



## THE COAST AND GEODETIC SURVEY AND OCEANOGRAPHY IN THE PACIFIC

BY N. H. HECK (1)

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One of the resolutions passed by the Third Pan-Pacific Science Congress at its recent meeting in Tokyo emphasized the need for more knowledge of bottom-configuration in the Pacific region, especially in the vicinity of the island groups. In my opinion, there should have been added the areas adjacent to the coasts because these two classes of area include most of the interesting features of the region.

Even when the vast area of the Pacific Ocean is taken into account, it is found that the Coast and Geodetic Survey is charged with the survey of a not inconsiderable part of such area in the North Pacific. Its normal activities include surveys from the coast or from island groups to a limit usually fixed at the thousand fathom curve. Such surveys include the area from the Mexican boundary to the Canadian boundary and from Dixon Entrance to Attu Island, the westernmost island of the Aleutian group, a distance of 3,500 miles; along the western coast of Alaska north of the Aleutian group 1,200 miles; the entire Hawaiian group extending 1,400 miles and the entire Philippine group, length north to south 1,200 miles and east to west 150 to 650 miles.

In addition to this normal work, a number of vessels passing between the Atlantic and Pacific coasts of the UNITED STATES have taken soundings and other observations en route from Panama Canal to California, and the same practice has been followed between California and the Hawaiian Islands, and between the State of Washington and Alaska.

These surveys include soundings by wire and echo-methods, the obtaining of temperatures and water-samples for the determination of salinity at the surface and at various depths and of bottom-samples. Special oceanographic work has been done also for the Scripps Institution at La Jolla, California.

Some very interesting submarine features have been developed as the result of these surveys, especially a series of deep troughs extending parallel to the coast of Mexico and Central America and the great submarine valley which approaches the California coast in Monterey Bay.

In connection with the execution of this work, the Coast and Geodetic Survey has taken an important part in the development of new methods. In connection with the echo-soundings it was the first to apply proper velocities of sound based on temperature, salinity, and pressure to soundings of all depths. Two of its officers prepared suitable tables for readily determining these velocities and later presented for the Pacific Ocean a method of applying velocity-corrections which requires knowledge only of the latitude and approximate depth of the soundings. It has applied the fathometer of the Submarine Signal Corporation of Boston, which was developed primarily for navigation, to hydrography and has developed a number of improvements which make it more suitable for such use.

The radio acoustic method of determination of position insures greater accuracy in the surveys of the critical area lying between the coast and the thousand-fathom-curve, especially in regions where frequent fogs or low-lying shores prevent objects on shore from being seen at considerable distances. The possibility of working a larger part of the time is resulting in a considerable increase of output.

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(1) Representing Colonel E. LESTER Jones, Director, U. S. Coast and Geodetic Survey.

The fact that the Coast and Geodetic Survey has taken up these new methods and made them effective shows its attitude in this matter and it is scarcely necessary to say that it is ready to adopt other new methods for carrying out the various operations that come directly within the field of its work, or which aid oceanography in general, provided it is not required to go outside of its field or interfere with its regular work.

It scarcely needs to be said that the Coast and Geodetic Survey is interested in the extension of oceanographic work in the Pacific Ocean. It not only appreciates the needs but the difficulties and it clearly understands that no one nation can or should undertake this great task alone. An organisation under which all the nations bordering the Pacific can exchange views and discuss plans should at the very least provide for the first steps which must be taken, and it can be expected to accomplish much more.

A matter of primary oceanographic importance is the determination of accurate datum-planes. These serve as the basic reference planes from which depths in the ocean are measured and thus permit the detection of changes in the relative elevation of land to sea. The Coast and Geodetic Survey has determined such planes at a number of points on the Pacific Coast of the UNITED STATES and is now maintaining in operation continuously five primary tide-stations on that coast.

The circulation of the sea near the land and the relation of this to the wind has been studied by the Coast and Geodetic Survey for several years, by means of observations on the five light-vessels stationed along the Pacific coast. The data derived establish definite results for winds of various directions and velocities.

The extension of work of this character to the entire Pacific region would not only add greatly to the value of the information that has been obtained, but would also be of international benefit.

The use of such work to oceanographers is obvious, but the Coast and Geodetic Survey is especially interested in another application. The Survey is constantly called upon to locate earthquake epicenters in the Pacific because the great earthquakes frequently occurring there are recorded on its instruments. It is important to know whether a special bottom-formation is associated with a submarine earthquake, and since the deep ocean-troughs stand first among such formations, it is at present a great handicap that we scarcely know their limits. Past work of the Coast and Geodetic Survey in the great deep north of Porto Rico shows that the ocean-deeps can be sounded to their greatest depths by the echo-method.

There is also need for the extension to the entire Pacific of the ocean gravity-surveys which have been conducted so successfully by Dr. MERNESZ. This work is especially needed in the Pacific since the surface-layer of the earth beneath this ocean appears from various evidence to differ from that elsewhere in the earth so that the determination of all the facts by the combined efforts of oceanography, seismology, and geodesy is of the greatest importance.

