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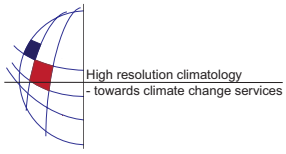

Dynamics of Heat Lows over elevated terrain

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Heat Lows are an important synoptic feature of dry subtropical regions where they have a significant impact on the local weather and climate. Previous idealized studies on heat low dynamics over flat terrain in quiescent and simple background flows pointed to the highly ageostrophic diurnal cycle of the circulation at lower levels in relation to the formation and inertial turning of the nocturnal low-level jet.

Here the impact of elevated terrain on the dynamics of heat lows is studied by means of a hydrostatic numerical primitive equation model. Different orographic setups on a circular island are utilized pinpointing sensitivities to slope and overall scale of the orography. Two distinct dynamical regimes can be identified: The temperature gradient and circulation related to the coastal sea breeze and the anabatic slope circulation with its maximum temperature gradient situated over the steepest ascent of the orography. Both circulations are characterized by an inward pressure gradient force during the late afternoon which initiates the low-level jet acceleration as soon as vertical mixing subsides after sunset. The two centers of the accelerating and inertially turning low-level jet subsequently form two distinct centers of cyclonic vorticity. If the plateau is wide enough, i.e. its radius is larger than the Rossby radius of deformation, even a third cyclonic center can be identified one radius of deformation around the center of the plateau during the night. Similar to the dynamics of heat lows over flat terrain there is almost no evidence of any horizontal circulation at low levels during the daytime when vertical mixing of momentum and heat erode the nocturnal features.