NORSAR

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VI.3 P-wave coda amplitudes at NORSAR for Semipalatinsk events

This paper presents some preliminary results on the stability of P coda and Lg for magnitude estimates for events from the Eastern Kazakh test site. The significant variations of P-amplitudes across NORSAR is well known, and illustrated in Fig. VI.3.1. Typically, these amplitudes vary across NORSAR by an order of magnitude, and show that single site measurements of m_b have a large factor of uncertainty. The standard deviation of log amplitudes across NORSAR is about 0.28 m_b units for any given Semipalatinsk event.

Fig. VI.3.2 shows that the amplitude variations are greatly reduced a few minutes into the coda. This figure, which covers the Lg window, demonstrates that the variability across the array of Lg amplitudes and P coda preceding Lg are similar. The standard deviation is of the order of 0.08 m_b units (peak amplitudes) and can be reduced even further (to about 0.05 m_b units) by considering RMS amplitudes. Thus, averaging the amplitudes of all 42 NORSAR SP sensors should provide 'm_b' estimates with a precision of about 0.01 m_b units.

The near-receiver 'focusing effects' illustrated in Fig. VI.3.1 might be expected to have counterparts in near-source 'focusing'. An indication that such focusing takes place is given in Fig. VI.3.3, where 3 Semipalatinsk events of the same NEIS m_b (5.9) are shown for NORSAR sensor 01A06. Event 1 (Degelen mountains) has the lowest amplitudes at NORSAR (NORSAR m_b = 6.02), but also the difference between the two Shagan River events is significant (m_b = 6.26 and 6.56, respectively).

Fig. VI.3.4 shows that the coda decay at NORSAR is very different for these 3 events. The event with the highest NORSAR m_b shows the most rapid decay. (Note also that Degelen Mountain events have a pronounced PP phase not usually observed at NORSAR from Shagan River). Fig. VI.3.5 is similar to Fig. VI.3.4, but with all 3 events plotted in the same amplitude scale. Here, it is seen that the P coda amplitudes are about equally large for the three events after about 3 minutes. The same applies

to Lg, although Lg has a low SNR. Thus, a hypothetical 'coda magnitude' (and also Lg magnitude) at NORSAR would be similar for the 3 events, consistent with the NEIS reportings.

In conclusion, P coda and Lg magnitudes show great promise both in reducing focusing effects near the receiver and near the source. Further investigations into this problem are planned.

