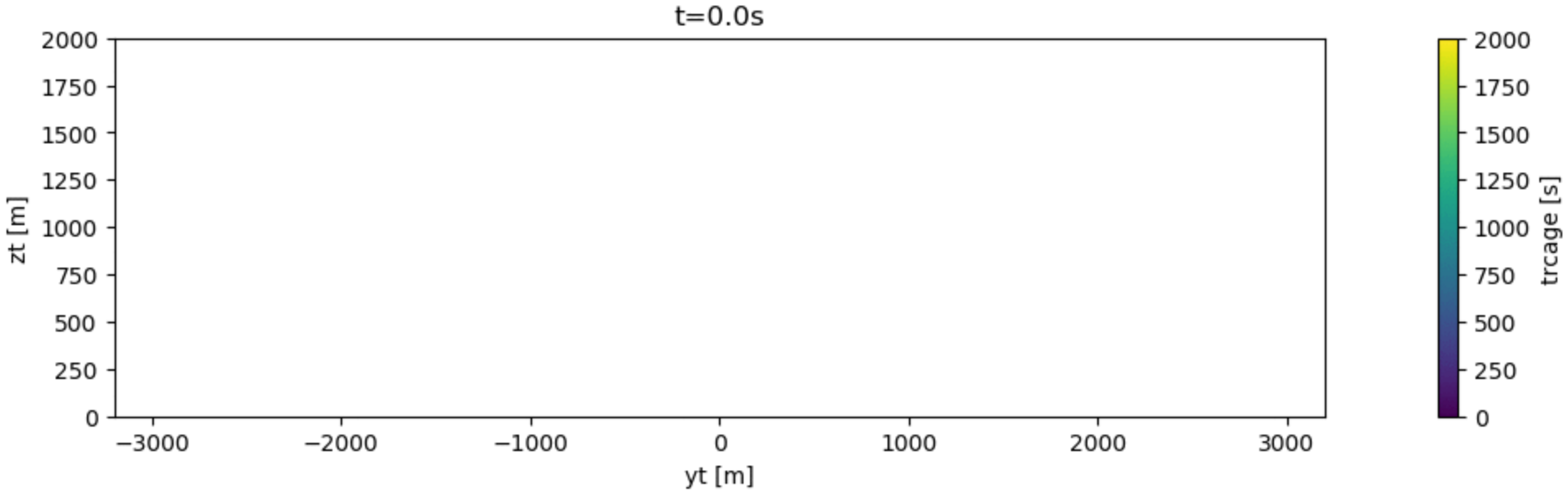
GENESIS Update

Leif Denby 30/8/18

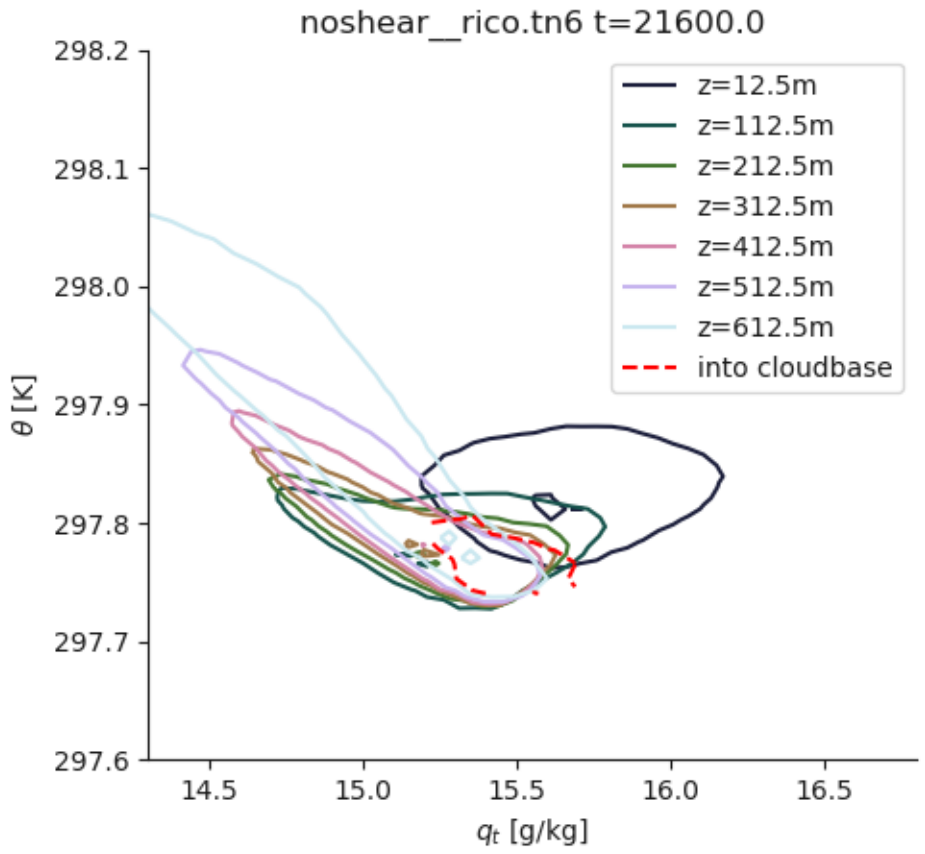
Boundary layer thermals marked with radioactive tracer



