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# 南海台风与上层海洋相互作用的数值模拟研究

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## A numerical simulation study on the typhoon-ocean interaction in the South China Sea

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**摘要** 本文建立了一个综合考虑大气-海流-海浪相互作用的区域海-气耦合模式系统,利用该系统模拟研究了南海台风发生发展的大气、海洋动力学机理.结果表明:耦合模式较真实地反映了台风和上层海洋的相互作用过程,提高了对台风路径和强度的模拟准确率;在台风充分发展阶段,上层海洋的反馈作用使台风路径发生左偏,并抑制了台风强度的发展;三种海洋反馈作用(海面降温、飞沫效应和波浪作用)对台风系统的影响程度不同,海面降温和波浪作用阻碍台风系统的发展,而飞沫效应增强了海气界面的热量传递,促进台风系统的发展;与海面降温和飞沫效应相比,波浪作用对台风系统的影响较小.只有综合考虑各种海洋反馈作用才能更好地解释和预测台风等海上灾害性天气的发生和演变过程.

**关键词:** 台风 区域海-气耦合模式 海面温度 海面粗糙度 飞沫效应

**Abstract:** Based on the theory of atmosphere-current-wave interaction, a regional atmosphere-ocean coupling system is formed in this paper. The complicated air-sea interaction under typhoon condition in South China Sea is studied using the coupling system. The experiment results show that the coupled model exhibits good capability in simulating the typhoon process and improves the simulation accuracy of typhoon track and intensity. With the feedback mechanism of the top oceanic environmental factors such as SST, sea spray and waves, the simulated typhoon system in the coupled model is stronger and moves more leftward than that in the uncoupled atmospheric model. The three different air-sea interaction processes, sea surface temperature (SST) decline, the spray effect and ocean wave action, have different influence on the typhoon system. SST decline and ocean wave act to resist the development of typhoon, while sea spray acts in an opposite way, it enhances the typhoon development through the heat transfer at the sea surface. In the three processes, the influences of SST decline and sea spray are more important, the influence of wave is least. The impact of air-sea interaction on the development of typhoon system is not a linear summation of the three factors. There are complicate interaction mechanisms among the three. Our conclusion is that in order to better explain and predict the occurrence and evolution of the weather disasters such as typhoon and other severe weather events in South China Sea, all the air-sea interaction processes should be considered.

**Keywords:** Typhoon Regional atmosphere-ocean coupled model Sea surface temperature Sea surface roughness length Sea spray

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