F. Ringdal

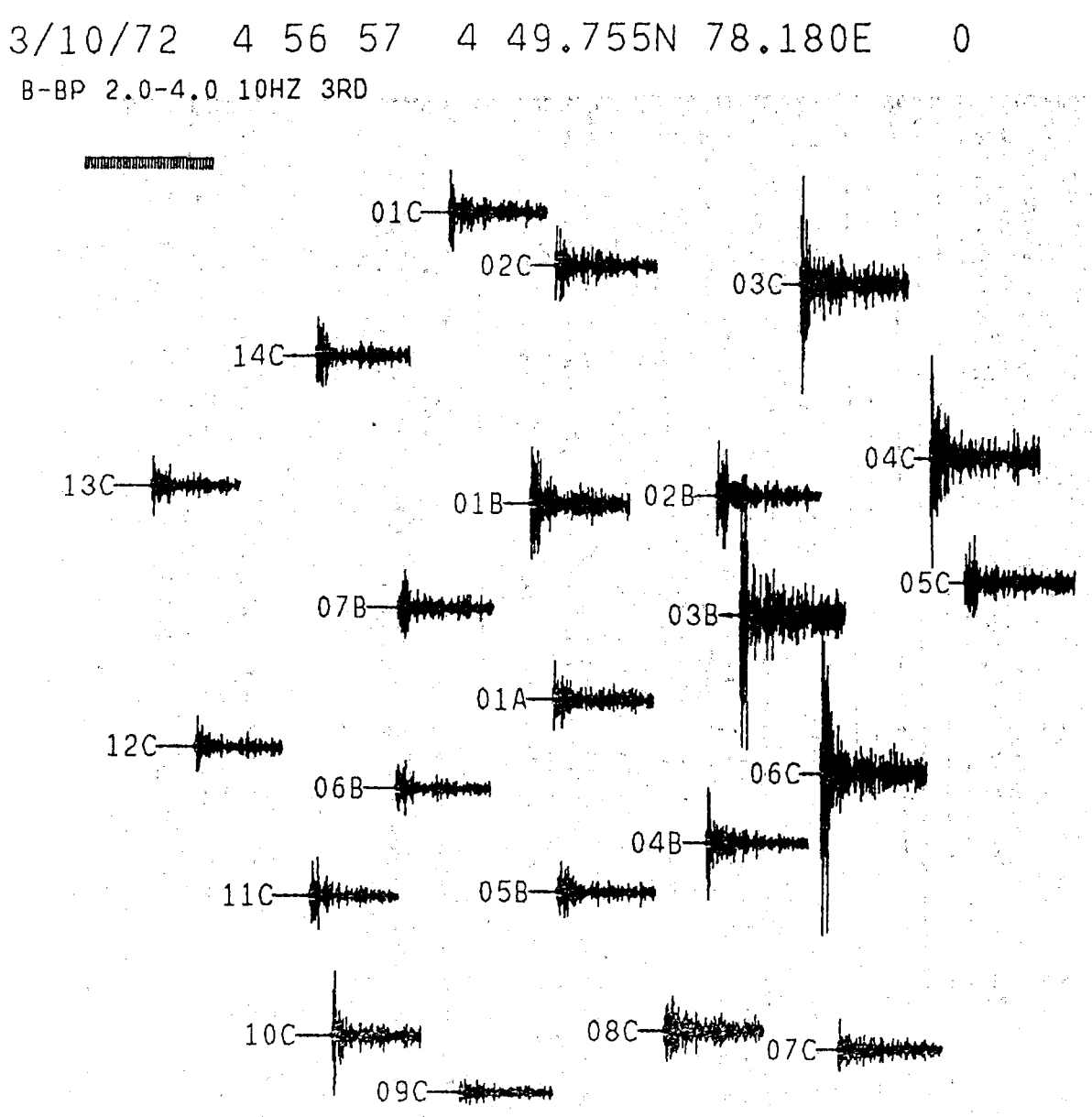


Fig. 1 . Typical P-wave amplitude distribution across NORSAR for Semipalatinsk events. Amplitudes vary by a factor of 10. Standard deviation of log amplitudes is 0.28.

