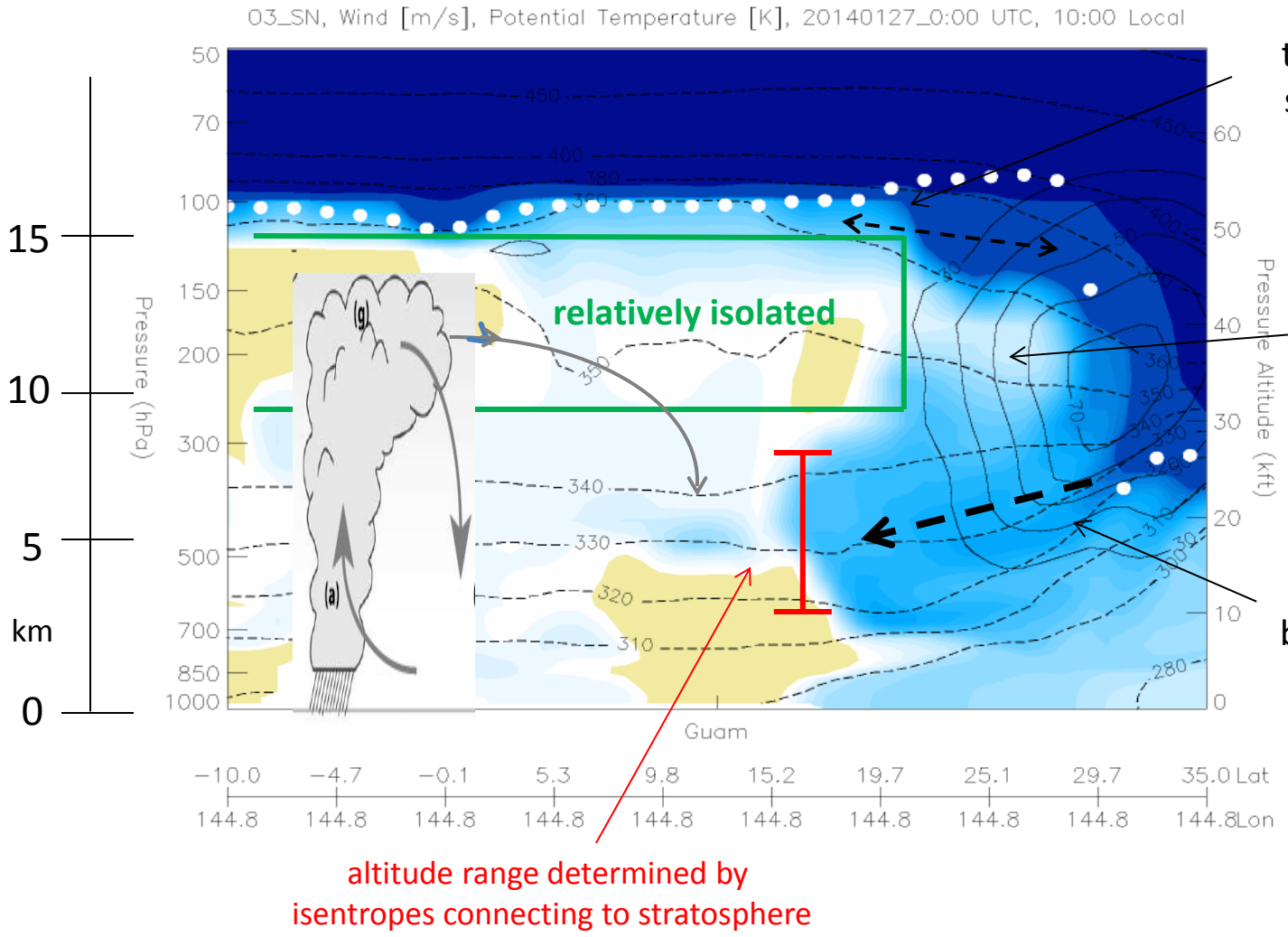
Stratospheric influence in the tropics inferred from CONTRAST



