Climate models should include ocean waves

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(Phys.org) -- A new field study by researchers from Swinburne University of Technology suggests that the effect of wave activity on oceans should be incorporated in long term climate and weather prediction models.

Mixing of the upper ocean directly affects the air-sea exchange of heat, momentum and gases, but currently wave physics exists only as a remote factor in most climate models.

"Large waves that occur in tropical storms and cyclones, can contribute in mixing a wider layer of the upper ocean with the cooler deeper parts, exchanging heat and carbon dioxide with the atmosphere which affects weather and climate," said lead researcher Dr. Alessandro Toffoli from Swinburne's Centre for Ocean Engineering, Science and Technology.

The study analyzed oceanographic data supplied by Woodside Energy

Ltd from the North Rankin A Gas Platform over the North-West Shelf about 135 kilometres off the coast of Australia between January and April 2006.

The period includes six tropical cyclones, whose wind speed at the location was above 10 metres per second and maximum significant wave heights were greater than three meters.

The study found that during summer periods the mixed layer depth and its variability is strongly affected by the injection of wave-induced turbulence, especially during cyclone seasons.

The analysis of wave activity confirms theoretical modelling that the rapid intensification of wave activity in tropical cyclones forces the production of wave-induced turbulence twice as deep as the average mixed layer depth, producing a quick and substantial deepening of the latter.

"Right now small-scale wave physics and large-scale climate modelling exist separately," said Professor Alexander Babanin, Director of the Centre for Ocean Engineering, Science and Technology. To improve prediction, wave modelling should be incorporated in larger climate models."

As these integrated models are improved and refined, Professor Babanin hopes they can be used in other oceanographic disciplines like marine biology.

The study has been published online in the *Journal of Geophysical Research*.

Provided by Swinburne University of Technology