Anmeldelser.

J. R. Rossiter: Storm Surges in the North Sea, 11 to 30 December 1954. Phil. Trans. Roy. Soc., Series A, No. 991, Vol. 251, pp. 139—160. London 1958. 23½ × 30 cm. Price 7 sh.

A stormy period with rising of the sea at the English, Dutch, German and Danish coasts occurred in the latter half of December 1954. It has attracted widespread interest because of the twin character of the surge in question, i.e. the surge reached considerable heights twice with a time interval of 36 hours, roughly speaking.

The surge heights were somewhat lower at the Danish west-coast than at the foreign coasts. At Hvide Sande the peak of the surge, which occurred on December 22, was a little more than 1.5 m above mean high tide, and it was of the same magnitude just outside Thyborön. Meanwhile, this surge offers a good opportunity to study the various factors, which play a role in connection with a North Sea surge.

This is clearly demonstrated in a work by G. Tomczak (Dtsch. Hydrogr. Z., 8, 145–156, 1955) who states in the first place that the surge at Cuxhaven on December 22 just before the hour of astronomical high water reached a height of 248 cm above mean high water, which means a remarkable height. Tomczak further states that a still higher level – 364 cm above mean high water or 0.3 m higher than the disastrous flood on February 4, 1825 – would have occurred on December 23, if the atmospheric depression in the North Sea had been somewhat more elongated and consequently the duration of the storm about 3 hours longer.

In a work by M. P. H. Weenink (Dtsch. Hydrogr. Z., 9, 240–249, 1956) the conclusion is drawn about this twin surge, that the second maximum, which at Hoek van Holland occurred on December 23, was caused some to extent by an oscillatory movement of the water in the North Sea. Weenink computes the period of a standing oscillation in the lengthwise direction of the North Sea to be 33 hours.

In Rossiter's work – the main object of this review – the opinion of Weenink is doubted. Rossiter confirms the periods of lengthwise oscillations in the North Sea to be between 30 and 40 hours, whereas the period of free transverse oscillations is about 12 hours. He points out that the damping is rather heavy in the case of such positive surges, so that the second of two successive oscillations is already drowned in other and stronger effects. Rossiter is furthermore of the opinion that Weenink has given insufficient allowance for geostrophic effects, i.e. effects caused by the rotation of the Earth.

Rossiter mentions so-called negative North Sea surges, which mean lowerings of sea level below normal, caused by southerly winds f. inst., and he finds evidence of positive "return" surges to succeed such negative surges in the course of about 18 hours, the halfpart of the free period mentioned. The probability of these "return" surges has emerged from some statistical investigations, and according to Rossiter such a "return" surge occurred in the North Sea a week before the said twin surge.

It can be questioned, whether the arguments adduced by Rossiter concerning these "return" surges are conclusive. Serious practical difficulties arise, when complete proofs of such surges have to be provided. One difficulty is that the pressure field and especially the wind field over the North Sea and the neighbouring parts of the Atlantic are normally not known with sufficient accuracy.

Setting aside these problems, which may still be objects of discussion, it may be stressed, that Rossiter arrives at and deepens several fundamental conclusions, which are without doubt. The conclusion is clearly set forward that the water level in the North Sea is influenced by winds outside the North Sea as well as by inside winds. A general uplift of the North Sea level is predominantly caused by westerly wind systems north and northwest of England, to be more exact, between the northern latitudes of 58° and 65°.

In this connection external surges, i.e. surges arisen outside the North Sea and moving into the North Sea as free waves, may be mentioned. The reality of such surges is established by various authors, but several details about them are still uncertain. According to Rossiter an external surge contributed essentially to the peak, which travelled southwards along the English eastcoast the night before December 22 and later reached the Danish westcoast, namely just before noon on December 22. The succeeding peak was small east of Scotland, but was strengthened when it moved southwards and eastwards. It must then be concluded about this second peak, which occurred in the afternoon of December 23, that – contrary to the first peak – it contained no appreciable element of external surge.

Like other surges these surges dealt with allow a valuation of the constants in the wind stress formula, especially of the frictional constant γ^2, which is defined by the equation $T = \gamma^2 \varrho_a V_s^2$, where T is the tractive force of the wind, ϱ_a the air density and V_s the surface wind velocity. Rossiter evaluates γ^2 to be 2.7×10^{-3} on the basis of the longitudinal water gradient in the North Sea during the storm period.

This order of magnitude of γ^2 is confirmed by a new and interesting method for measurements of sea currents. It consists in recording of electrical potential differences between the ends of a sea cable. During the surge period mentioned such records were obtained by means of a telephone cable traversing the Channel between England and France.

Altogether, Rossiter's work is a valuable and well balanced contribution to the important surge problem in the North Sea, a problem, which is very urgent in Denmark too.

A. Lundbak.