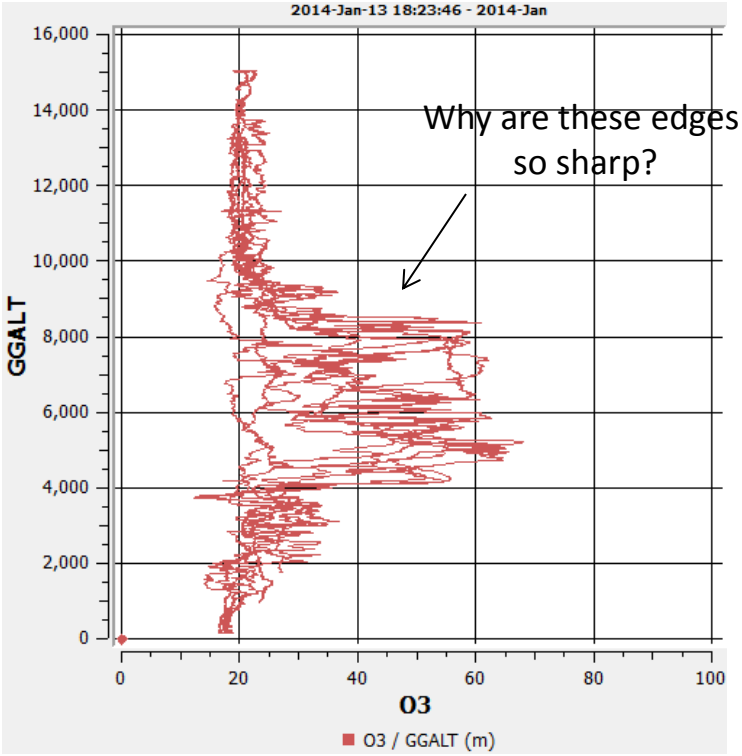
transport above jet seen in CO and H_2O

weak transport across jet core

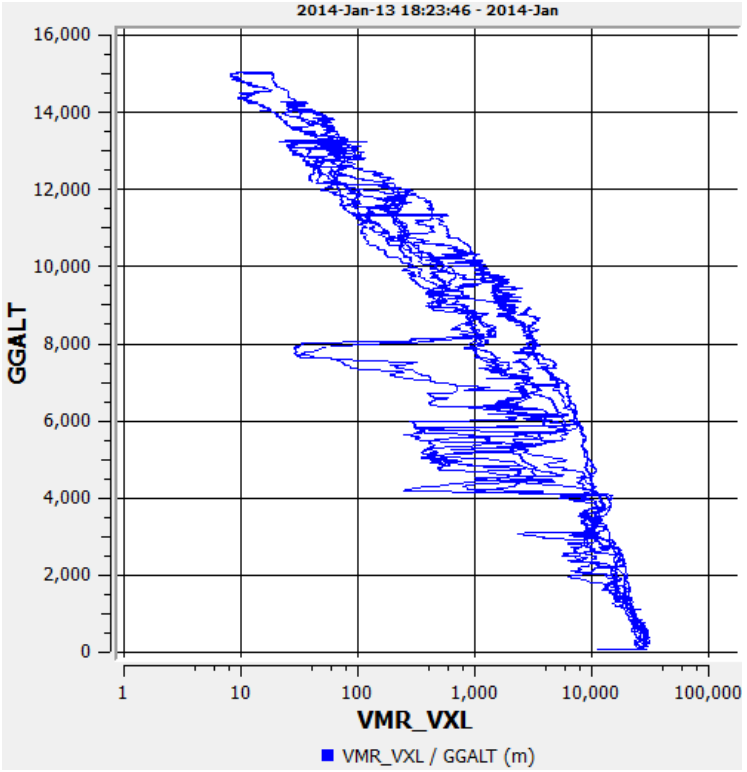
ubiquitous transport below jet – source of very dry air

