GENERAL SCIENCE NOTES

TURBIDITES

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On November 18, 1929, an earthquake shook the New England coast and the Maritime Provinces of Canada. This earthquake, known as the Grand Banks Earthquake, loosened a large mass of mud on the edge of the continental shelf. The mud then slid down the continental slope into the deeper part of the North Atlantic Ocean. It eventually spread over the abyssal plain at the foot of the slope, parts traveling over 500 miles. One might think that a mass of loose mud flowing in the ocean would quickly mix with the sea water and lose its integrity as a separate unit, but this is not the case. The mud has a greater density than sea water because it is a combination of water and an abundance of heavier rocks, sand, silt, and clay particles. This heavier mud flows beneath the lighter sea water somewhat like water flows on land beneath lighter air. Only a small amount of mixing takes place between the mud and the overlying water. Such an underwater mudflow is called a turbidity current, and the new mud layer deposited as the flow stops is referred to as a turbidite.

Fortunately for science, but unfortunately for commercial telegraphy, 13 transatlantic cables that were in the way of the Grand Banks turbidity flow were broken, some in two or three places. The first break of each cable was precisely timed by the interruption of the teletype machines and its location determined by resistance tests. Those cables that were closest to the epicenter of the earthquake near the top of the continental slope broke almost instantly, while further away an orderly succession could be followed as the mudflow broke successive cables. Rates of travel were calculated to be sometimes greater than 50 miles per hour. The last cable, more than 500 miles out, was broken a little over 13 hours after the earthquake. It has been estimated that the resulting turbidite coming from this mudflow covered more than 100,000 square miles and had an average thickness of 2-3 feet.

To have such widespread deposits laid down so rapidly may seem quite unusual, yet it appears to be a fairly common phenomena. In Lake Mead large quantities of sediments accumulate at the eastern end where the Colorado River enters the lake. Occasionally a turbidity type of current transports some of this sediment to the opposite end of the lake which is over 100 miles away. The same phenomenon has been observed in lakes in Switzerland, and in 1954 several cables were broken by an earthquake-induced turbidity current which originated on the coast of Algeria and flowed into the Mediterranean.

Turbidites have certain characteristic features such as grading (the gradual change in particle size from coarse to fine as one goes up through the deposit), grain orientation, and special contact and internal features. Because of this they can be identified in ancient sediments found in the crust of the earth. In a world-wide catastrophe such as the flood described in Genesis, one would expect a significant number of these, and this is the case. Their abundance and widespread distribution in sediments which are found high above sea level and over large areas of continents further increase the credibility of such a catastrophe. Single turbidites may be scores of feet thick and the volume of the flow producing some of the larger ones is estimated at more than twenty cubic miles.

Since the advent of the turbidite concept 25 years ago, there has been a significant revolution in the interpretation of a large number of sedimentary deposits. Tens of thousands of graded beds piled upon each other, which were previously interpreted as being slowly deposited in shallow water, are now interpreted as the result of turbidity flows. Even the interturbidite layer, which consists of sediments found between some turbidites, is occasionally interpreted as the result of rapid deposition. This new concept indicates that some events in the past history of the earth may have proceeded much more rapidly than was previously believed.