



## **FIO-ESM: the Earth System Model with surface gravity waves**

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The critical role of oceanic surface waves in climate system is receiving more and more attention. We set up an Earth System Model (ESM) in 2013, which is the first climate model with surface gravity waves and named as the First Institute of Oceanography-Earth System Model (FIO-ESM), composed of a coupled physical climate model and a coupled carbon cycle model. In the coupled physical climate model, a surface wave model is introduced through coupler by including the non-breaking wave-induced vertical mixing into the ocean circulation model. Surface waves can improve the performance of climate model especially in the simulation of upper ocean mixed layer depth in the Southern Ocean, and in the reduction of tropical biases. The FIO-ESM version 1.0 was employed to conduct Coupled Model Intercomparison Project Phase 5 (CMIP5) experiments. Now, the new version of FIO-ESM (FIO-ESM version 2) is under development. Its framework is similar to FIO-ESM version 1, but the model components, physical processes and resolution will be much improved. It will be employed to take part in CMIP6.