altitude range determined by isentropes connecting to stratosphere

Example: RF03

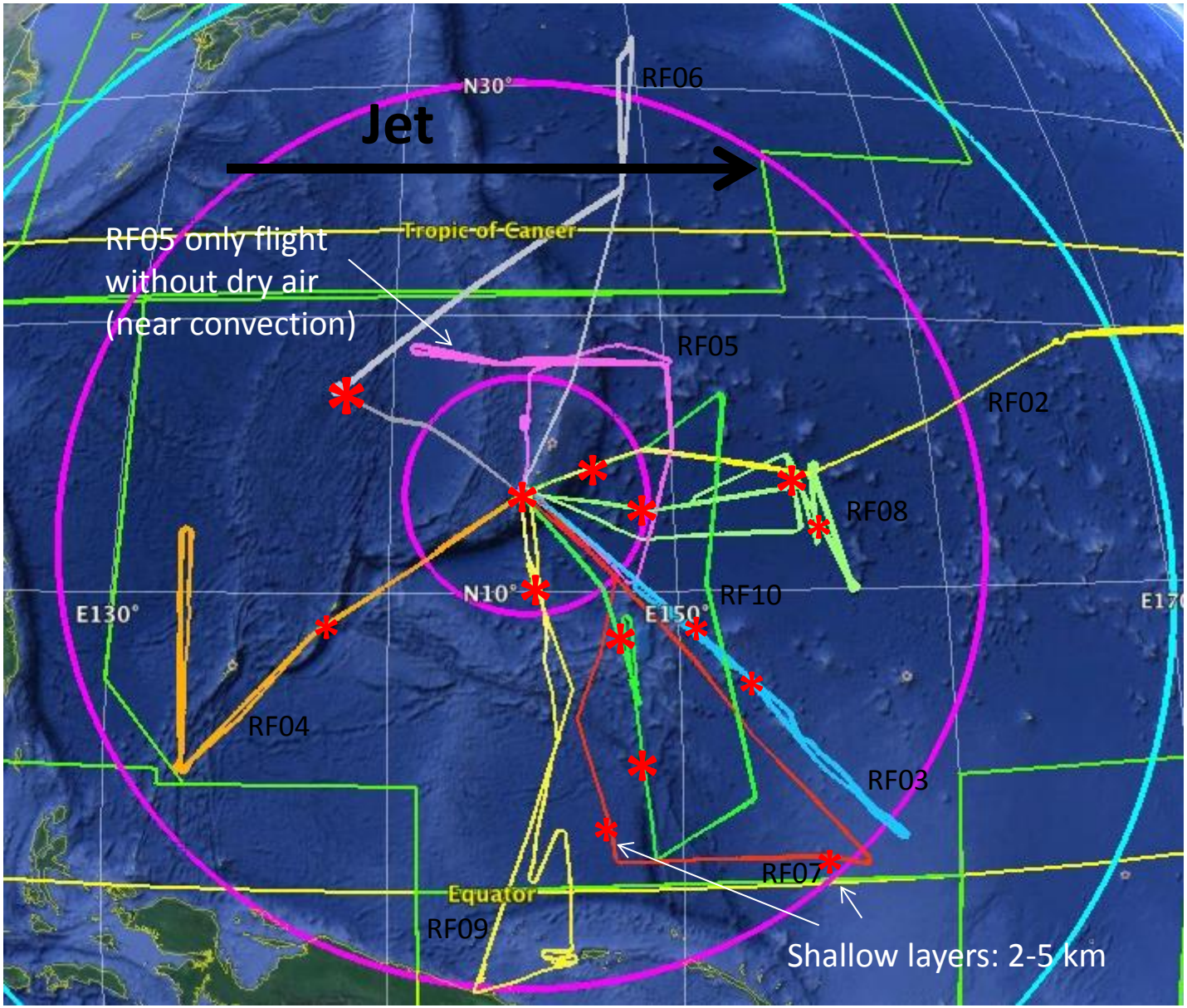


