EVIDENCE OF UNDERTOW FROM ENGINEERING PRACTICE

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ABSTRACT

Although in our geological textbooks the undertow has been described as a well known phenomenon, some doubts have been expressed in recent years as to its reality. This question was first raised by Professor W. M. Davis in 1925 as the result of some observations made by him along the Florida coast. A few years later independent investigations regarding the existence of the undertow were made by Dr. F. P. Shepard and by the writer. Dr. Shepard believes that the undertow, as a current of sufficient velocity to be dangerous to swimmers, is non-existent and that the water carried shoreward by the incoming waves moves out again in localized currents at the surface.

The result of my own studies shows that in small bodies of water a definite undertow does exist when onshore winds are present and that in water bodies of only a few feet across this may extend from the leeward to the windward shores, thus giving a complete surface and bottom circulation. However, within the breaker zone of larger bodies of water the currents are irregular and may flow at almost any angle to the shore. Sometimes the water escapes at the surface in localized currents as described by Dr. Shepard or it may be in localized currents beneath the surface and may flow either swiftly or slowly depending on volume of water, velocity of wind, and configuration of the bottom.

Investigations of currents have been made on the Great Lakes by engineers in connection with water supply and sewage disposal problems. Similar studies have also been made at Squam Lake, New Hampshire, by Harvard University engineering students. Both investigations show that with an onshore wind there is present a definite circulation which is analogous to that found by the writer in small lakes. The shoreward travel of the water extends downward during storms to a depth of about the height of the waves. Between the outermost breaker line and the shore the current conditions are mixed as described above but outside the breaker line there is a regular subsurface outward current, or undertow, similar to that described in textbooks.

Thus dangerous undertow near shore is ordinarily rare, yet locally during strong onshore winds strong outward currents either at depth or on the surface may be present. During heavy storms on the Great Lakes the outer breaker line will be out at a depth of 10 to 20 feet but during storms of lesser intensity it will, of course, be found closer to shore.