

Spatial variability of near-surface temperature over the coastal mountains in southern Chile (38°S)

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The spatial distribution of the near-surface air temperature over a coastal mountain range in southern Chile [Nahuelbuta Mountains (NM), 38°S, maximum height 1300-m ASL] is investigated using in situ measurements, satellite-derived land-surface temperature, and simulations during the austral winter of 2011. Based on a few selected but representative cases, we found that under rainy conditions?either at day or night?temperature decreases with height close to the moist adiabatic lapse rate (~ 6.5 °C/km). Likewise, the temperature tends to follow the dry adiabat (~ 9.8 °C/km) during daytime under dry- and clear-skies conditions. During clear-skies nights, the temperature also decreases with height over the southeastern side of NM, but it often increases (at about 8 °C/km) over the northwestern side of the mountains. This temperature inversion extends up to about 700-m ASL leading to an average temperature contrast of about 7 °C between the northwestern and southeastern sides of Nahuelbuta by the end of dry nights. These dawns also feature substantial temperature differences (>10 °C) among closely located stations at a same altitude. High-resolution numerical simulations suggest that upstream blocking of the prevailing SE flow, hydrostatic mountain waves, and strong downslope winds is responsible for such distinctive nocturnal temperature distribution.