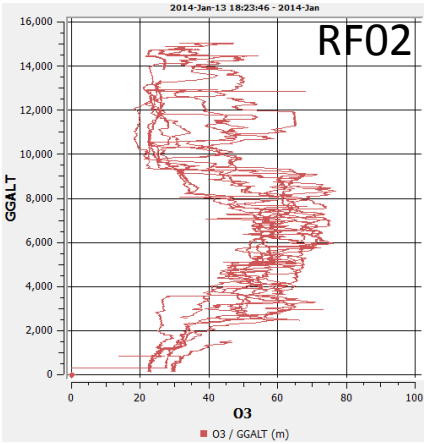
ozone

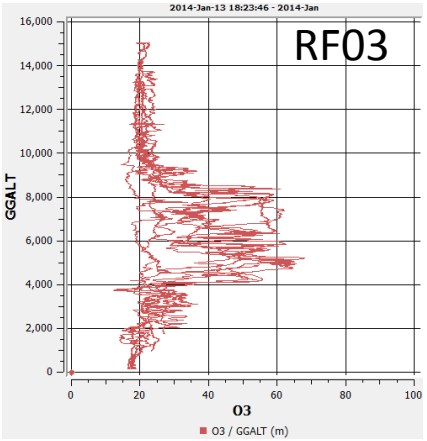


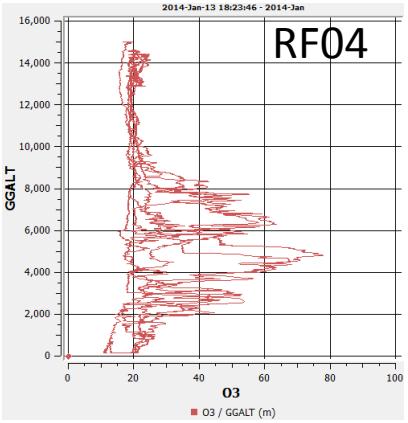
H_2O

Where is the dry air?