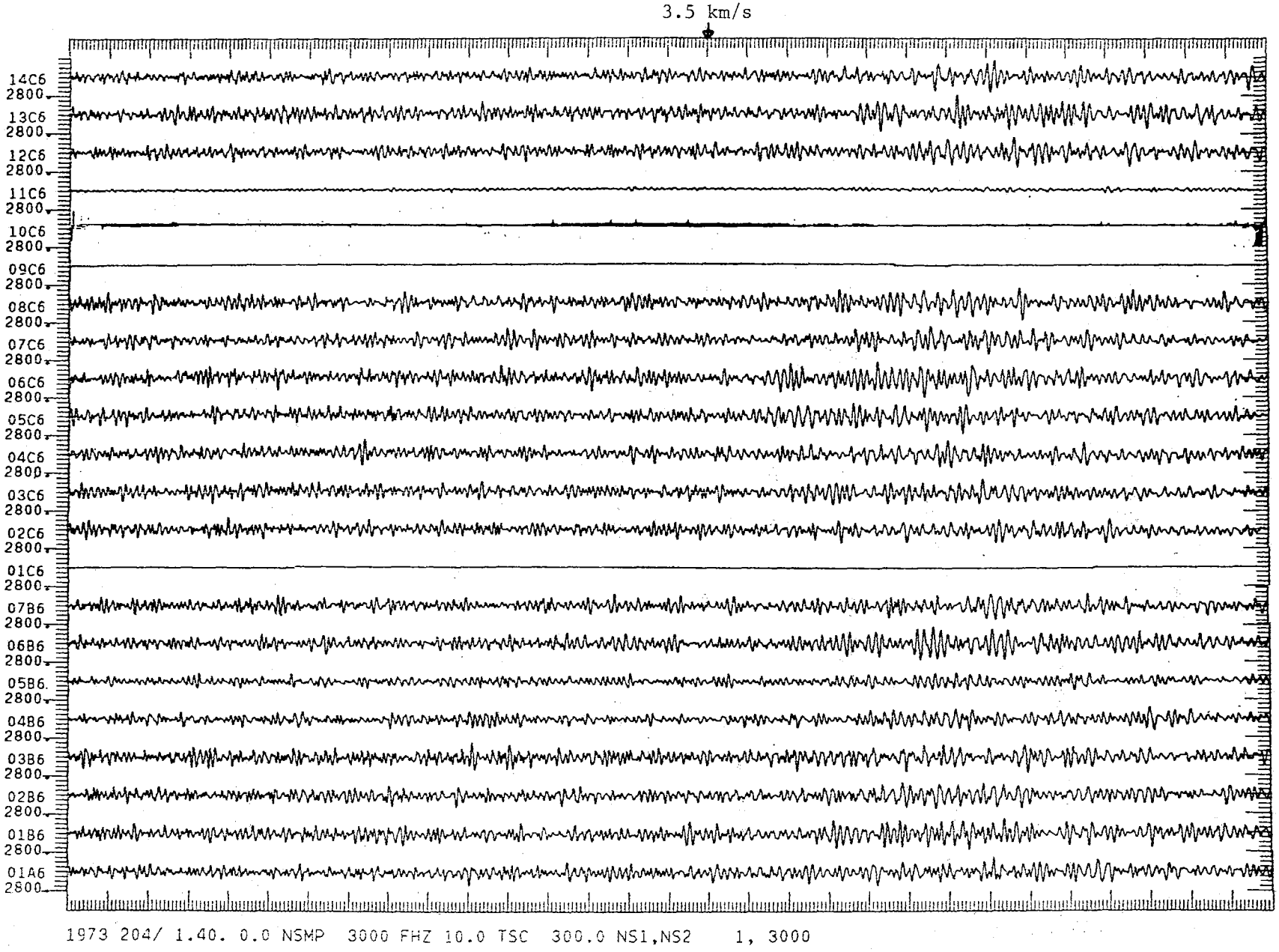
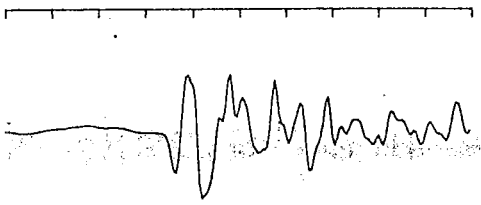


Fig. 2. P coda for NORSAR subarray center sensors plotted for a Semipalatinsk explosion. The plot covers 5 min, and Lg can be identified. The standard deviation across NORSAR of log amplitudes is 0.08 and 0.05 for peak and rms amlitudes, respectively.

Event 1 - Degelen Mountains

4/25/71 3 32 58 0 49.823N 78.092E 0 5.9 38.0

** FLTR = ALL PASS **



m_b (NORSAR)= 6.02

Event 2 - Shagan River

10/12/80 3 34 14 1 49.958N 79.085E 0 5.9 38.4

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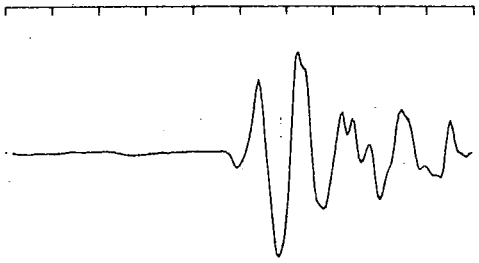
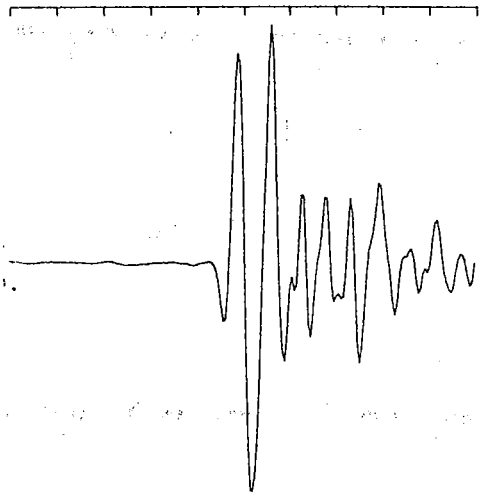


m_b (NORSAR)=6.26

Event 3 - Shagan River

4/22/81 1 17 11 4 49.901N 78.901E 0 5.9 38.4

** FLTR = ALL PASS **



m_b (NORSAR)=6.56

Fig. 3. NORSAR P-wave recordings of 3 Semipalatinsk explosions plotted to the same amplitude scale. All 3 events have NEIS m_b 5.9. Note the significant amplitude differences (instrument 01A06).