- Two tracers (ϕ_1, ϕ_2) with different half-life (τ_1=10min, τ_2=15min) released from surface
- Time since release: $t_{age} = \tau_1\tau_2 \log(\phi_1/\phi_2)/(\tau_1-\tau_2)$

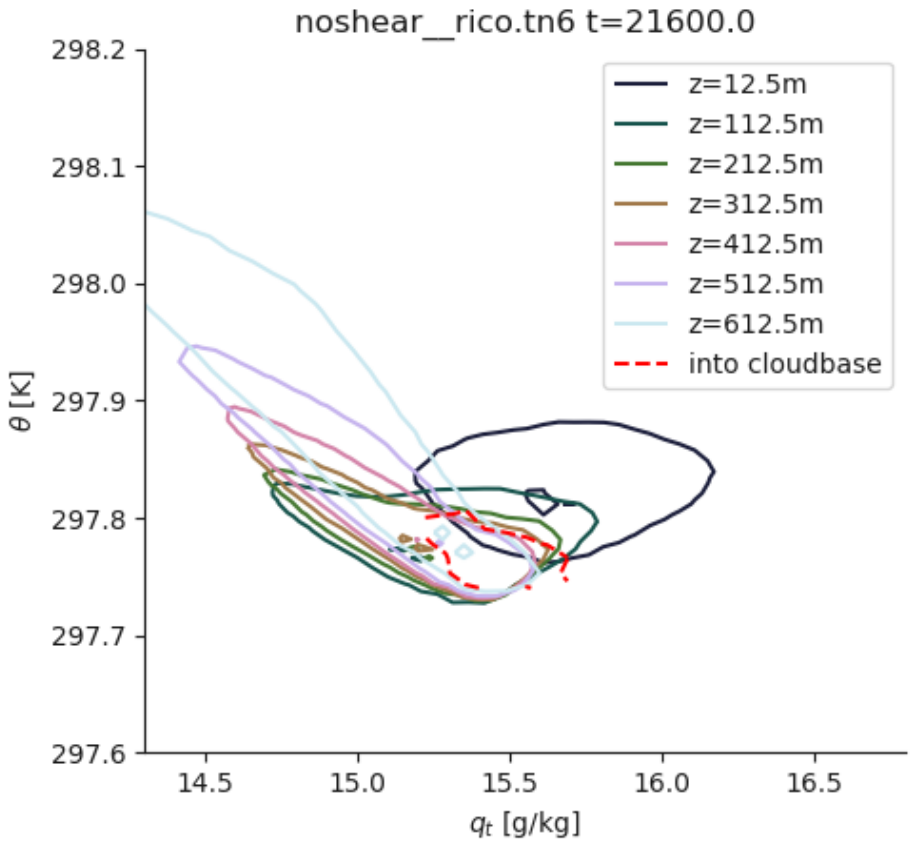
- Thermal edge defined using deviation from std. div. in horizontal slice: $\phi'(x,y,z) > \sigma(\phi(z))$ (as in Couvreux

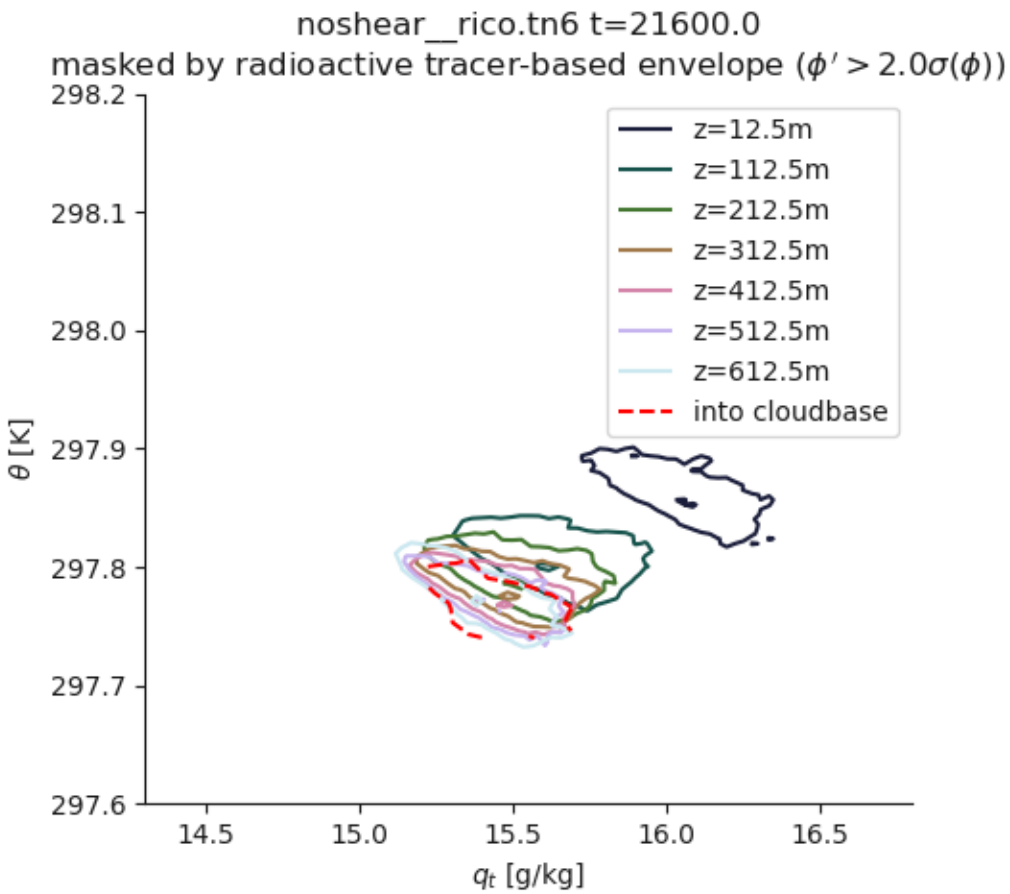
How does water vapour and temperature correlate in the boundary layer?



