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Impact of Regional Circulation and Heat Budget to Tropical Night

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The impact of regional circulation and heat budget on tropical night in the coastal city and the basin city, defined as persistent high air temperature over than 25^{0}C at night was carried out from August 14 through 15, 1995. In the coastal mountainous city, convective boundary layer (CBL) of a 1km depth is developed over the ground surface of the mountainous basin, while a depth of thermal internal boundary layer (TIBL) is less than 150m from the coast along the eastern slope of the mountain. As sensible heat flux convergences between the surface and lower atmosphere both at the top of mountain and the inland coast are much greater than on the coastal sea, sensible heat flux (SHF) should be accumulated inside both the TIBL and the CBL near the mountain top and then, accumulated sensible heat flux under the influence of sea breeze circulation combined with easterly sea breeze from sea to inland and uplifted valley wind from inland to the mountain top returning down toward the eastern coastal sea surface should be transported into the coast, resulting in high air temperatures of 35^{0}C at the coastal city[1].

Under nighttime cooling of ground surface after sunset, mountain wind causes the daytime existed westerly wind to be an intensified westerly downslope wind and land breeze further induces it to be strong offshore wind. No sensible heat flux divergence or very small flux divergence occurs in the coast, but the flux divergences are much greater on the top of the mountain and along its eastern slope than on the coastal inland and sea surfaces. Thus, less cooling down of the coastal surface than the mountain surface and sensible heat transfer from warm pool over the coast into the coastal surface produce nocturnal high air temperature on the coastal inland surfaces, which is not much changed from daytime ones, resulting in the persistence of tropical night of 29^{0}C (nocturnal thermal high) until the early in the morning. In the mountain region without sea, the height of CBL is about 1km and there is no thermal internal boundary. The SHF in the basin city surrounding by the mountains for daytime is in convergence, enhancing the heating of air parcels over the surface in the CBL and resulting very high air temperature over than 39^{0}C. The SHF at night is in divergence and produces the cooling of air parcels near the surface and a warm pool of 33^{0}C over the ground surface. The back long wave of the warm pool toward the surface induces tropical night.

Keywords: Tropical night, Convective boundary layer, Warm pool

References

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