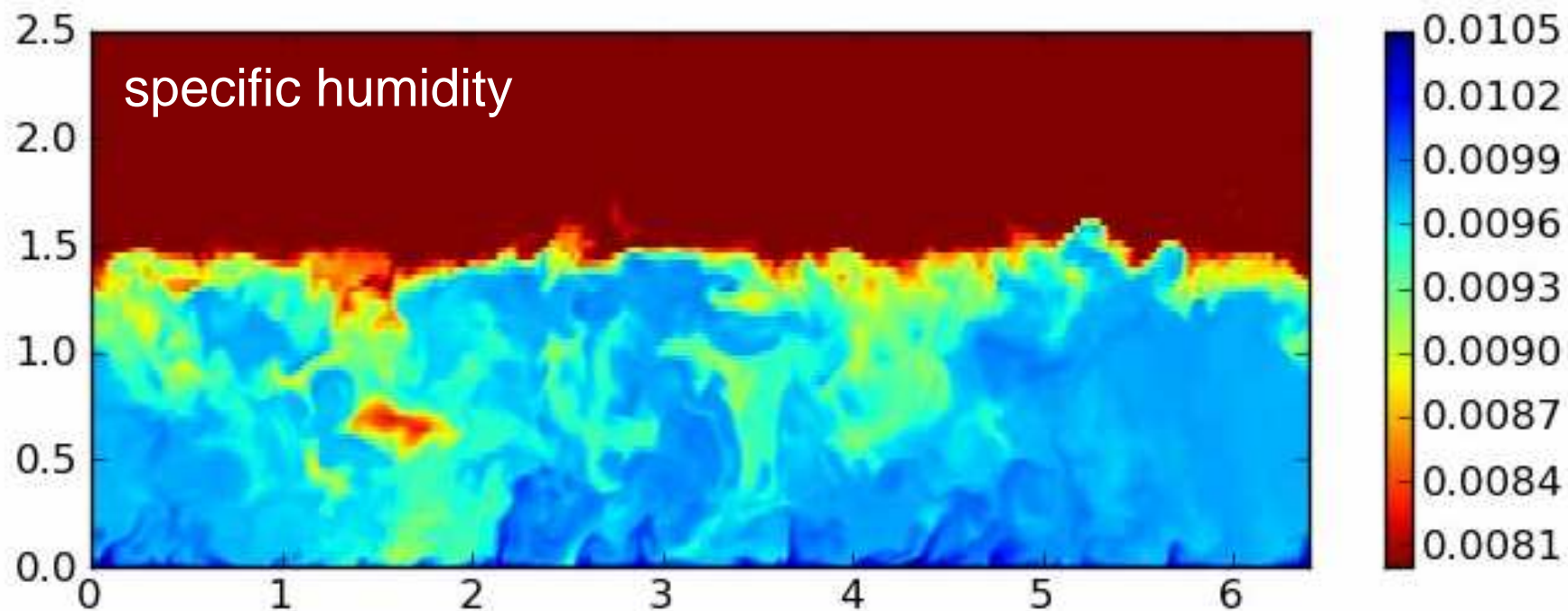


# Detection of Entrainment Influences on Surface-Layer Measurements



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ARTICLE

