

## Sea-level rise is quickening pace

**Data crunch confirms model predictions of flooding coastlines.**

**Philip Ball**

The rate of global sea-level rise has sped up during the twentieth century, Australian researchers have confirmed.

This disturbing acceleration is predicted by climate models, but has been difficult to spot in real data; natural variations in sea level have masked long-term trends.

Now researchers have managed to tease out the acceleration from tide-gauge data, by cleaning up the information using satellite measurements.

Both these databases come with their own problems for spotting such trends: the first is too noisy; the second doesn't go far enough back in time. But by melding them together, John Church and Neil White of the Australian governmental science organization CSIRO's Marine and Atmospheric Research centre in Hobart, Tasmania, have managed to chart the sea's rise.

They say the acceleration they have detected since 1870 matches up nicely with model predictions: if the acceleration continues as expected, by 2100 the seas will lap the shore about 31 centimetres higher, on average, than they did in 1990. That matches what has been forecast by the Intergovernmental Panel on Climate Change (IPCC).

This will push back typical beach shorelines by around 300 metres. "That's a real concern," says marine geologist Kenneth Miller of Rutgers University in New Jersey.

### **Data clean-up**

Sea levels are closely monitored by tide gauges all around the world. But pinning down average sea-level change is hard, because there are natural fluctuations in sea level that vary from place to place.

The issue is also complicated by subsidence or elevation of land masses. "Teasing out sea level at any scale is a daunting challenge," says Miller. Most studies using tide-gauge data have failed to spot any acceleration, leading to suggestions that the models needed to be re-evaluated.

Recent satellite measurements of sea level, which are more accurate and less variable than tide gauges, have suggested a relatively high rate of rise over the past decade<sup>1</sup>. But comparing this rate of sea-level rise to rates determined by tide gauges in the earlier part of the century is problematic: researchers weren't sure that the difference in rates wasn't down to the difference in measurement methods.

Church and White decided to use both datasets to get the best result. They used satellite measurements to distinguish random 'noise' in recent tidal data from more systematic site-to-site variations. They could then use these results to clean up older tidal data.

### **Rising tide**

This gave them a smoother and more reliable record of sea-level change stretching back to 1870. They find that since then, not only has the sea level risen by an average of 1.7 millimetres each year, but the rate of rise has increased by an average of 0.01 millimetres per year. They report their results in *Geophysical Research Letters* this month<sup>2</sup>.

The acceleration has not been steady, however. Sea-level rise was relatively high from 1930 to 1960, they say, and rates have wobbled up and down since then. The highest rate has been since the early 1990s, with sea levels shooting up by about 3 millimetres per year.

Having a complete year-by-year record of the rates of rise will allow detailed comparison with climate models, Miller says. It will also enable researchers to study the effects of specific climate perturbations, such as volcanic eruptions.

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#### References

1. Intergovernmental Panel on Climate Change Third Report, The Scientific Basis, Section 11.3.2.3 [Link](#). (2001).
2. Church J. A. & White N. J, *Geophys. Res. Lett.*, **33**. L01602 (2006).