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VII.4 Two New Earthquake Focal Mechanism Solutions

As a part of our investigations of the seismicity of the North Atlantic Ocean and of the Greenland and Norwegian Seas, focal mechanism solutions have been obtained for two recent earthquakes, one from Iceland and one from Svalbard. A complete report will be published elsewhere (Bungum, 1977).

Iceland Earthquake of 13 January 1976

The PDE solution for this earthquake is based on 160 observations and given as 66.2°N , 16.6°W , with origin time 13.29.19.5 and magnitude 6.0. The focal mechanism solution presented in Fig. VII.4.1 is based on 81 first motion readings from predominantly long period and broad band seismograms. The present focal mechanism solution is in general agreement with those published for an earthquake from 28 March 1963 (Sykes, 1967) and one from 5 May 1969 (Conant, 1972), all situated at or close to the Tjøernes Fracture Zone. We suggest that the actual plane of faulting for the present earthquake is the one striking at 131° , the movement is thereby right-lateral, which is in accordance with the concept of transform faulting. In comparing the strike angles for these three earthquakes, we find a systematic increase as we move from west to east along the fracture zone. Such deviations, which also have been observed along the Jan Mayen Fracture Zone (Bungum and Husebye, 1977), would be consistent with the interpretation of the Tjøernes Fracture zone as an *en*-echelon system of north-south trending troughs and volcanic chains, developed successively as spreading axes across the fracture zone (Sæmundsson, 1974).

Svalbard Earthquake of 18 January 1976

The PDE solution for this earthquake is based on 128 observations given as 77.9°N , 18.6°E , with origin time 04.46.24.4 and magnitude 5.6. The focal mechanism solution presented in Fig. VII.4.2 is based on 61 first motion readings from

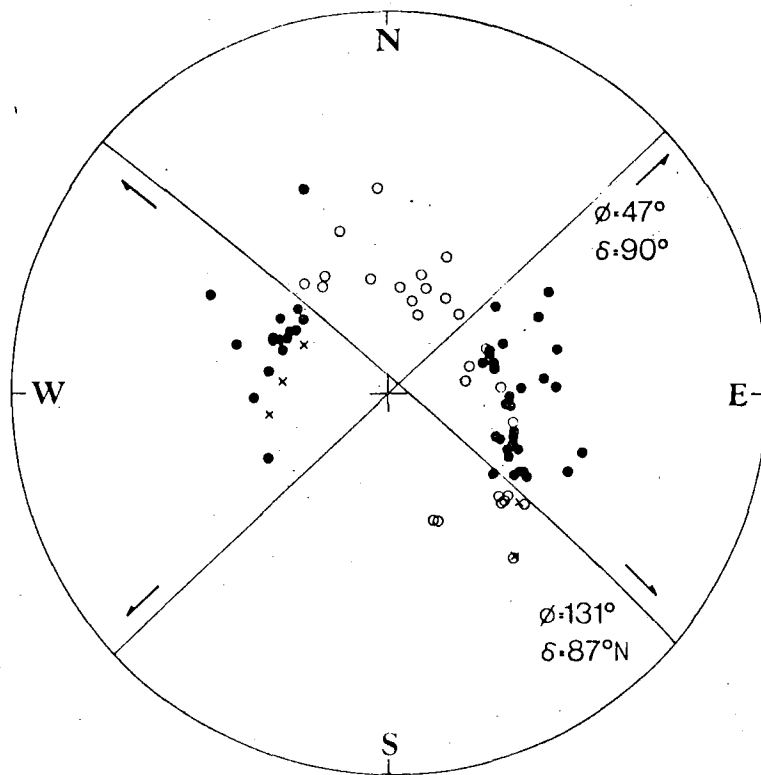


Fig. VII.4.1 Focal mechanism solution for the Iceland earthquake of 13 January 1976. Solid circles are compressions, open circles dilatations, and crosses indicate stations with questionable first motion.

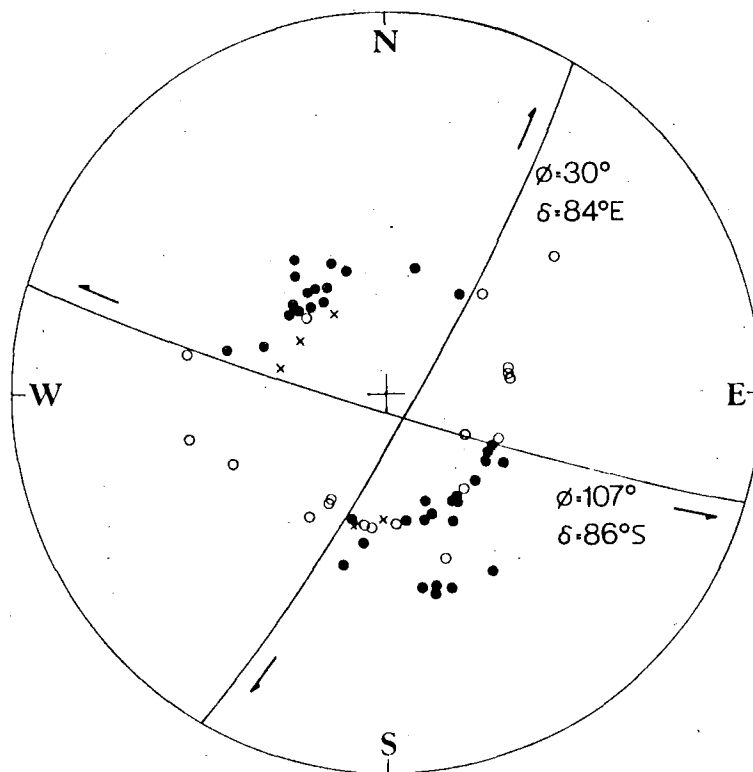


Fig. VII.4.2 Focal mechanism solution for the Svalbard earthquake of 18 January 1976. Solid circles are compressions, open circles dilatations, and crosses indicate stations with questionable first motion.

predominantly long period or broad band seismograms. This is the first focal mechanism solution published for the Svalbard area, and it is noteworthy that a clear strike-slip solution has been obtained for this intra-plate earthquake. Little information is available bearing on the stress pattern in this area, most likely it is the accumulated contribution from several sources and orogenic cycles. The geologic trend in the area (notably late Caledonian and Devonian faulting) is NNW-SSE, and this is just between the directions of the two nodal planes in Fig. VII.4.2. We return briefly to this event in Section VII.5.

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REFERENCES

- Bungum, H. (1977): Two focal-mechanism solutions for earthquakes from Iceland and Svalbard. *Tectonophysics*, in press.
- Bungum, H., and E.S. Husebye (1977): Seismicity of the Norwegian Sea: The Jan Mayen Fracture Zone. *Tectonophysics*, in press.
- Conant, D.A. (1972): Six new focal mechanism solutions for the Arctic and a center of rotation for plate movements. M.A. Thesis, Columbia Univ., New York, 18 pp.
- Sæmundsson, K. (1974): Evolution of the axial rifting zone in northern Iceland and the Tjørnes Fracture Zone. *Geol. Soc. Am. Bull.*, 85, 495-504.
- Sykes, L.R. (1967): Mechanism of earthquakes and nature of faulting on the mid-oceanic ridge. *J. Geophys. Res.*, 72(8), 2131-2151.