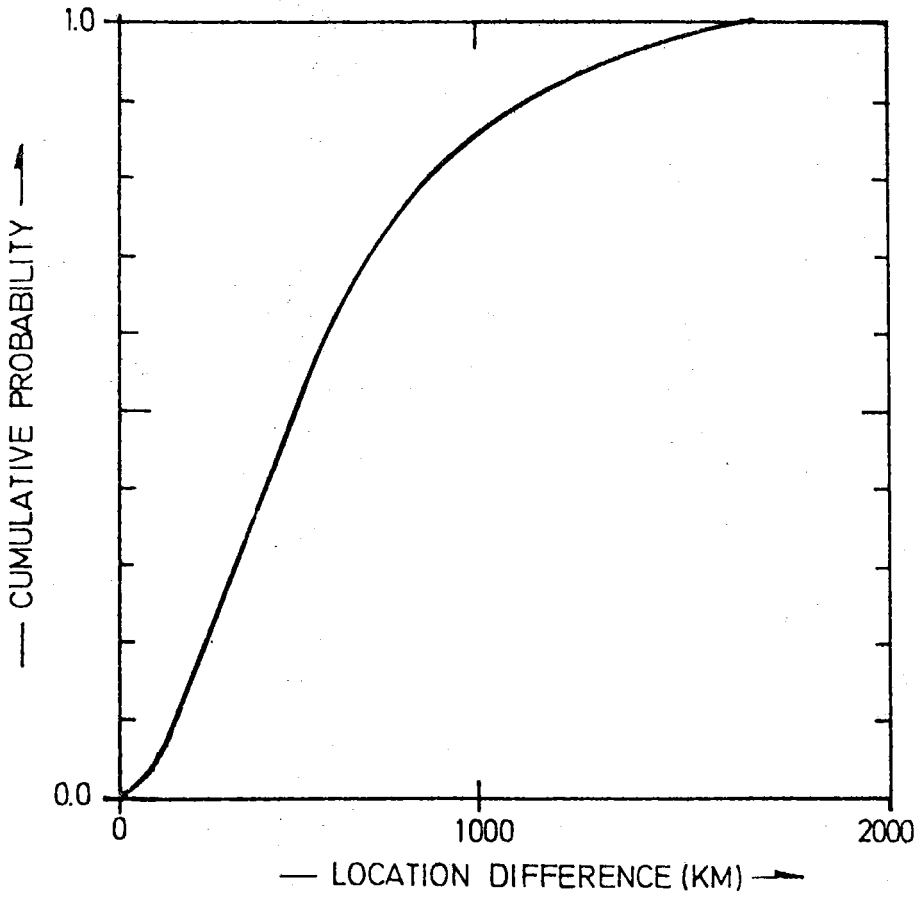

Fig. B1 Cumulative distribution of the length of the location calibration vectors transformed into real space. Only P-phase data are used.

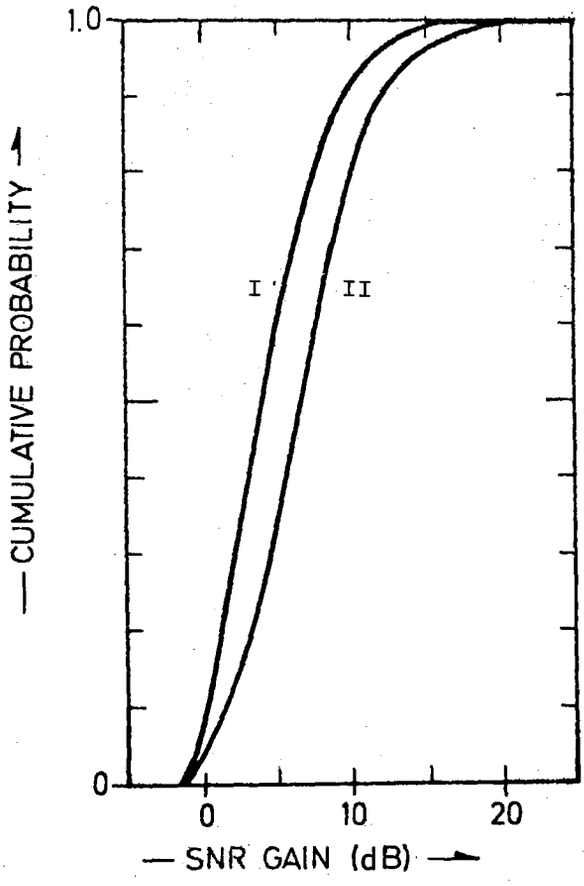

Fig. B2 Cumulative distribution of signal-to-noise (SNR) gain in DP. Curve I is for region corrections only, while Curve II gives the gain distribution when both region corrections and calibrations are applied.

The distribution of the loss in SNR between the beam the particular event was detected on in DP and the beam DP would have used if neither time delay corrections nor location calibrations had been available is plotted in curve II, Fig. B2. The 90 per cent value here is 12.5 dB, the median is 6.8 dB, while the mean is 7.4 dB. The location calibrations alone thus seem to give an SNR gain which in average is 7.4-5.2=2.2 dB. Based on the mean length of the location calibration vectors and the response pattern of the array, this value is theoretically expected to be approximately 3.0 dB.

The conclusion is thus that both the regional time delay corrections and the location calibrations are close to optimal.

K.A. Berteussen

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