## Detection of Entrainment Influences on Surface-Layer Measurements and Extension of Monin–Obukhov Similarity Theory

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①



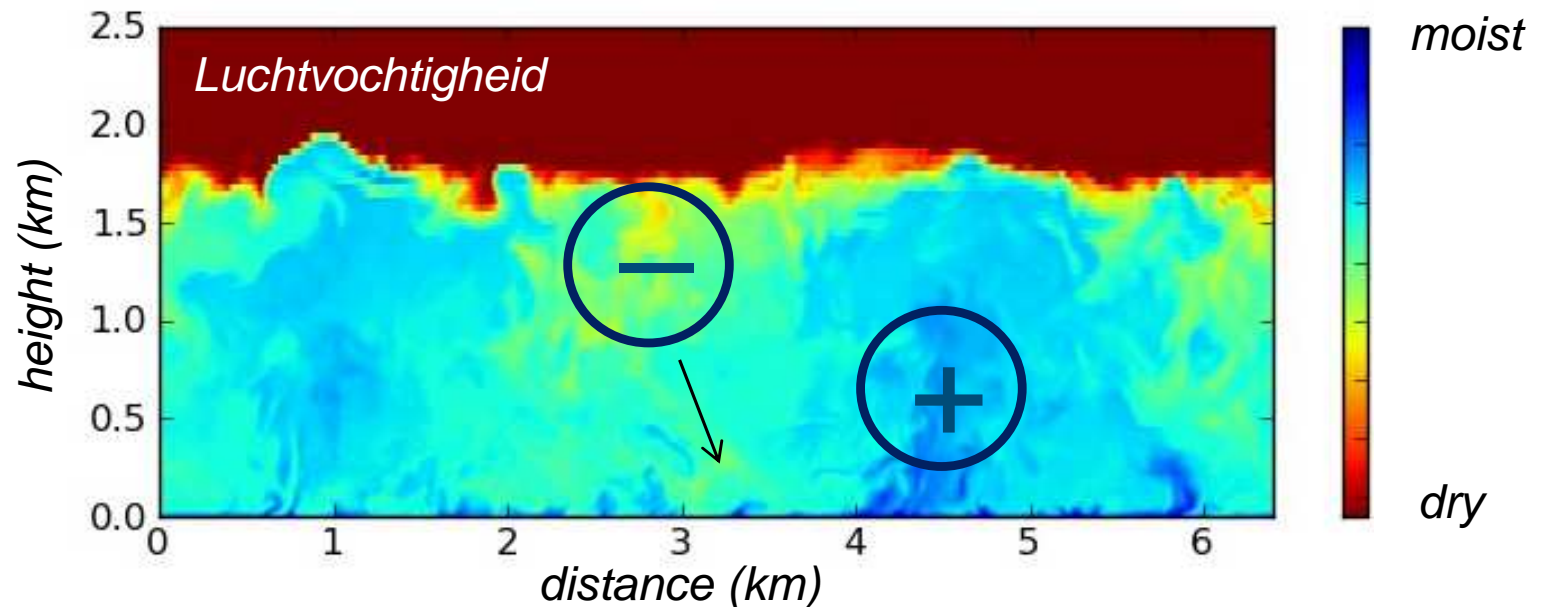