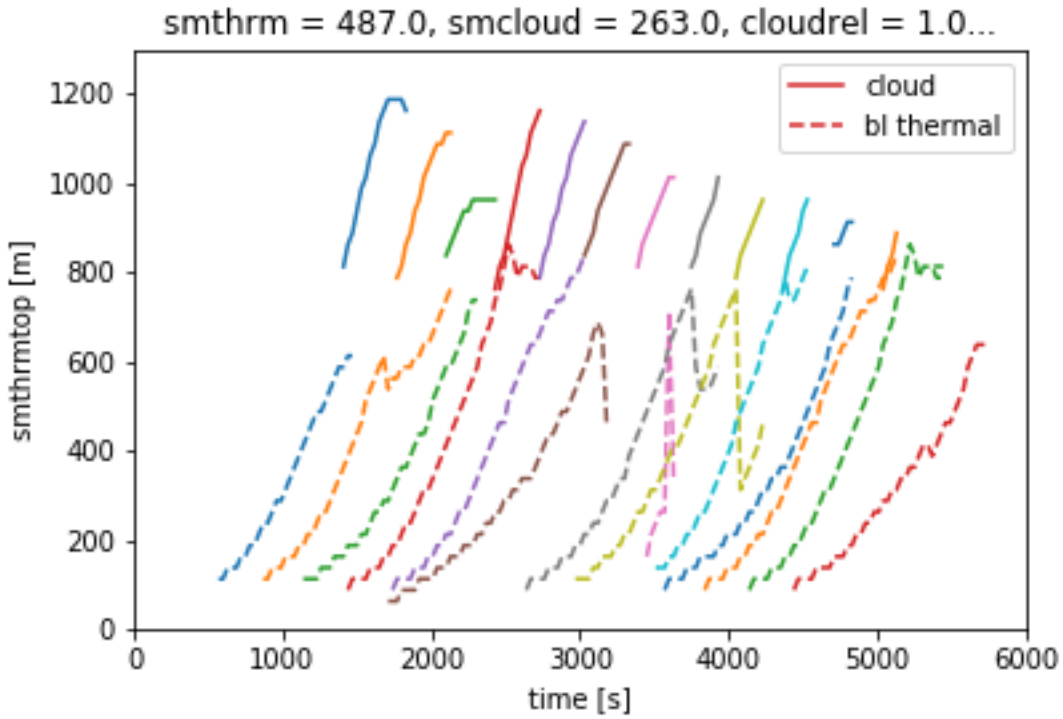
- Cross-correlation of water vapour and potential temperature
- Inner and outer contour at each height contain regions with top 5% and top 90% concentration of points respectively
- Red contour: air Δx below tracked clouds within 3min of appearance => air entering clouds

Radioactive tracer picks out air entering clouds





Tracking thermals and clouds



Height of top of individual clouds and thermals that each cloud was triggered by

- Both thermals and clouds are tracked separately (using rad. tracer and liquid water)
  - Cloud-tracking code altered to identify coupling
- Can study properties of air triggering specific clouds
- Currently ~60% clouds have triggering thermals identified. Another trigger mechanism? Investigating cut-offs in tracking

Next steps

- Have performed RICO-like simulations with varying Bowen ratio
- Setting up RICO-like deep convection simulations
- Writing paper on techniques developed (rad. tracer, cumulants, Minkowski funtionals etc)
- Working with Chris Dearden to introduce radioactive tracer in UM simulations (topography case over India)
- Will look at flight-based AMMA observations of isoprene (unstable compound released by plants)