From 1849 to 1900, a diagram by Colonel REID, according to which the swell travelled outwards from the centre of the cyclone in all directions, was accepted as correct. In reality, things occur very differently.

The study carried out by Mr. CLINE shows that the winds in the right-hand rear quadrant of the cyclone have a direction which is mainly the same as that in which the cyclone is travelling and that they continue to blow thus during the life of the cyclone. These winds form an air stream which persists with wind velocities of 40 to 100 miles per hour, covering a distance of some 200 miles, and in some instances a tail of winds of 20 to 30 miles per hour extends over a further 100 miles.

These winds, which are constant in direction, develop waves and swells ranging from 20 to 50 feet in height, which are not developed to the same extent in other portions of the cyclone where the winds are constantly changing direction.

Once formed, these waves move forward in the same direction as the cyclone and parallel to its track. The speed of some of them is more than 40 miles per hour, while that of the cyclone may be only 12 to 15. They thus quickly overtake the latter and reach the coast far in advance of the arrival of the storm.

For example, on 26th September, 1915, at 8 p.m., a cyclone centred south of western Cuba was approaching the Yucatan Channel. At Galveston, Tex., and Burrwood, La., there was a storm tide of 0.8 feet.

At 8 a.m. on 27th September the storm tide was 1 foot from Galveston to Burrwood and had commenced rising at Fort Morgan, Ala.

The storm centre passed through the Yucatan Channel during the night of the 27th-28th, and at 8 a.m. of the 28th there was a storm tide of 1.5 feet from Galveston to Burrwood.

There was no further rise in the storm tide on the Texas coast, but at 8 p.m. of the 28th it had risen to 1.7 feet at Burrwood, La., and had extended to Fort Morgan, Ala.

From 8 p.m. of the 28th to 2 a.m. of the 29th the storm tide rose to 2.7 feet at Burrwood, and in the following 6 hours it reached 3.7 feet. The rise in the storm tide extended well eastward on the Florida Coast but there was no rise in the tide west of Isle Dernier, 25 miles to the left of the path followed by the centre of the cyclone. The greatest rise in the storm tide was about 40 miles to the right of the line followed by the storm centre.

In this case, the first warning of the passage of the cyclone was given three days in advance by the rise in the tide.

The progressive movement along the coast from the point where the rise in the tide is greatest gives valuable indications of the subsequent alterations in the path of the cyclone, as is clearly shown by the observations made between 2nd and 14th September, 1919. During that period the movements of the barometer were slight and sometimes contradictory. Also they became evident much later than those of the tide.

The swells sent out by the right-hand rear quadrant of a cyclone give rise to powerful currents running from right to left. These currents are capable of moving buoys rapidly, with their sinkers and mooring chains (the whole weighing more than 15 tons), for anything up to ten miles.

Naturally, these storm swells are capable of causing great destruction. An idea of this can be obtained from the mere fact that, at Sabin Bank Lighthouse, cast iron plates 5/8 of an inch thick, 27 feet above the surface of the water, were bent up and crushed in by the storm swells.

THE IMPORTANCE OF TIDE-OBSERVATIONS.

by

H. A. MARMER

(Extract from the *Transactions of the American Geophysical Union*, Fourteenth Annual Meeting, April 27, 28, 29, 1933, Washington, D.C., page 21).

In the first place, such tide-observations permit the accurate determination of basic datums from which both heights on land and depths in the sea may be measured. And, in the second place, such observations furnish quantitative data for determining coastal stability.

The expression "Mean Sea Level" is apparently free from ambiguity and carries an implication that can be determined readily and accurately. However, when it becomes necessary to determine this plane accurately, difficulties appear. For we find that sea-level at any point along the coast varies from day to day, from month to month, and from year to year.

For very rough values the average height of the sea at any place during a day may be taken as approximating sea-level. But for any one day sea-level so determined may differ from a precise determination of mean sea-level by several feet. When averaged over a period of a month, sea-level may differ from mean sea-level by as much as half a foot. Even when derived directly from a year of observations the value determined may differ from a precise value by as much as a tenth of a foot.

Sea-level derived from 19 years of observations is generally considered to constitute a primary determination of mean sea-level and as giving accurately the datum of mean sea-level. If observations covering this period were necessary for an accurate determination of mean sea-level at all points where such a datum is desired, the task would be a very formidable one. Fortunately it is possible to make secondary determinations of mean sea-level with considerable accuracy from observations covering a period of a year or even less, by comparison of simultaneous observations at the station for which mean sea-level is desired with observations at some suitable station at which a long series has been obtained. Thus, with a suitable spacing of a relatively small number of primary tide-stations along the various coasts at which continuous tide-observations are bieng made, it is possible to secure accurate determinations of mean sea-level for geophysical purposes at many other places by means of short series of observations.

The variations in sea-level from year to year are generally of much greater magnitude than the changes in relative elevation of land to sea during several years. It follows, therefore, that only by continuous observations covering a number of years can such relative changes in elevation be determined. But in this case, too, in connection with the relatively small number of primary tide-stations in continuous operation, short-period observations may be used to determine coastal stability at any desired place. For example, if at a given place it is desired to determine whether or not emergence or subsidence is taking place, a year of observations may be made and mean sea-level determined by comparison with some suitable nearby tide-station. A number of years later another year of observations may be taken at that place and again reduced to a mean sea-level value by comparison with a primary tide-station. The difference of the two mean sea-level values at the given place will then be a measure of the change in the relative elevation of land to sea at that place.

PUBLICATION SCIENTIFIQUE N° 1

(SCIENTIFIC PUBLICATION N° 1)

OF THE INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION

(ASSOCIATION OF PHYSICAL OCEANOGRAPHY) :

I. — *HISTORICAL REVIEW OF DYNAMICAL EXPLANATIONS OF TIDES IN NON-ELONGATED SEAS AND LAKES.*

II. — *HISTORICAL REVIEW OF DYNAMICAL EXPLANATIONS OF THE TIDES OF THE MEDITERRANEAN, THE BALTIC SEA, THE GULF OF MEXICO AND THE ARCTIC OCEAN.*

by

S. F. GRACE, University of Liverpool.

(In 8vo, 26 pages - Helsingsfors, 1931).

Part I of this pamphlet on the tides in non-elongated enclosed basins relates to publications involving dynamical explanations of tidal motion either in actual seas and lakes or in geometrically simple basins.

It indicates the development of two modes of discussion. One concerns the theoretical explanation of actual tides in non-elongated enclosed basins, either by the equili-