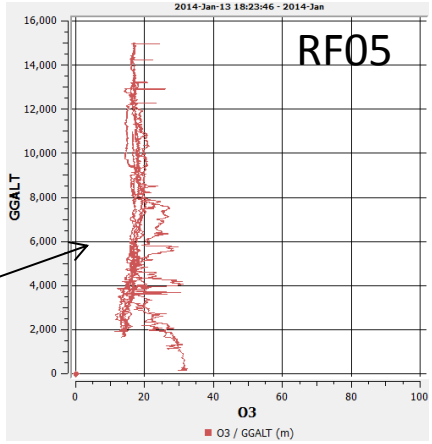




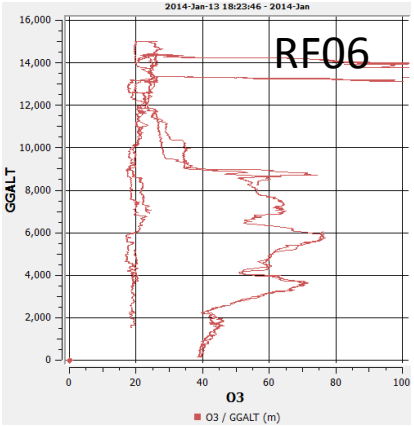


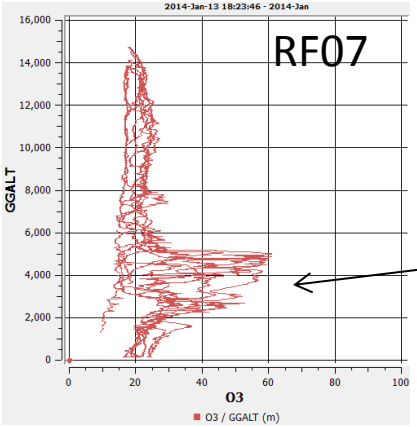


layer altitudes typically ~4-10 km

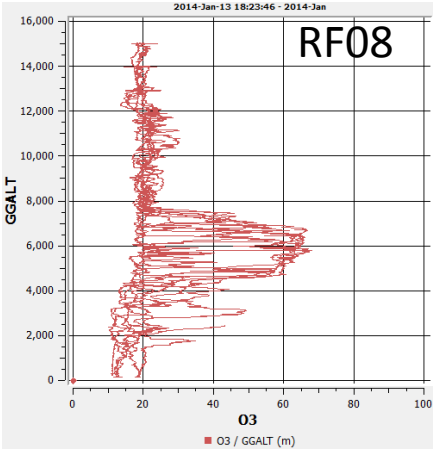


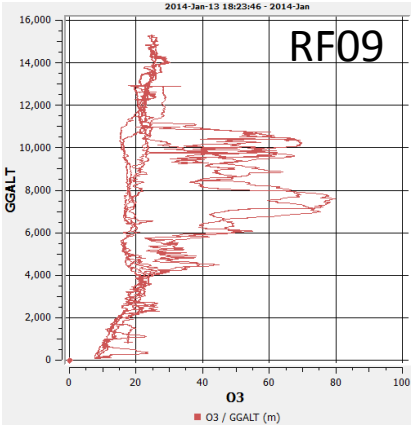
no layers

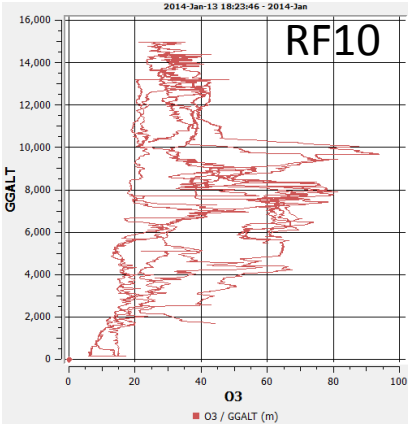


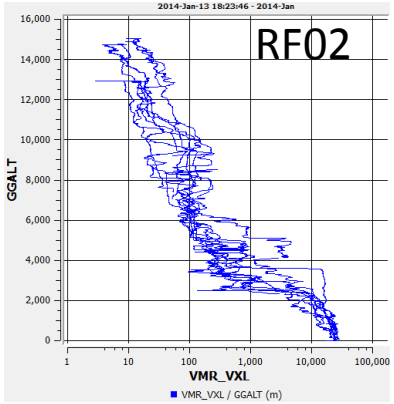


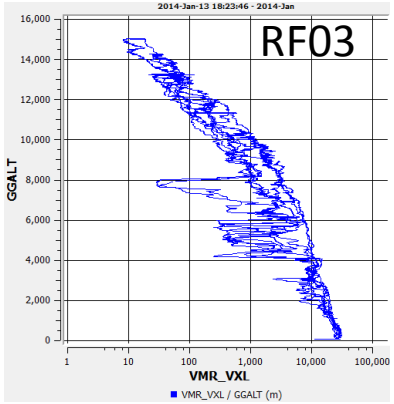
