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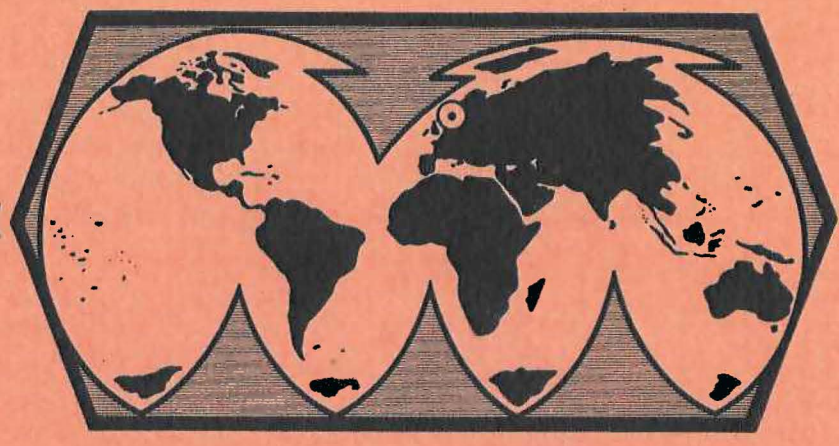

VII.6 Seismicity of the Norwegian Sea: The Jan Mayen Fracture Zone

The seismicity of the area around the presently active part of the Jan Mayen Fracture Zone has been re-examined. The epicenters presented in Fig. VII.6.1 cover the time period 1955-1975, and consist primarily of ISC solutions. Moreover, only solutions with at least 15 reporting stations have been plotted. These restrictions have significantly reduced the scatter in the epicenter distribution previously observed when primarily PDE data have been used (Husebye et al, 1975). It is seen from Fig. VII.6.1 that the seismicity is restricted to the mid-oceanic axes and to the part of the fracture zone which is located between the two ridge ends (Wilson, 1965), the only notable exception being the seismicity area northeast of the Jan Mayen island itself.

Fault plane solutions have previously been published for four events in this area, and the nodal plane directions for the two most reliable ones are given in Fig. VII.6.1. Moreover, the solution for one more earthquake has been obtained by us; this is the westernmost of the events in Fig. VII.6.1, and the actual solution is given in Fig. VII.6.2. All the focal solutions are strike-slip with deeply dipping planes.

Fracture zones are important within the new global tectonics because they are considered to represent actual flow lines delineating the relative direction of plate movements. More specifically, the Jan Mayen Fracture Zone plays an important role in the opening of the Norwegian Sea, where a model recently has been published by Talwani and Eldholm (in press). Based on this model, synthetic flow lines have been calculated through the fault plane epicenters in Fig. VII.6.1, where it is seen that the strike of these flow lines coincides reasonably well with the orientation of the fault planes. The Jan Mayen Fracture Zone is bathymetrically characterized by a 2.2 km deep and 10-12 km wide trough where the orientation is such that the epicenters in Fig. VII.6.1 roughly follow the northeast facing escarpment. All this data (flow lines, fault planes,

bathymetry, seismicity) are consistent with a model where the transform portion of the Jan Mayen Fracture Zone consists of an én-echelon system of active faults. The resulting orientation of the fracture zone differs slightly from the one previously delineated on the basis of a gravity low (Talwani and Eldholm, in press).

H. Bungum
E.S. Husebye

References

Husebye, E.S., H. Gjøystdal, H. Bungum and O. Eldholm (1975): The seismicity of the Norwegian and Greenland Seas and adjacent continental shelf areas. Tectonophysics, 26, 55-70.

Talwani, M., and O. Eldholm (in press): Evolution of the Norwegian-Greenland Sea. Geol. Soc. Am. Bull.

Wilson, J.T. (1965): A new class of faults and their bearing on continental drift. Nature, 207, 343-347.