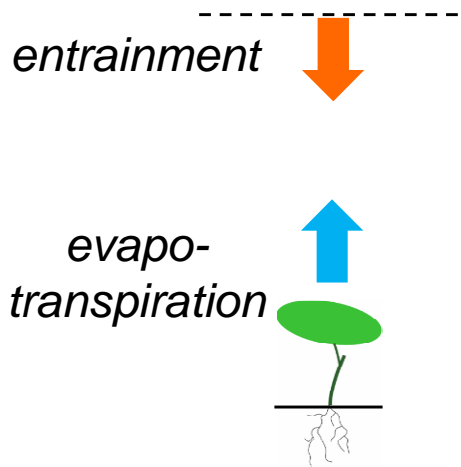
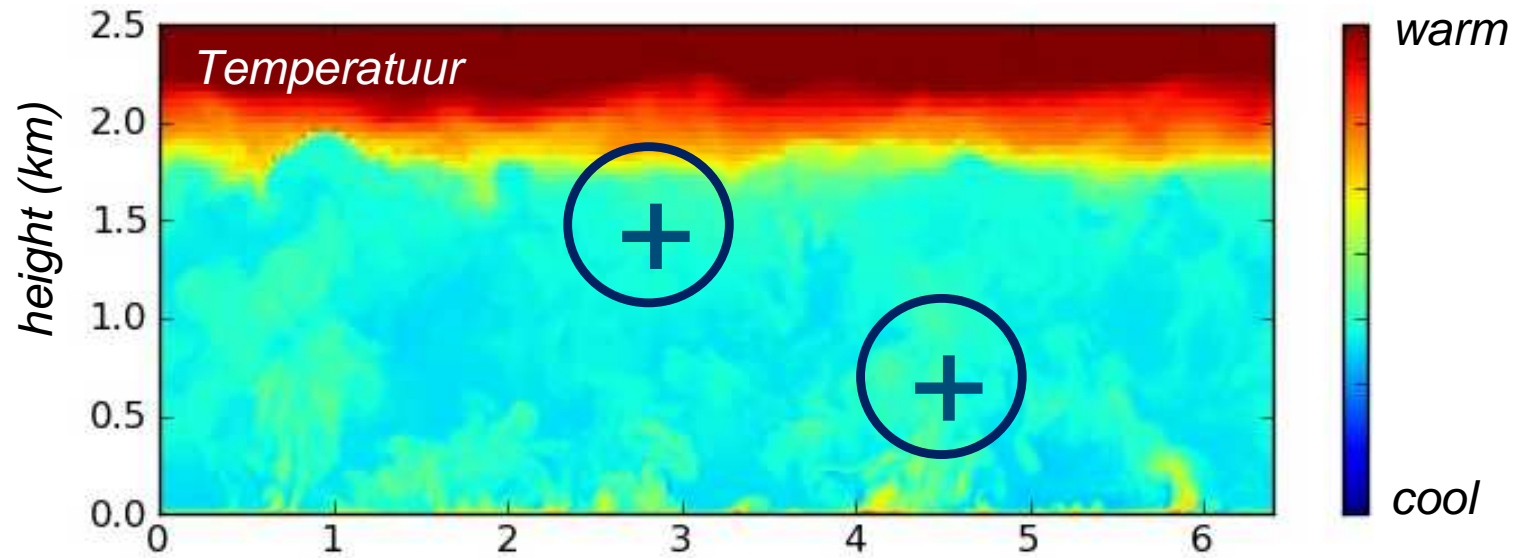
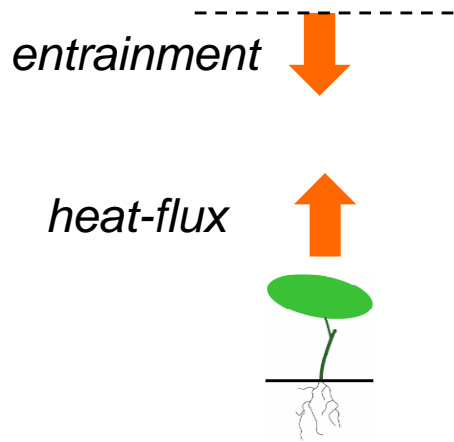
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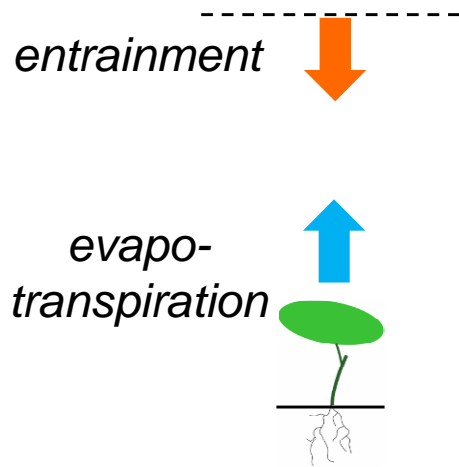