shallow layers near equator

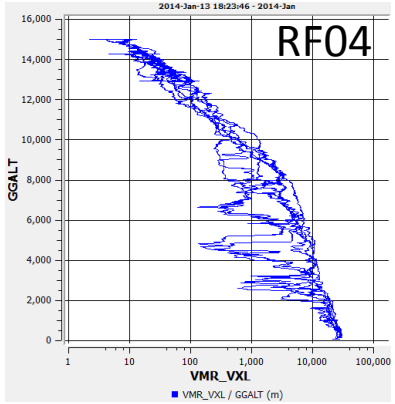


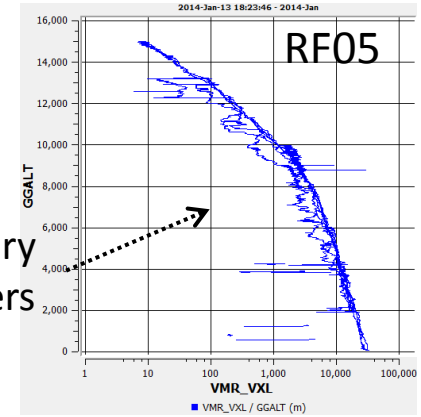




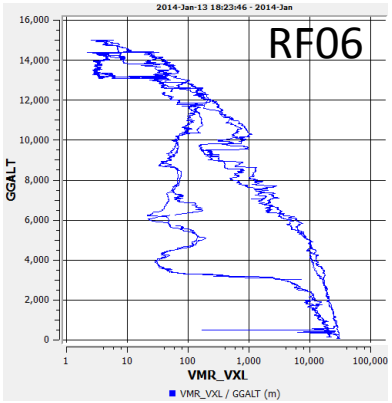


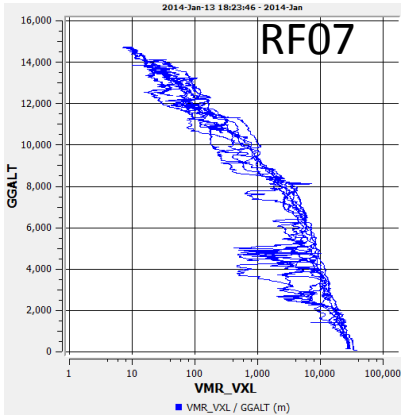


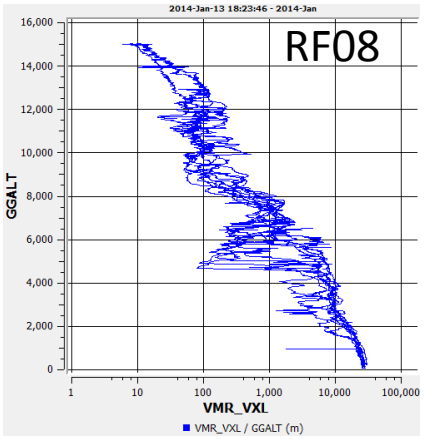


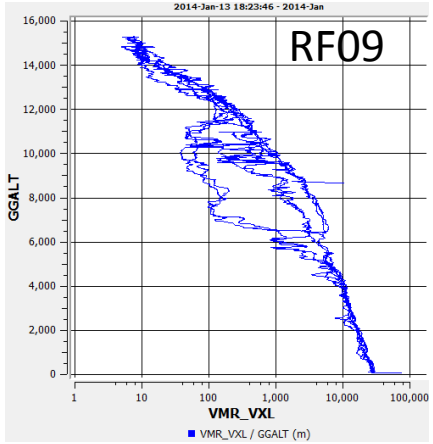


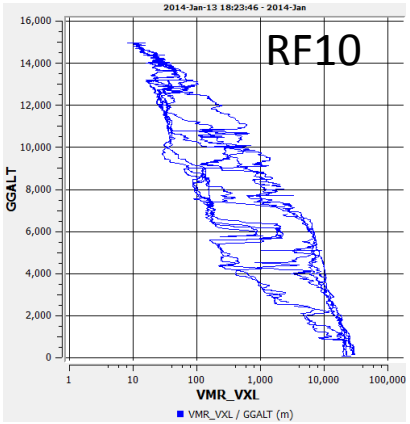
no dry layers







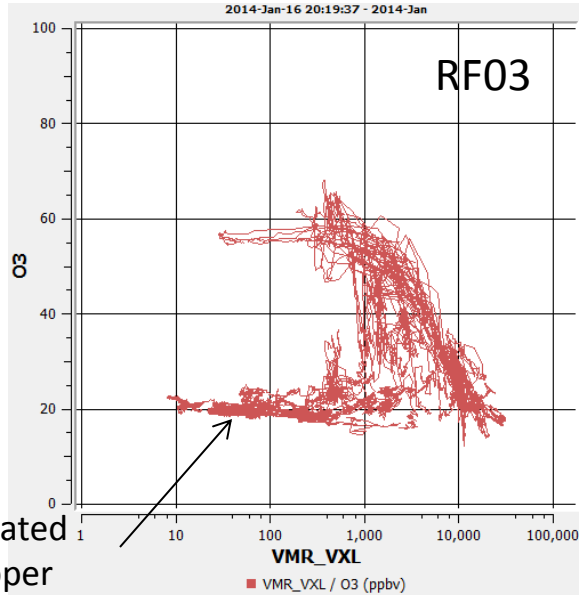




