



Physics of Stratocumulus Top – high resolution observations of entrainment and mixing.

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Physics of Stratocumulus Top (POST) was a research campaign held in the vicinity of Monterey Bay in July and August 2008. High-resolution in-situ measurements with CIRPAS Twin Otter research aircraft were focused on a detailed study of processes occurring at the interface between the the Stratocumulus top and the free troposphere. High frequency (up to 1000 samples/second, corresponding to 5.5cm spatial resolution) records of temperature and LWC, accompanied with moderate frequency (1.5m spatial resolution) records of humidity and three components of velocity allowed to characterize entrainment of tropospheric air into the boundary layer across capping inversion, turbulence and mixing of the entrained air into the cloud top.

A detailed analysis of two thermodynamically contrasting cases: first permitting cloud top entrainment instability CTEI (dry air above inversion) and second prohibiting CTEI (humid air above inversion) indicates that entrainment-mixing process at the cloud top can be conceptually decomposed into two independent components:

- 1) shear-driven turbulent mixing across a stable inversion layer of thickness adopting to the wind and temperature jump (to keep Richardson number close to critical value, i.e. to keep inversion turbulent)
and
- 2) buoyancy-sorting in the cloud top region, resulting in removal of negatively buoyant air from the cloud top in penetrative downdrafts (CTEI permitting case) or buildup of the diluted cloud top (CTEI prohibiting case).