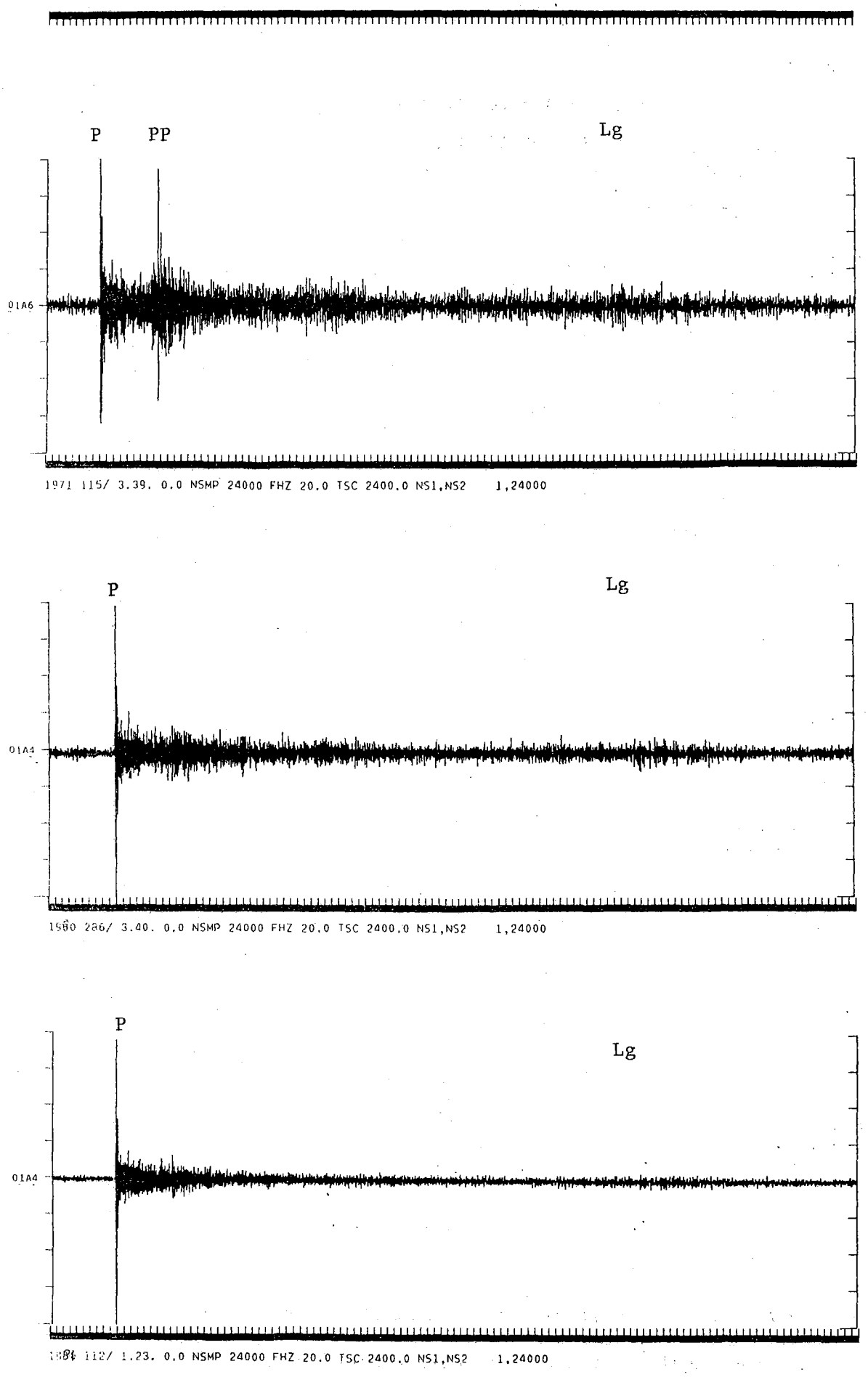


Fig. 4. 20 minutes recordings of the same three events as displayed in Figure 3. Note the much more rapid coda decay of event 3 (bottom).

