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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

**Dynamics of wind-driven upwelling off the
northeastern coast of Hainan Island**

by

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Abstract

Both observational and reanalysis sea surface temperature data reveal that upwelling occurs frequently off the northeastern coast of Hainan Island (downstream of the change in topography off Tongluo Cape), which cannot be attributed to the along-shelf wind alone. To identify dynamics of the upwelling we conduct a numerical experiment using an idealized topography that is simplified from the actual topography off the eastern and northeastern coasts of Hainan Island. The result indicates that the upwelling downstream of the change in topography is associated with onshore cross-isobath transport. Analysis of the vertically integrated momentum balance shows that the upwelling-linked onshore transport is primarily intensified by the along-isobath barotropic pressure gradient force (PGT), but is weakened by the along-isobath baroclinic pressure gradient force (PGC). The along-isobath PGT is linked to the advection of relative vorticity, the bottom stress curl and the gradient of momentum flux in vorticity equation. On the other hand, the PGC-related process is diagnosed by potential vorticity (PV) balance. Similar to the negative PV term from wind stress, the negative PV terms of the joint effect of baroclinicity and relief and the baroclinic bottom pressure torque weaken the upwelling-linked onshore transport downstream of the change in topography. The onshore transport is enhanced by the positive PV from bottom stress. In addition, the cross-isobath forces play an important role in upwelling intensification in the shallow nearshore region.

Date: Monday, 11 Sept 2017

Time: 3:00p.m. – 4:00p.m.

***Venue: Room 4475, Academic Building
(near Lifts 25 & 26), HKUST***

All are welcome!