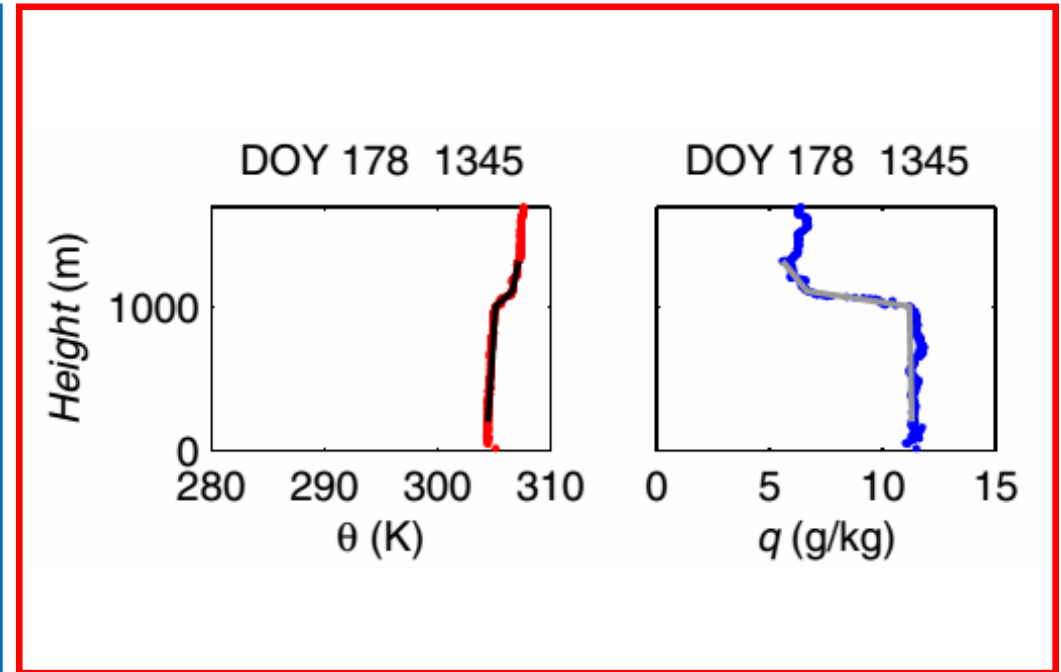
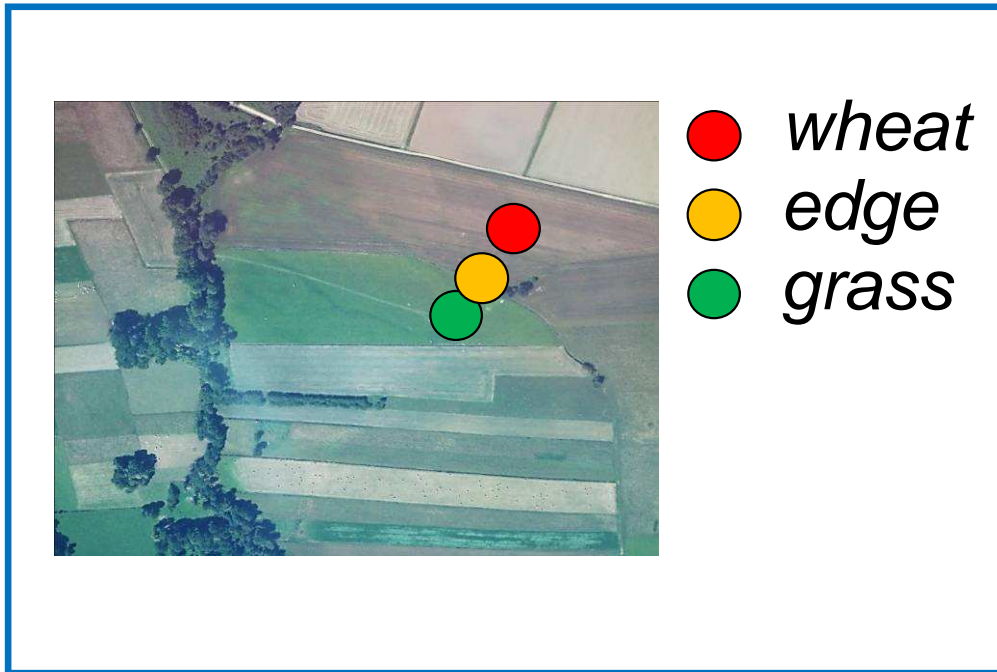
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# Temperature and humidity