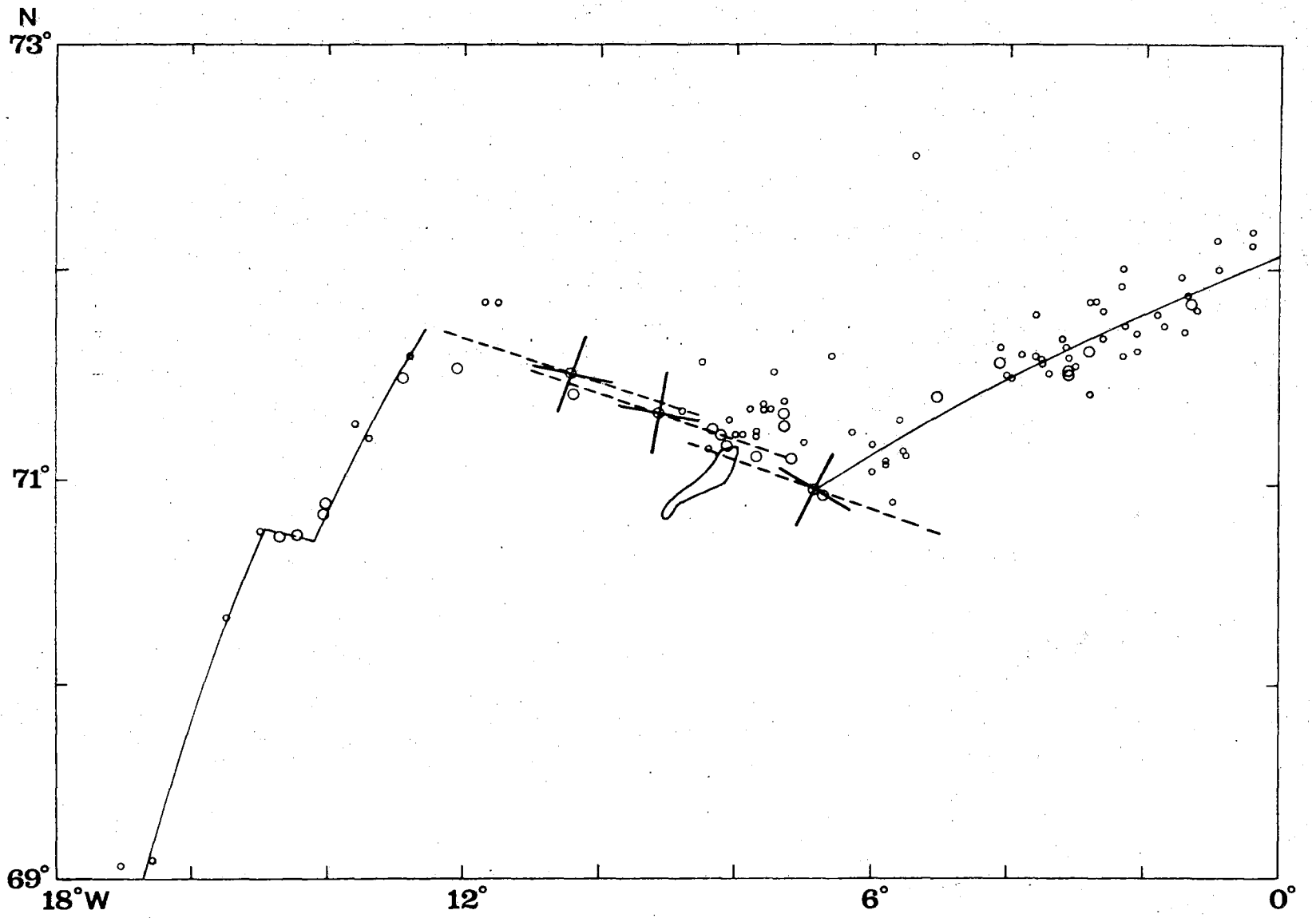

Fig. VII.6.1 The seismicity of the Jan Mayen Island Region for the time period 1955-75 where ISC-solutions have been used when available (1964-1973), and where all solutions are based on at least 15 stations. Three fault plane solutions are also included. The structural trends in this figure are our suggestions, and the dashed lines are synthetic flow lines based on the opening model of Talwani and Eldholm (in press).

