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Numerical simulations of coastal convection over the western Malay Peninsula

SUE CHEN[1], BINSON JOSEPH[2], TEDDY HOLT[1] AND KEITH SASHEGYI[1]
[1]*Naval Research Laboratory, Monterey, CA, USA*
[2]*Temasek Laboratories, National University of Singapore, Singapore*

During the intermonsoon season, when the synoptic-scale forcing is generally weak, thermally or mechanically induced local circulations such as the land-sea breezes, slope flows, mountain-valley circulations, gap winds, mountain waves etc. strongly affect the development of thunderstorms on the western side of the Malay Peninsula. Mechanisms leading to the development of intense, short-lived, afternoon convective thunderstorms in the Kelang Valley, on 23 April, 2002, are examined using the US Naval Research Laboratory (NRL) Coupled Ocean and Atmosphere Mesoscale Prediction System (COAMPS®)[1]. The present COAMPS® simulations use either real-data or idealized initial conditions, derived from representative soundings, and different surface conditions. The study will focus on factors influencing the onset and location of the observed convective event, and the model's ability to capture this event using a nested, high-resolution (1 km grid spacing) forecast coupled with a three-dimensional variational data assimilation system. Figure 1 shows a sample comparison of observed and simulated radar reflectivity field at 1700 local time. Preliminary model results show that convective forecasts are sensitive to the land-surface processes, and the interaction of the sea breeze with wind circulations in the vicinity of the Ulu Kali and Nuang mountain ranges along the eastern border of Selangor. We will discuss the land-convection "trigger" mechanisms that have an impact on this event, and the roles played by the interaction of thermally/mechanically induced local circulations on convective initiation within this particular equatorial zone.

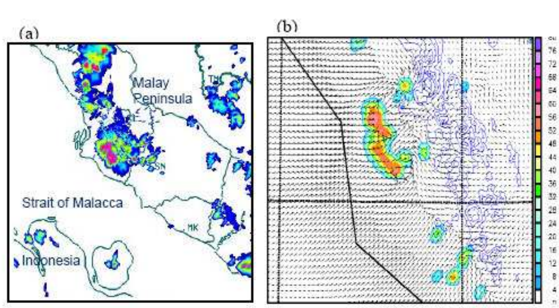

Figure 1: Comparison of (a) observed and (b) model simulated radar reflective field (color shaded areas) at 9 UTC (17 LT). The blue contoured lines in (b) are topography and the black arrows are surface wind vectors.

[1] COAMPS® is a registered trademark of Naval Research Laboratory