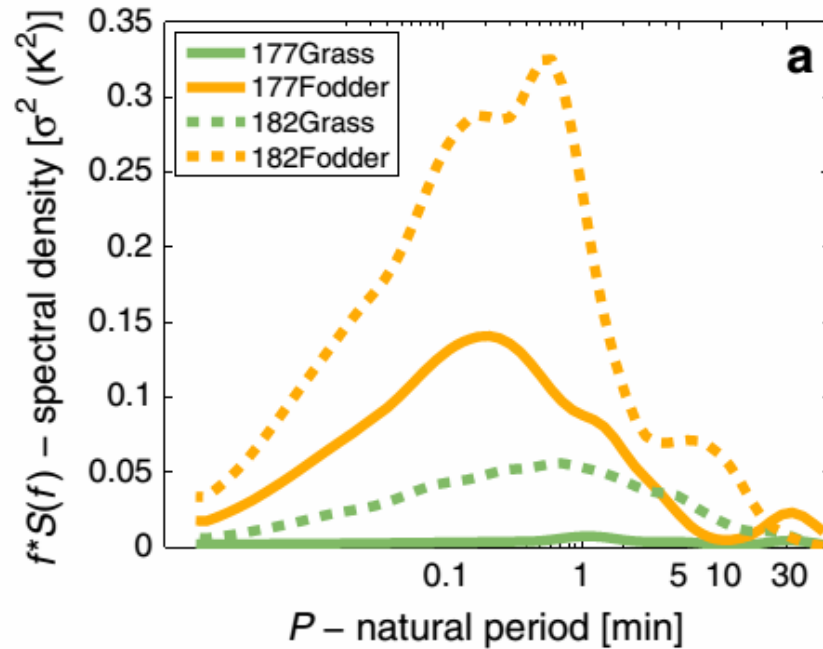
# Effect in surface layer



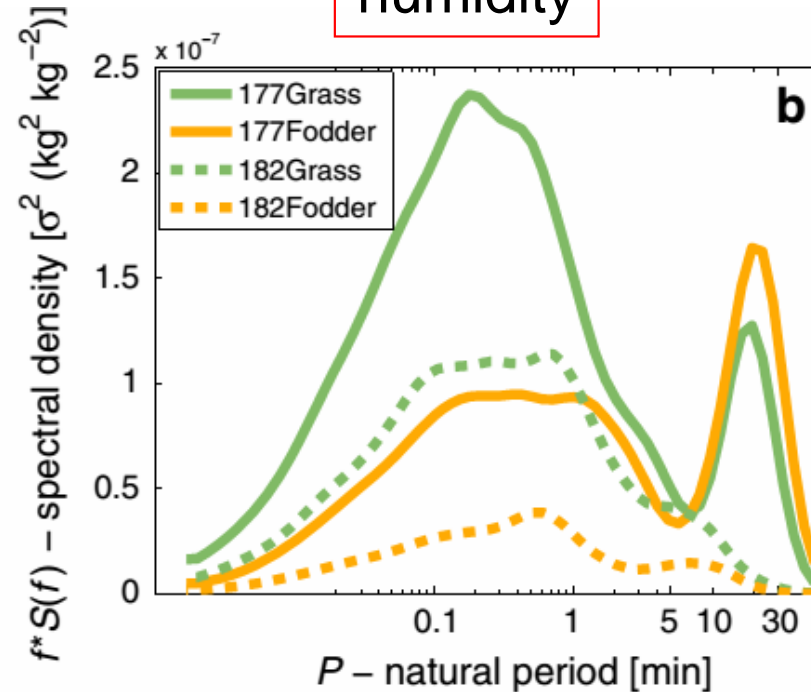
Relative strength of **surface flux** and **entrainment flux**: *entrainment ratio*