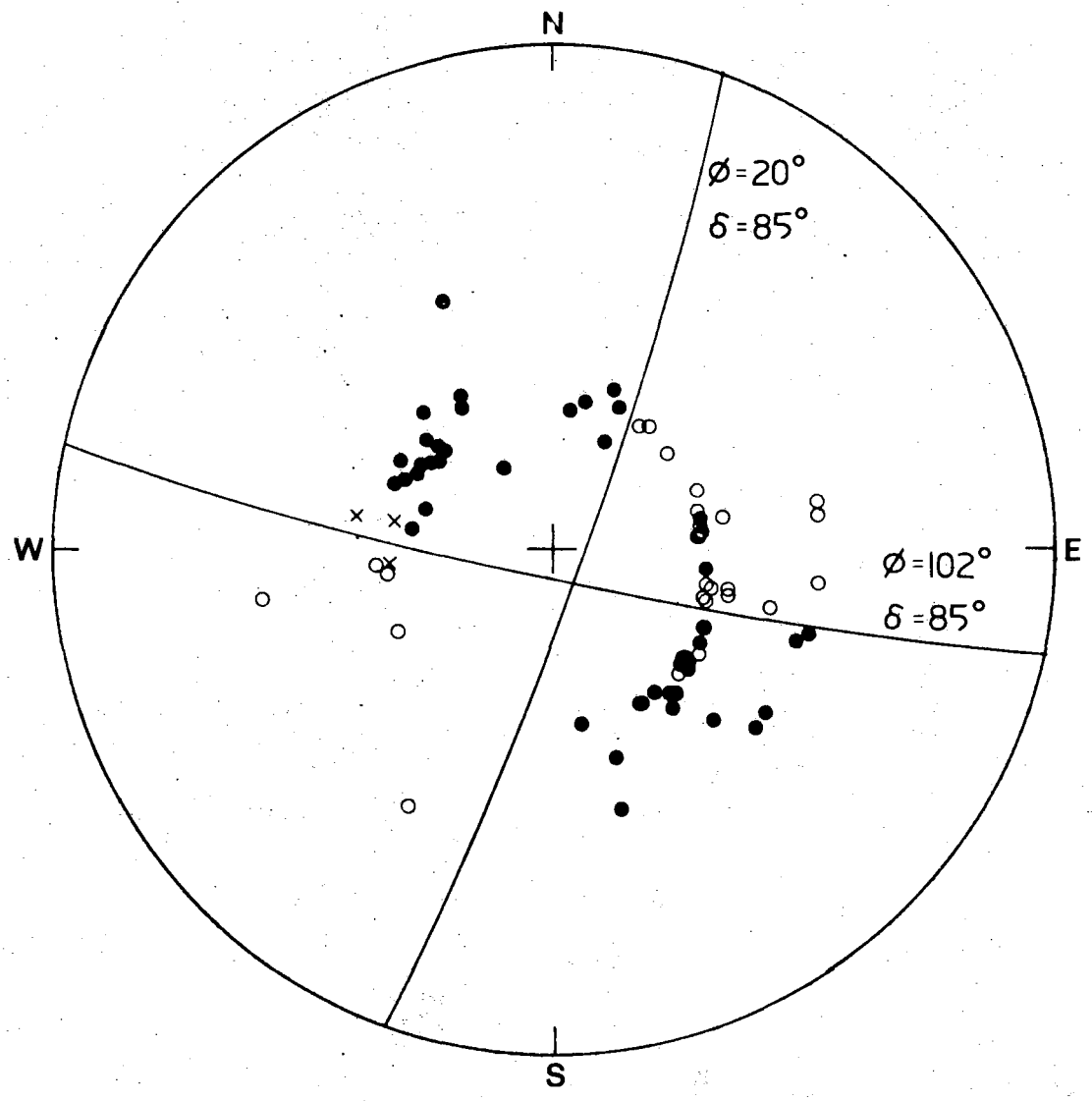

Fig. VII.6.2 Fault plane solution for the westernmost of the three events in Fig. VII.6.1. There are 80 readings of first motion from predominantly long period or broad band seismographs. Solid circles are compressions, open circles dilitations, and crosses indicate stations near the nodal plane. Stereographic projection.