Introduction:

Dugway Proving Ground, Granite Peak and the MATERHORN project

Granite Peak, located in the Dugway Proving Ground in western Utah, is an isolated mountain rising ~1800 m above the surrounding terrain. Granite Peak separates a salt flat (playa) to the W from a NW-sloping plain covered by herbaceous vegetation to the E.

During the day, thermally-driven flows induced both by topography and by land-surface heterogeneity are expected to occur in the area and to interfere with the CBL development. During fall 2012 and spring 2013, DPGR was the target area of the MATERHORN project. An existing meso-network of measurement stations (SAMS) was enhanced with an extensive set of special measurement platforms (SIM), including a Twin Otter aircraft with a Doppler Wind Lidar on board (TODOLI).

CBL depth variability at DPGR

Since the early '90s, DPGR has used a continuously operating meso-gamma-scale analysis and forecast system (40WX) developed at the NCAR Research Applications Laboratory (RAL), currently based on WRF simulations with a maximum resolution of 1.1 km. "Final analysis" simulations are nudged towards SAMS measurements by means of Newtonian relaxation. A statistical analysis of 40WX output (three years of hourly data, 2009-2011) highlights a significant spatial variability of the CBL depth in the area, as demonstrated by transects and quadrant maps. The spatial variability of sensible heat fluxes, related to land-surface properties, explains the phenomenon only partially (Serafin et al. 2014).

 Dwelling diagrams (y axis: time in hours, x axis: distance along AB in km)

Factors (at t = 8 hours; vertical cross sections along CD)

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Conclusions:

- Weak heat fluxes over the plains cause a locally thinned CBL.
- Even with spatially uniform heat fluxes, geometry to topography probably both factors matter. What matters most?

References: