

NORSAR

ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

Scientific Report No. 5-74/75

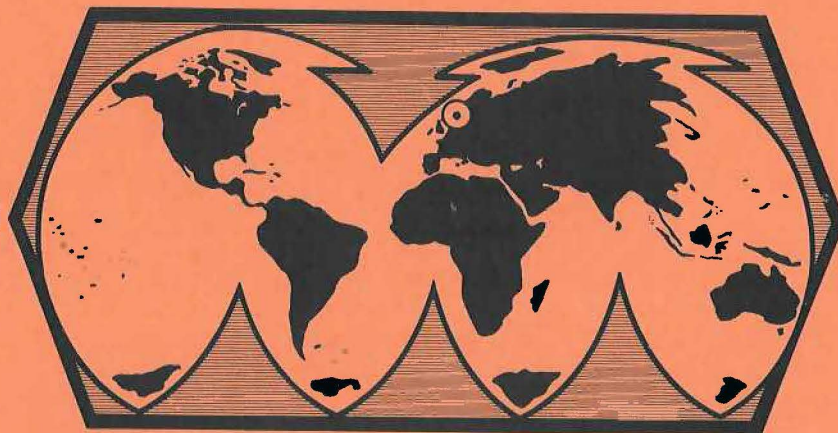
FINAL TECHNICAL REPORT NORSAR PHASE 3

1 July 1974 – 30 June 1975

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Kjeller, 8. August 1975

Sponsored by
Advanced Research Projects Agency
ARPA Order No. 2551



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U. EVENT PROCESSOR OPERATION

U.1 General Considerations

The operation of the Event Processor system (EP) has in this period been somewhat hampered by malfunctioning hardware (Tape drives, 2260 console, disk drives) and improper input data from disk files and tapes. Since the EP is strongly tape-dependent, the recurring problem of tape read data check causes a deterioration in the performance.

U.2 Computer Utilization

During the period July-December 1974 the EP was up 32.5% of the time, and for January-July 1975 the percentage was 27.2, which is the lowest ever recorded. Two changes in the EP programs in this last year have influenced the processing time: Firstly, a new package has been developed which is executed for some of the events in order to perform some statistical tests and a possible weighted beamforming. This should increase the computer time per event, while the statistics show that the time per processed detection and especially the time per accepted event has never been smaller. This can be explained by the second change, namely, the floating EP acceptance threshold. Although the number of processed detections is still about the same, the number of false alarms has decreased and the relative number of accepted events has increased. Since the false alarms (noise detections) always require more computer time, this can explain the increased efficiency of the EP.

U.3 EP Operational Problems

No special operational problems have occurred in this period, apart from the infrequently occurring breakdowns because of bad input data from the shared disk files or tapes. Bad detection times are especially malicious, because the effects of reading such times propagates through the system. Another source of operational problems is malfunctioning hardware, such as tape drives, disk drives and the 2260 console station.

U.4 EP Parameters and Algorithms

The following changes have been made to the Event Processor system within this period:

A new program package was added on December 2. This package (SP8) will be invoked by weak events with signal-to-noise ratios just above the pre-processing threshold. Three different test statistics will be computed, to aid the analyst in his signal-noise decision. Depending on the value of the first statistic a weighted array beamforming will be performed, using optimum subarray beam weights.

The results of the three tests and the optimum weights will be printed in the Summary Report for the event. Also, the weighted array beam is plotted on the event's plot panel.

On December 16 changes were introduced in the EP controller, in order to compute periodically a "floating" signal-to-noise ratio pre-threshold for the coherent detections. A noise stability estimate (STAB) is received with each signal arrival, as read from the Signal Arrival File on the Shared Disk pack. Together with the desired false alarm rate (FAR) inserted by the operator at start-up time, the pre-threshold value (TH) is computed as follows:

$$TH = 12.08 - 0.89 \log (FAR) - 0.18 STAB$$

This computation is performed each time a new value of STAB differs from the earlier one, which means that the noise stability, as computed by DP, has changed. The actual computation of TH is done in a separate FORTRAN overlay phase, loaded and invoked by the EP controller each time it is used.

On January 4 an option to invoke the SP8 package for a re-run was introduced in MJRRUN, the re-run initialization program.

On March 4 a small subroutine (SPCONV) was added to the Detection Bulletin Report package. Instead of doing a dummy read statement (from data set zero) in SPRELSE, using PFIOCS and IOCS for a format conversion, the new subroutine performs just this. The earlier technique did not seem to work on all occasions and caused EP to terminate at this point.

On May 15 the Partial Array Beam list in EP Common was changed upon request from Vela Seismological Center. The Partial Array Beams (PABs) were changed to be as follows:

PAB 1 =	Subarray Beam	01A
PAB 2 =	"	" 03C
PAB 3 =	"	" 07C
PAB 4 =	"	" 13C

At the same time the lower limit for the computed "floating" pre-threshold of coherent detections was lowered from 3.4 to 3.2.

U.5 EP Performance Statistics

Summaries of analyst decisions for each of the two half years in this reporting period are given in Tables U.1 and U.2. The only significant change from previous reporting periods is the drop in the number of false alarms after the floating threshold procedure was implemented late in December 1974. The main effect there, however, is not so much on the total number of false alarms but on the distribution: there is now about equally many false alarms every day regardless of noise conditions. This avoids the

processing of a large number of noise detections during microseismic storms, and normally it should also pick up some additional events during quiet periods. As mentioned above, it has resulted in a more efficient utilization of the computers: the EP up time per accepted event is now at an all time low.

