

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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Antarctic Ice Melt and California's Shoreline

An iceberg the size of Delaware got closer to breaking off of the Antarctic Peninsula last week and a group of scientists gathered in England to try and figure out why. Antarctica is one and a half times larger than the entire United States, and it's covered with ice, a lot of ice.

It is the largest repository of ice on the planet by virtue of it being centered over the South Pole and being almost permanently frozen. In fact, Antarctica contains about 90% of all the fresh water on Earth. Think of the entire United States covered with 10,000 feet or nearly two miles of ice and you get an idea of how much of this frozen stuff is sitting on the southern continent.

If it were all to melt, and no climate scientist or glaciologist thinks that this will happen this century or the next, it would raise sea level about 200 feet. We don't want to go there because this would displace well over half of the world's people. But the threat and impact of even melting a small portion of Antarctica is serious enough that scientists who study climate are worried about it.

Five years ago, a committee appointed by the National Academy of Sciences was charged with assessing future sea level for the coasts of California, Oregon and Washington. Three governors as well as a number of federal and state agencies

requested this study for one simple reason, there is a huge investment along the shorelines of each of these states, California in particular.

Whether power plants, sewage treatment facilities, airports, highways, railroads, bridges, homes, businesses, or public infrastructure, there is a lot a stake with a rising sea. The governors felt this issue was important enough that we ought to know something about what might happen in the future so we could begin to plan for it.

The committee was asked to project or estimate what sea-level rise was likely to be by 2030, 2050 and 2100. These values then became the guidance for California's state agencies and also coastal communities as they began to plan for their own futures.

Due to the uncertainties involved in projecting future sea levels, an important one being how much more additional greenhouse gas the world puts into the atmosphere, there were ranges given for each of these three time periods.

The Committee's report, which is available free for downloading at the National Academy of Sciences website: <https://www.nap.edu/catalog/13389/sea-level-rise-for-the-coasts-of-california-oregon-and-washington>, projected average or mid-range estimates of sea-level rise relative to 2000 of about 6 inches by 2030, 12 inches by 2050 and 36 inches by 2100.

This report was based on research available as of 2010, however, and in the intervening six years ice shelves in Antarctica have been monitored more intensively and are showing signs of instability. This has raised concerns about the

possibility of major ice sheet collapse, which could add significantly to sea-level rise.

Governor Brown has requested that a committee be appointed to assess how findings from recent Antarctic research may affect the sea-level rise projections that California has been using. This committee had their first meeting this past week to begin to tackle this issue.

The big question is focused on the floating ice shelves that are holding back Antarctica's massive ice sheets, much like corks in champagne bottles. The most recent analysis indicates that a warming ocean is eating away at the undersides of these ice shelves, and rising air temperatures are melting them from above. The meltwater drains downward and forms cracks that can cause ice shelf collapse.

Removing these corks surrounding the major Antarctic ice sheets would accelerate the flow of these massive glaciers into the ocean, generating a more rapid rise in sea level than had previously been projected. This would be bad news for shorelines around the world, including California.