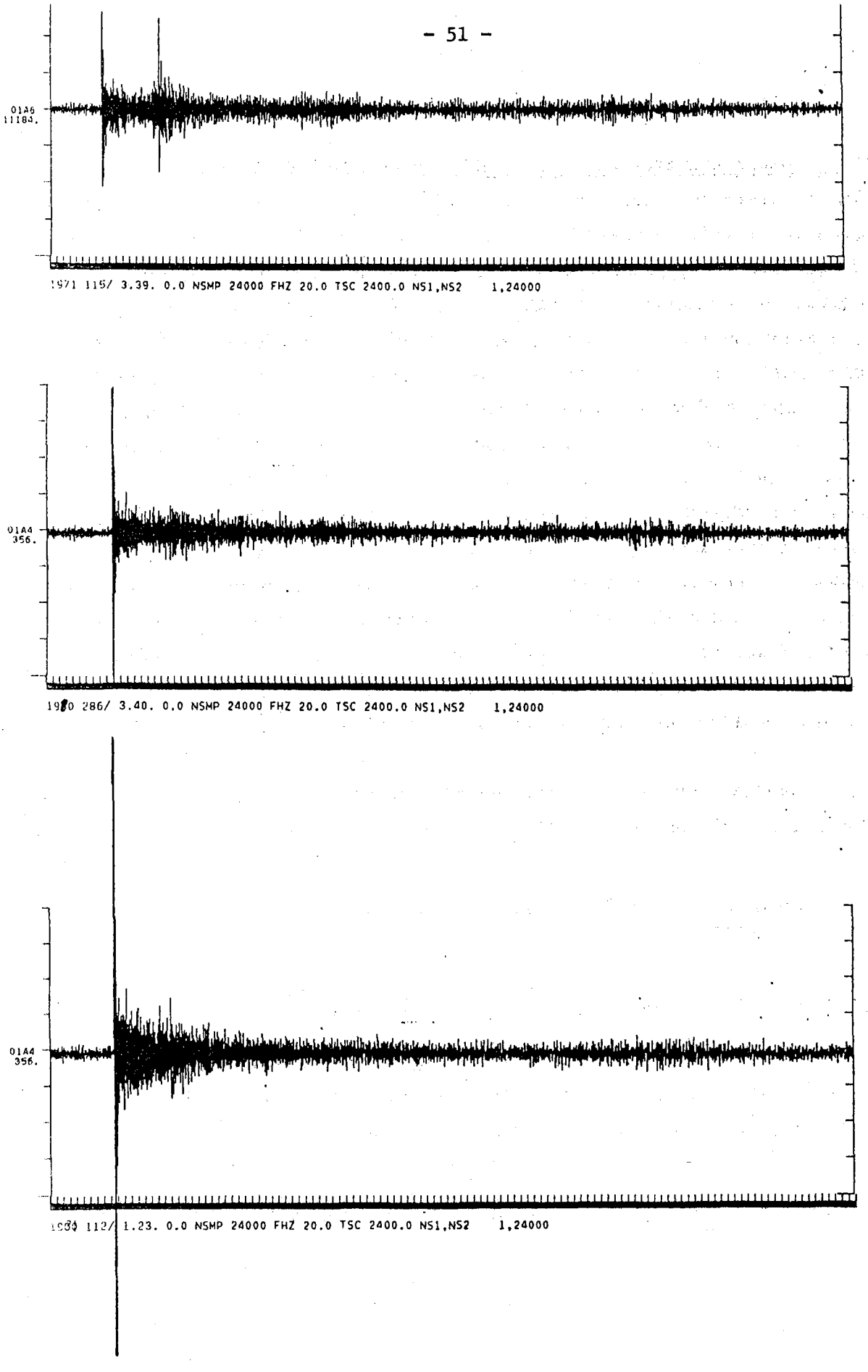


Fig 5. Same as Fig 4, but with all 3 traces plotted in the same amplitude scale. Note that the coda level (including Lg) is very similar after about 3 minutes, thus indicating that a coda magnitude would give relative magnitudes consistent with NEIS.