COASTAL FORUM

Unusual Damage from a California Storm

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ON JANUARY 17, 1988 A STORM of exceptional intensity approached the coast of Central and Southern California. Within the following 24 hours it would break every historical record for the strength of its low pressure system, the speed of its winds and the height of the waves that it generated. This event, perhaps a 200 year storm, was so compact that it was impossible to forecast with present technology, yet its impact was felt along hundreds of miles of American and Mexican coastline. Because of its unique characteristics, a group of coastal engineers and oceanographers gathered in La Jolla on 18 January, 1989 — the first anniversary of the storm — to discuss its evolution and its effects on the shoreline. The eight papers presented at that La Jolla Workshop will be the subject of a special issue of SHORE & BEACH (October, 1989) devoted entirely to this unusual storm.

In addition to the impacts of great waves on structures and on beaches, the typical concerns of this journal's readers, there are other effects often overlooked in the damage assessment. On the day before the January, 1988 storm the kelp beds off Point Loma, some of the most dense giant kelp forests in California, were thicker than anyone could remember seeing them during the past 40 years. The day after the storm, more than 85% of the adult plants were gone[3]. The damage from this single day far exceeded the accumulated toll on these kelp forests of the six great storms that occurred during the 1982-1983 El Niño winter[2]. Thousands of tons of kelp were deposited on local beaches and in-situ burial, rather than trucking it away, was the only feasible solution.

At the same time that the kelp was being ripped from its holdfasts, the drag and inertial loads near the bottom resulting from these very steep waves was severely disturbing the sea bed. The rim of Scripps Canyon was fractured and dislodged over 80% of its eastern edge at a depth of about 65 ft., as described in Dayton *et al*[1]. This study also showed that limestone reefs, with a mature encrusting community of algae and animals that biologists estimated takes over a hundred years to form, were fractured (see photograph, Figure 1). Sections with in-water weights of greater than 20 tons were broken off and flipped shoreward at depths exceeding 70 feet! Rocks were sand-blasted completely clean of encrusting growths and cobbles were substantially rearranged at depths much greater than those often assumed to represent the limit of sediment transport by waves in this area. This agrees with observations of Wiegel and Doyle,[4] offshore of Diablo Canyon that substantial sand migration occurs at 100 foot depths in an area with only narrow cobble beaches.

The storm of January 1988 was clearly an event that coastal engineers must reckon with in the design of coastal structures and protective measures. We are indeed fortunate that it occurred in a region with probably the highest density of wave measuring instruments of any in the world so that it could be adequately analyzed.

REFERENCES

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Fig. 1 Fractured limestone reef at a depth of about 50 feet, immediately following the January 1988 storm. The height of the ledge near the center of the photograph is about 2 ft. (From Dayton et al.)[1]