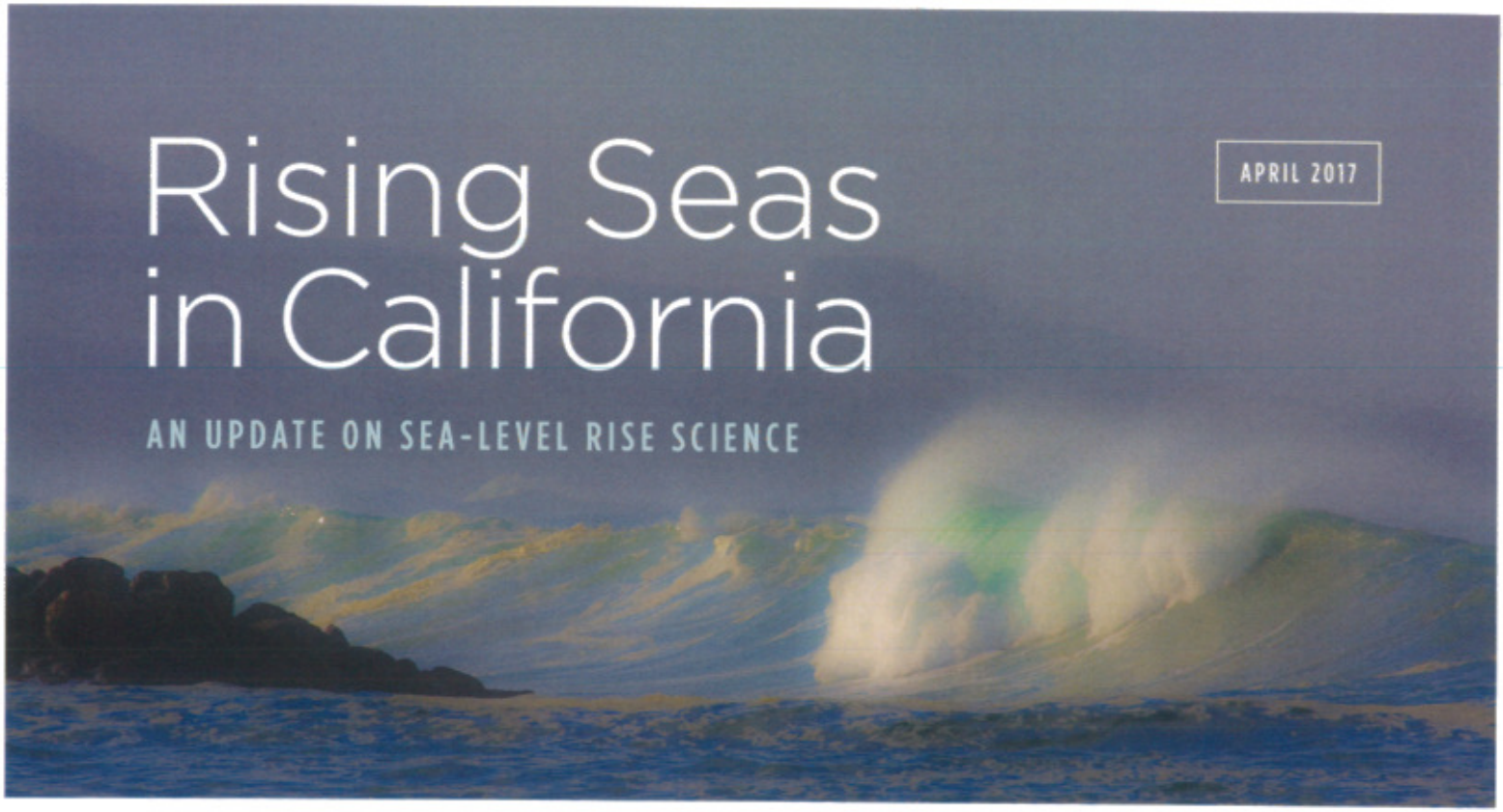

Rising Seas in California

APRIL 2017

AN UPDATE ON SEA-LEVEL RISE SCIENCE

CALIFORNIA OCEAN SCIENCE TRUST

California Ocean Protection Council
OPC-SAT
Science Advisory Team

Key Findings

1 **Scientific understanding of sea-level rise is advancing at a rapid pace.** Projections of future sea-level rise, especially under high emissions scenarios, have increased substantially over the last few years, primarily due to new and improved understanding of mass loss from continental ice sheets. These sea-level rise projections will continue to change as scientific understanding increases and as the impacts of local, state, national and global policy choices become manifest. New processes that allow for rapid incorporation of new scientific data and results into policy will enable state and local agencies to proactively prepare.

2 **The direction of sea level change is clear.** Coastal California is already experiencing the early impacts of a rising sea level, including more extensive coastal flooding during storms, periodic tidal flooding, and increased coastal erosion.

3 **The rate of ice loss from the Greenland and Antarctic Ice Sheets is increasing.** These ice sheets will soon become the primary contributor to global sea-level rise, overtaking the contributions from ocean thermal expansion and melting mountain glaciers and ice caps. Ice loss from Antarctica, and especially from West Antarctica, causes higher sea-level rise in California than the global average: for example, if the loss of West Antarctic ice were to cause global sea-level to rise by 1 foot, the associated sea-level rise in California would be about 1.25 feet.

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4 **New scientific evidence has highlighted the potential for extreme sea-level rise.** If greenhouse gas emissions continue unabated, key glaciological processes could cross thresholds that lead to rapidly accelerating and effectively irreversible ice loss. Aggressive reductions in greenhouse gas emissions may substantially reduce but do not eliminate the risk to California of extreme sea-level rise from Antarctic ice loss. Moreover, current observations of Antarctic melt rates cannot rule out the potential for extreme sea-level rise in the future, because the processes that could drive extreme Antarctic Ice Sheet retreat later in the century are different from the processes driving loss now.

5 **Probabilities of specific sea-level increases can inform decisions.** A probabilistic approach to sea-level rise projections, combined with a clear articulation of the implications of uncertainty and the decision-support needs of affected stakeholders, is the most appropriate approach for use in a policy setting. This report employs the framework of Kopp et al. (2014) to project sea-level rise for three representative tide gauge locations along the Pacific coastline: Crescent City in northern California, San Francisco in the Bay area, and La Jolla in southern California. These projections may underestimate the likelihood of extreme sea-level rise, particularly under high emissions scenarios, so this report also includes an extreme scenario called the H++ scenario. The probability of this scenario is currently unknown, but its consideration is important, particularly for high-stakes, long-term decisions.

6 **Current policy decisions are shaping our coastal future.** Before 2050, differences in sea-level rise projections under different emissions scenarios are minor but they diverge significantly past mid-century. After 2050, sea-level rise projections increasingly depend on the trajectory of greenhouse gas emissions. For example, under the extreme H++ scenario rapid ice sheet loss on Antarctica could drive rates of sea-level rise in California above 50 mm/year (2 inches/year) by the end of the century, leading to potential sea-level rise exceeding 10 feet. This rate of sea-level rise would be about 30-40 times faster than the sea-level rise experienced over the last century.

7 **Waiting for scientific certainty is neither a safe nor prudent option.** High confidence in projections of sea-level rise over the next three decades can inform preparedness efforts, adaptation actions and hazard mitigation undertaken today, and prevent much greater losses than will occur if action is not taken. Consideration of high and even extreme sea levels in decisions with implications past 2050 is needed to safeguard the people and resources of coastal California.