

What is the ocean circulation?

The ocean circulation is driven by three major forcing functions: winds, tides and density gradients. Another important factor to determine the circulation by means of numerical models is the underlying bathymetry, which is given for the East-Hainan coastal waters in Fig. 1. A resulting circulation pattern for the surface layer accounting for all of these driving forces is presented in Fig. 2.

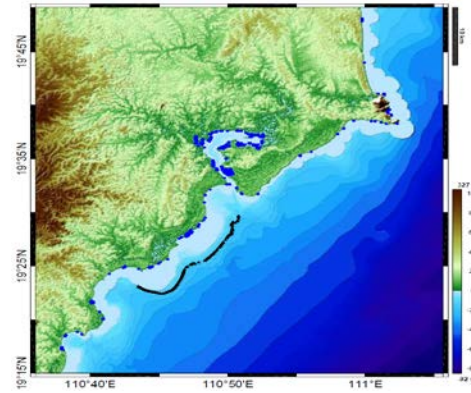


Fig. 1: Bathymetry (m) of eastern Hainan coastal waters. Blue dots indicate areas potentially flooded by sea level rise scenarios. Black triangles show the locations of fringing reefs, which potentially can also be flooded.

Why is it important?

The knowledge of the ocean circulation is an essential prerequisite for the understanding of any physical, chemical and biological process in a marine system, since it constitutes the underlying physical background signal.

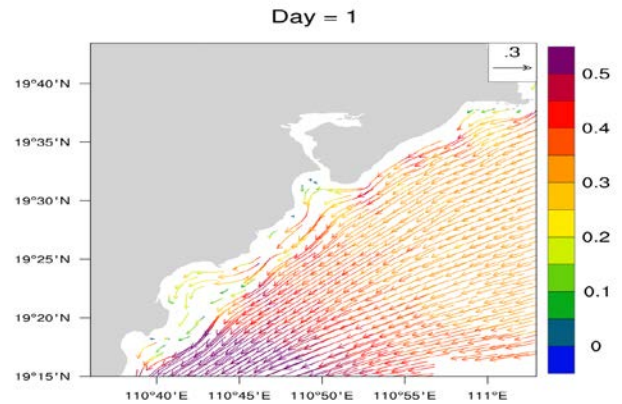


Fig. 2: Typical sea surface circulation (m/s) in the East-Hainan coastal waters during winter monsoon showing mostly southeastward flow.

Climate tracer study

To demonstrate the impact of climate change, three tracer scenarios have been performed, i.e., S0: no sea level change, S1: 1 m sea level increase, reefs can survive S2: like S1, but reefs are flooded.

Simulation results show that more particles can leave the back reef area for scenario S2, since the fringing reef is located under the sea surface (Fig. 3).

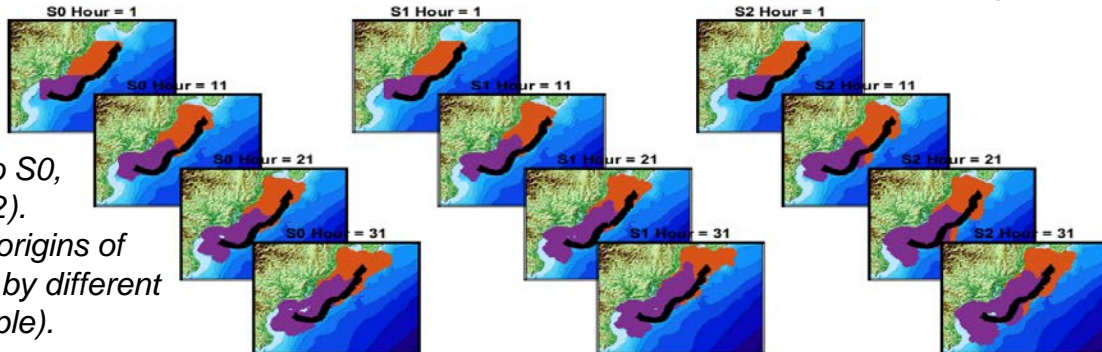


Fig. 3: Tracer studies for April 2015. (left: scenario S0, center: S1, right: S2). Different back reef origins of tracers are marked by different colors (orange, purple).