# Effect in surface layer: wavelet spectra

temperature



humidity



wheat —

grass —

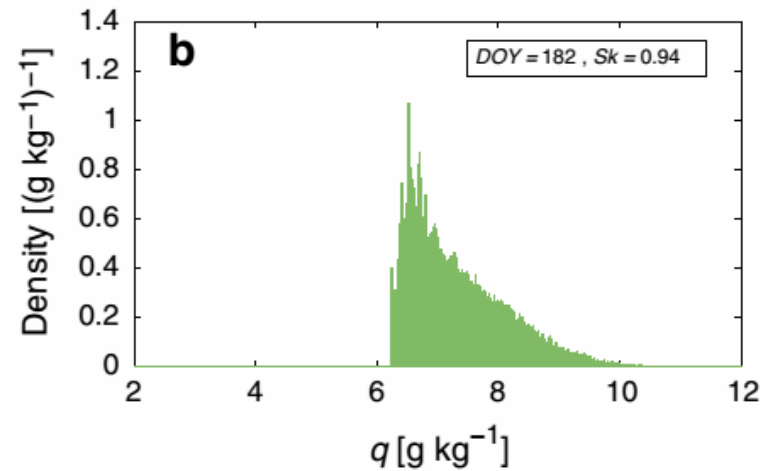
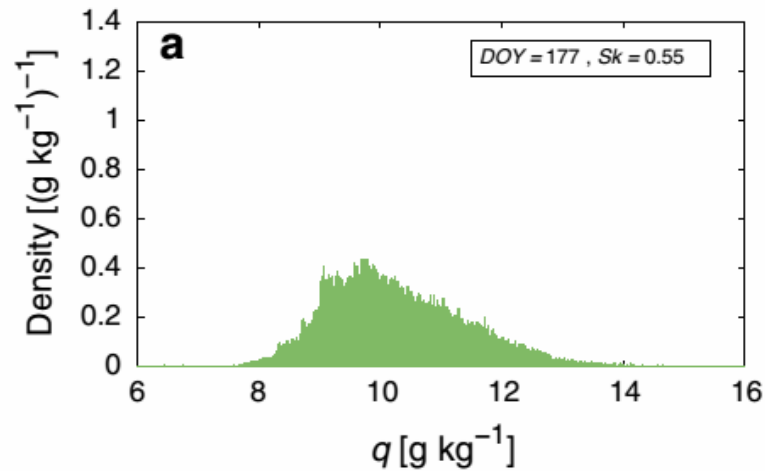
strong entrainment —

weak entrainment ····

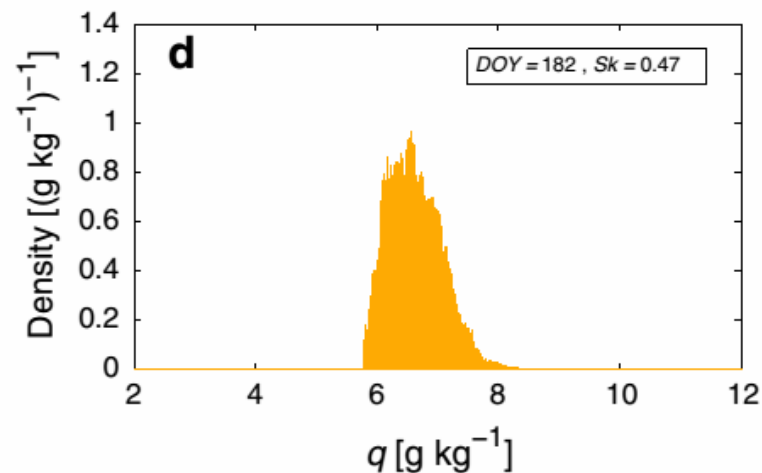
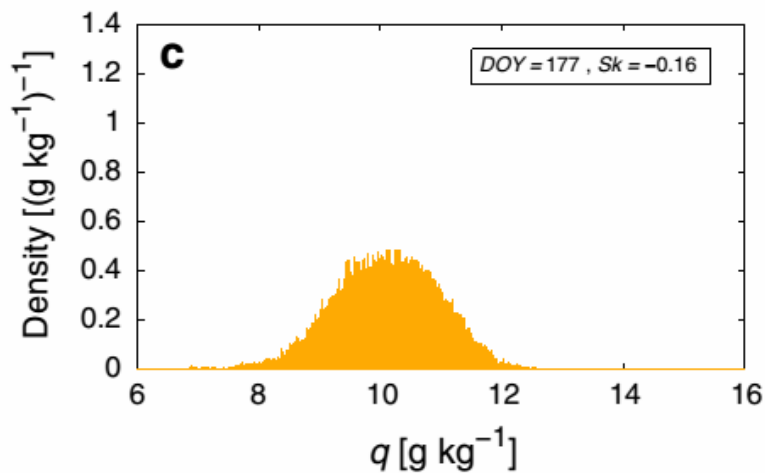
# Effect in surface layer: PDF of $q$ (skewness)

