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H. MECHANISM STUDY OF NORTH ATLANTIC EARTHQUAKES

So far, most of the research efforts at NORSAR have been directed towards the array's event detection and location capabilities. However, for reliable earthquake-explosion discrimination surface wave information is badly needed. In order to gain the necessary insight in the sophisticated processing techniques currently used in analysis of surface waves, we have as a first step started an investigation of the mechanisms of N. Atlantic earthquakes. Preference was given to this area, because the epicentral distance is small, thus minimizing complex multipathing effects (Bungum and Capon, 1974) and also because the seismicity of this region is well known (Husebye et al, in press).

The mechanism of intraplate earthquakes occurring in the Norwegian Sea between the Mohn's Ridge and the Norwegian coast was discussed by Husebye et al (in press) in relation to geological and geophysical data from the area within the context of plate tectonics. Their discussions suggest the following alternative hypotheses for their mechanism.

(1) The post-opening marginal subsidence; in this case, we expect a normal faulting with fault strikes parallel to the coast.

(2) The intra-plate stress which appears to have the horizontal compressive axis parallel to the direction of plate motion. In this case, we expect a thrust faulting with fault strikes perpendicular to the direction of plate motion or a strike-slip faulting with the pressure axis parallel to the direction of plate motion.

(3) The seismic zone in the Norwegian Sea, especially the belt which continues southward as an apparent extension of the Knipovich ridge, may be a plate boundary.

As shown schematically in Fig. H.1, if the mid-Arctic ridge spreads faster than the Mohn's ridge, we expect right-lateral strike slip along the Knipovich ridge as well as along its extension into the Norwegian Sea. Two fault plane solutions published by Lazareva et al (1965) in this zone are right-lateral strike-slip along fault with the North-South strike, consistent with this hypothesis.

4) If the Mohn's ridge is spreading faster than the mid-Arctic ridge, we expect left-lateral strike-slip along the extension of the Knipovich ridge.

The surface wave method can give us an accurate determination of focal depth of an earthquake if the fault plane solution is known (Weidner and Aki, 1973). We can also determine the phase velocity and attenuation of surface waves along the path from an epicenter to a station if the fault plane solution is known. Once the phase velocity and attenuation are known for various parts in the region of our interest, we can determine the source factor of amplitude and phase spectra for any earthquake in the area. If we have both Love and Rayleigh wave source spectra for a few different azimuths, we can probably make a reliable determination of the focal mechanism, seismic moment and focal depth. Additional data from body waves, such as the pP-P time difference and the sense of first P motion at crucial directions, would be helpful to increase the accuracy of the determinations. The outcome of the above studies - the dispersion, attenuation, focal depth, seismic moment and focal mechanism - are useful quantities for discussing the tectonics of the North Atlantic.

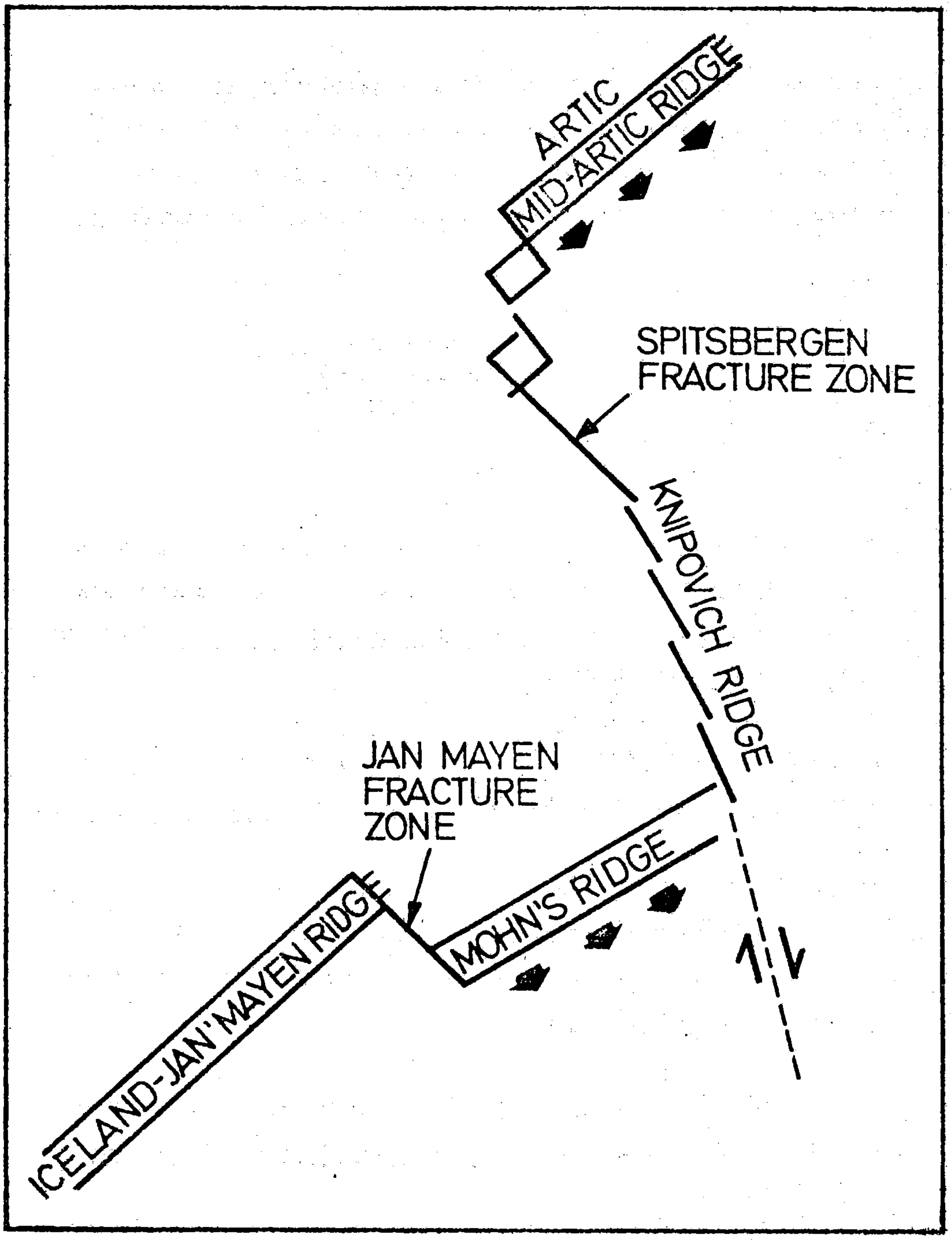

Fig. H.1 Schematic view of the principal spreading axis in the North Atlantic.

The necessary software for utilizing the surface waves in focal mechanism studies is now available at NORSAR, and has already been tested on two earthquakes on the Mohn's ridge and Mohn-Knipovich Ridge (Aki and Husebye, 1974).

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