Research team projects wind and wave changes as planet heats up

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Credit: NASA

(Phys.org)—An international team of climate researchers has written and published an open letter in the journal *Nature Climate Change*, describing wind and wave pattern changes expected to come about due to global warming. In their letter, they suggest that much of the southern hemisphere will see increased winds along with higher waves, while the northern hemisphere will see the opposite.

More specifically, in their letter, the researchers write that after much study and analysis of data, it appears that areas such as Australia's east

coast, much of Antarctica and Indonesia, will experience increased wave height as the planet heats up. This, they say, will be the result of changes in wind intensity over the southern hemisphere. Waves come about, they note, as energy is transferred between the atmosphere and ocean water. Rising atmospheric temperatures can change the height, direction and frequency of waves, resulting in wave changes in coastal regions.

The team came to its conclusions based on data given by five separate climate models. Climate change data input into the models came from a special report called "Emissions Scenarios" created by the Intergovernmental Panel on Climate Change that gave predictions of global temperature changes for both air and sea over the next century. The models predicted changes to the southern annular mode, which is an area of climate variability that surrounds the South Pole. Because of that, the researchers predict an increase in westerly winds over oceans in the southern hemisphere. That in turn could mean bigger, stronger waves in such places as Australia's Gold Coast.

Because the models also predict a northward shifting of high pressure systems in the Pacific basin, they expect less wind and as a result lower wave height in the North Atlantic, which should mean less turmoil for fishing vessels and reduced waves pounding the shores of the eastern United States and Western Europe.

Wave size is important, the researchers note because it's such a determining factor in beach erosion, but also because it has an impact on fishing and drives plans for using waves to create energy for power grids. They also point out that their study shows that a means of quantifying wave size impact has yet to be created and note that in the end, despite changes in wave size, ocean levels will continue to be the overriding concern as polar ice melts, impacting shorelines across the globe.

More information: Projected changes in wave climate from a multi-

model ensemble, *Nature Climate Change* (2013)
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Abstract

Future changes in wind-wave climate have broad implications for the operation and design of coastal, near- and off-shore industries and ecosystems, and may further exacerbate the anticipated vulnerabilities of coastal regions to projected sea-level rise1, 2. However, wind waves have received little attention in global assessments of projected future climate change. We present results from the first community-derived multi-model ensemble of wave-climate projections. We find an agreed projected decrease in annual mean significant wave height (HS) over 25.8% of the global ocean area. The area of projected decrease is greater during boreal winter (January–March, mean; 38.5% of the global ocean area) than austral winter (July–September, mean; 8.4%). A projected increase in annual mean HS is found over 7.1% of the global ocean, predominantly in the Southern Ocean, which is greater during austral winter (July–September; 8.8%). Increased Southern Ocean wave activity influences a larger proportion of the global ocean as swell propagates northwards into the other ocean basins, observed as an increase in annual mean wave period (TM) over 30.2% of the global ocean and associated rotation of the annual mean wave direction (θM). The multi-model ensemble is too limited to systematically sample total uncertainty associated with wave-climate projections. However, variance of wave-climate projections associated with study methodology dominates other sources of uncertainty (for example, climate scenario and model uncertainties).