strong entrainment

weak entrainment

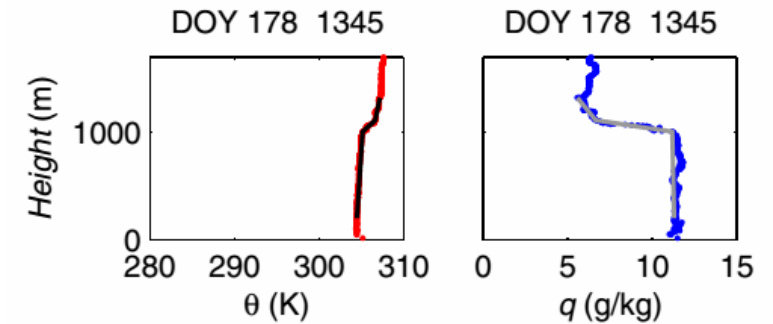
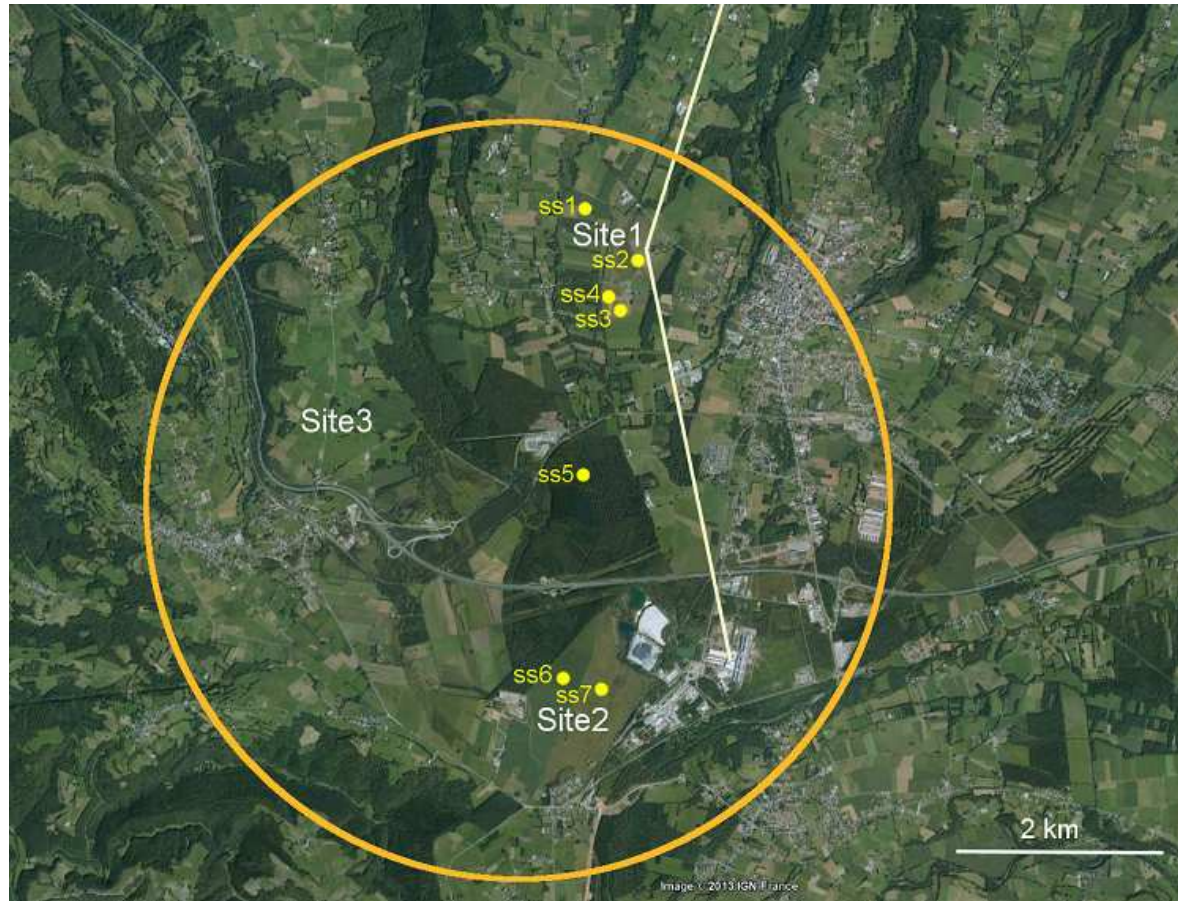