The number of reported events on a monthly basis is given in Table U.3, and the distribution on a daily basis is shown in Fig. U.1. The large number of events in August 1974 is due to an earthquake swarm from the Tadshik-Sinkiang region, while swarms from Japan and the Kuriles can explain the large number of events in June 1975.

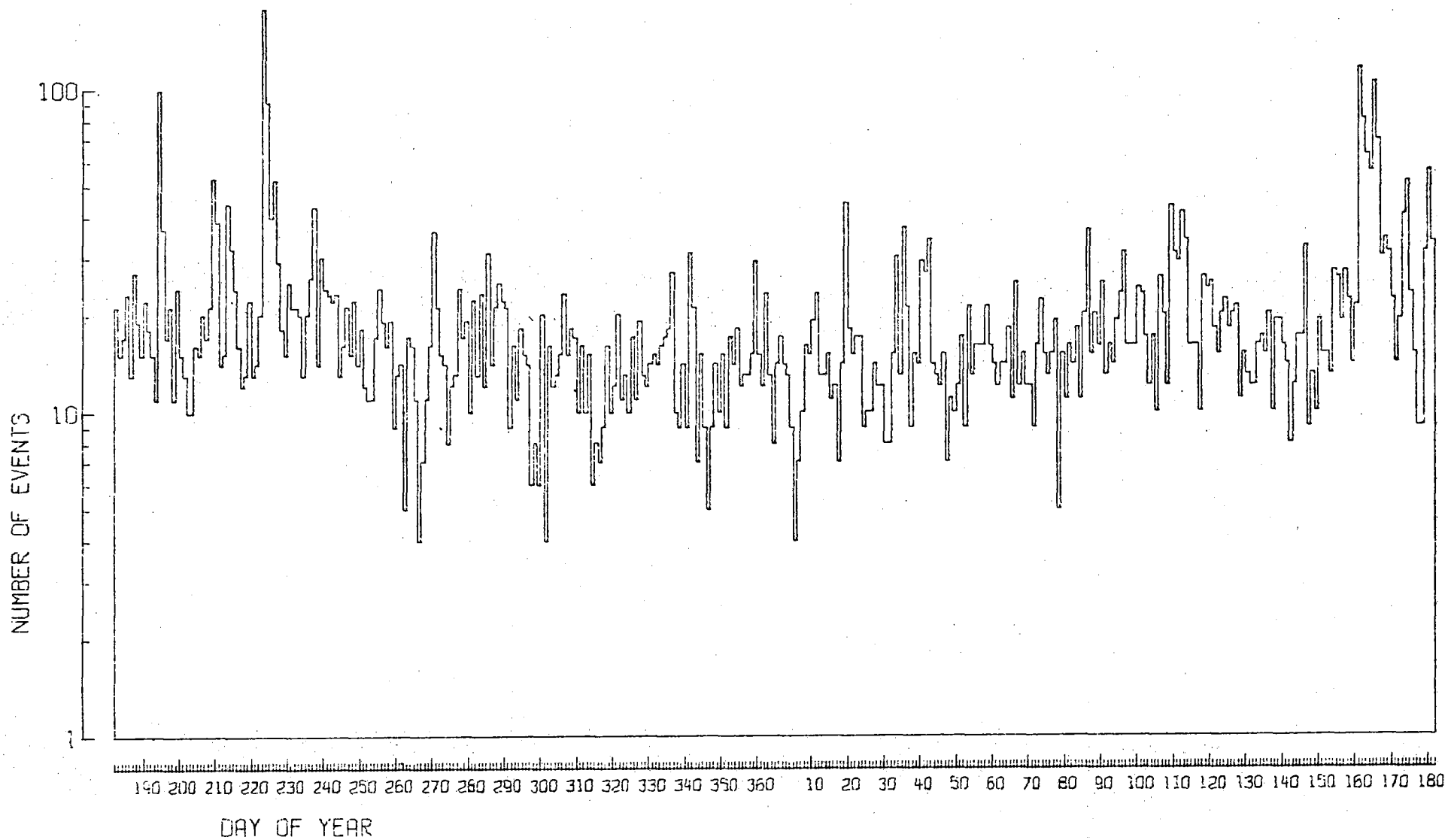


Fig. U.1 Number of events as a function of day of year July 1974-June 1975.

TABLE U.1

Analyst decisions for detections processed by EP during the time period July-December 1974.

Analyst Classifications	Number of Processings	Percentage
Accepted as events	3798	48.4
Rejected as being		
- Poor SNR or noise	1910	24.3
- Local events	905	11.5
- Double processings	796	10.2
- Communication errors	436	5.6
Sum Processed	7845	100.0

TABLE U.2

Analyst decisions for detections processed by EP during the time period January-June 1975

Analyst Classifications	Number of Processings	Percentage
Accepted as events	3929	53.2
Rejected as being		
- Poor SNR or noise	1039	14.1
- Local events	1213	16.4
- Double processing	723	9.8
- Communication errors	476	6.5
Sum Processed	7380	100.0

TABLE U.3

Number of teleseismic and core phase events reported during the time period July 1974-June 1975.

Month	Teleseismic	Core	Sum
Jul 74	532	151	683
Aug	851	106	957
Sep	374	83	457
Oct	394	81	475
Nov	318	91	409
Dec	369	79	448
Jan 75	346	80	426
Feb	391	92	483
Mar	401	89	490
Apr	525	111	636
May	402	93	495
Jun	1003	80	1083