SOME PROBLEMS CONCERNING THE SEISMICITY OF THE NORTH SEA AREA

J.-M. Van Gils
Observatoire Royal de Belgique

Abstract.

Seismicity is considered from a double point of view: its "static" aspect that leads to the seismotectonic conformation of the area, while its dynamic concept aims to the evaluation of earthquake hazard. After having examined the case of the North Sea it is stated that an isoseismal map of the area is still missing and should be undertaken. The occurrence of seismic seawaves in the North Sea has an extremely low probability. Conclusions and recommendations.

1.- Seismicity and Seismic activity.

Seismicity and seismic risk being the main subjects of the workshop, some consideration should be made as regards the use of these terms. Principally, as the first one can be understood in two different ways, its concept must be made clear.

From the static point of view, seismicity means the set of events affecting the area under investigation, while from the dynamical viewpoint it must be considered in its space-time context. In the first case, seismicity answers the question: is the area concerned affected by earthquakes or not, whereas the second concept replies to the double question: where and when do seismic events strike the area.

In the latter case, the term "seismicity" should be replaced by "seismic activity". The first acceptation of seismicity obviously leads to drawing up a seismotectonic map of the area, while seismic activity aims to the evaluation of earthquake hazard, one
of the main factors in "seismic risk" assessments.

2.- Static Seismicity.

Coming back to the statical aspect of seismicity, the only aspect that will be considered further on, an area may be struck by earthquakes having their epicentres either inside or outside the area itself.

As regards the North Sea, its seismicity is implied by its own epicentres and those located in the surrounding countries. This is illustrated in Fig. 1, extracted from (1) ; and reveals that the seismicity of the North Sea is rather on the lower level in comparison with that of the encircling region. As a result, the area under investigation doesn't act as an independent seismic unit. More, its borders may be affected by the adjacent zones having a relatively higher seismicity level. That means that the coastal belt should be given special consideration.

These reciprocal effects of earthquakes with epicentres both on land and offshore are demonstrated in figures 2 up to 8.

Figures 2, 3 and 4 show the influence of the three major earthquakes having occurred in the North Sea:

a) the Oslofjord earthquake of October 23d 1904 ;

b) the North Sea earthquake of January 24th 1927, and

c) the Doggerbank earthquake of June 7th 1931.

On the contrary, figures 5, 6, 7 and 8 illustrate the effects of on land earthquakes on the coastal zone and may suggest an eventual outline of extrapolated isoseismals on the sea:

a) the Düren earthquake of April 4th 1640 ;

b) the Tirlemont earthquake of September 18th 1692 ;

c) the Düren earthquake of December 26-27th 1755, and

d) the Brabant Massive earthquake of June 11th 1938.

3.- The isoseismal map of the North Sea.

Thus far, only the effects of individual earthquakes have been examined, but the same procedure is applicable when considering a set of seismic events having occurred in a selected area during a given period. Doing so, the maximum influence observed at every place of the region can be mapped out. Such a chart has been drawn for the region encompassing the territories of Belgium, Luxemburg, the Netherlands and the western part of Germany.

It is based on data set grouping all epicentres with an intensity I V of the MSK-Intensity Scale 1964 for a period running from 1500 AD up to 1975. It reflects the distribution of