grass 



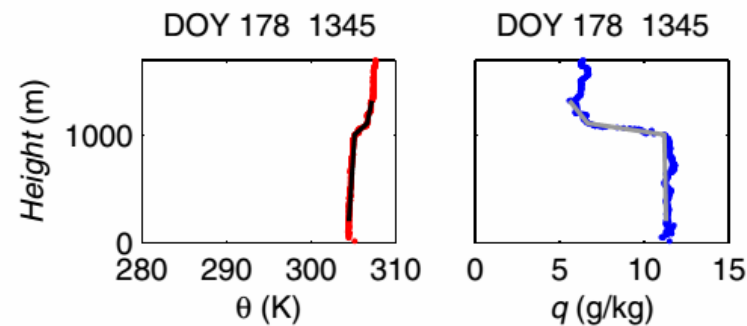
wheat 

# Entrainment ratio from radio soundings



Site	166	170	171	175	176	177	178	181	182	183	186
1 (main)		●	●	●	●	●	●	●	●		●
2 (moor)	●	●	●		●	●	●		●	●	●

# Classification: *local* entrainment ratio $q$



- Entrainment fluxes ( $H_{\theta e}$ ,  $L_v E_{qe}$ ) computed from
  - Surface fluxes  $H$  and  $L_v E$
  - $\Delta\theta$  and  $\Delta q$  from soundings
  - $\beta_{\theta v} = \square 0.2$  (buoyancy entrainment)
- Classification based on *local* entrainment ratio  $F_{xe} / F_{x,local}$
- Criterion:  $\beta_{q,wheat} > 3 \beta_{\theta,wheat}$

# Classification: local entrainment ratio $q$

- Classification based on entrainment ratio  $q$  ( $\beta_q$ ) and entrainment ratio  $\theta$  ( $\beta_\theta$ )
- Entrainment ratios ( $\beta_\theta$ ,  $\beta_q$ ) computed from
  - Surface fluxes  $H$  and  $L_v E$
  - $\Delta\theta$  and  $\Delta q$  from soundings
  - $\beta_{\theta_v} = \square 0.2$  (buoyancy entrainment)
- Criterion:  $\beta_{q,wheat} > 3 \beta_{\theta,wheat}$

June 25



Site	166	170	171	175	176	177	178	181	182	183	186
1 (main)		●	●	●	●	●	●	●	●		●
2 (moor)	●	●	●		●	●	●		●	●	●