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Observations of near-surface heat flux and temperature profiles through the early evening transition over contrasting surfaces

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Abstract Near-surface turbulence data are used from the Mountain Terrain Atmospheric Modeling and Observations (MATERHORN) program to study counter-gradient (CG) heat fluxes through the late afternoon and early evening transition. Two sites are considered, with vastly different surface and subsurface characteristics. The Playa site is located over a large desert playa with high soil moisture and no vegetation. The Sagebrush site is located over sparse desert steppe vegetation with little soil moisture. The observed CG heat flux is found to be site and height dependent. At the Sagebrush site, the CG flux at 5 m and below occurs when the sensible heat flux reversal precedes the local temperature gradient reversal. For 10 m and above, the CG flux occurs for the opposite reason. At the Playa site, the CG flux occurs from the gradient reversal preceding the heat flux reversal at all tower heights. The phenomenon is discussed in terms of the mean temperature and heat flux evolution. The temperature gradient reversal is a top-down process while the flux reversal occurs nearly simultaneously at all heights. The differing CG behaviour is primarily due to the differing subsurface characteristics between the two sites. The combined high volumetric heat capacity

use counter-gradient instead of CG

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all figures: include thin vertical line @ T=0

organization:
1) → first heat flux balance
2) → 2nd divergence.
→ change order

→ typical conditions of flow at Playa / Sage
→ rewrite 3.3 related to SEB / closure
→ check sections