Easily identified in tracer correlations:

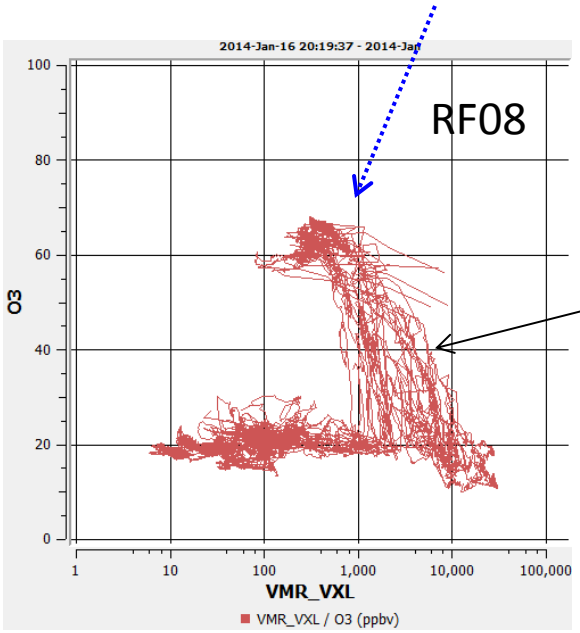
What does the slope of this line tell us about mixing?

ozone



isolated upper troposphere

H_2O



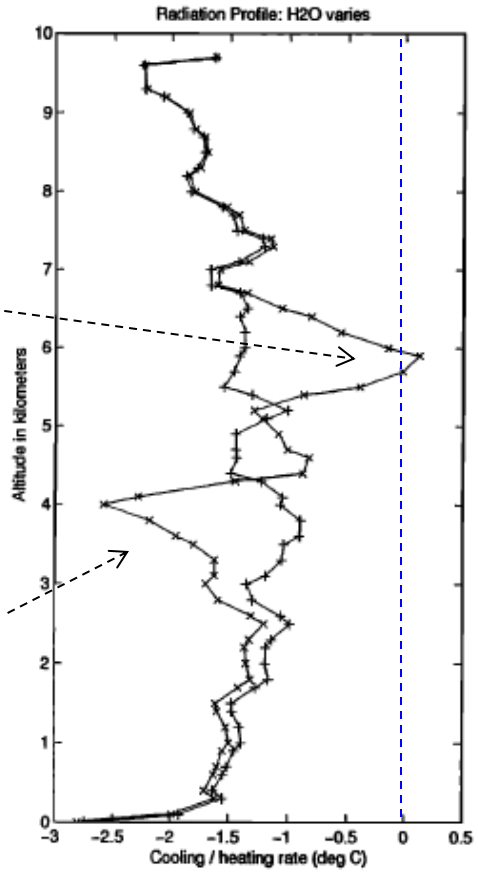
layered stratosphere influence

H_2O

Radiative impact of dry layer:

reduced cooling at top of layer (stabilizing)

enhanced cooling at bottom of layer (destabilizing)



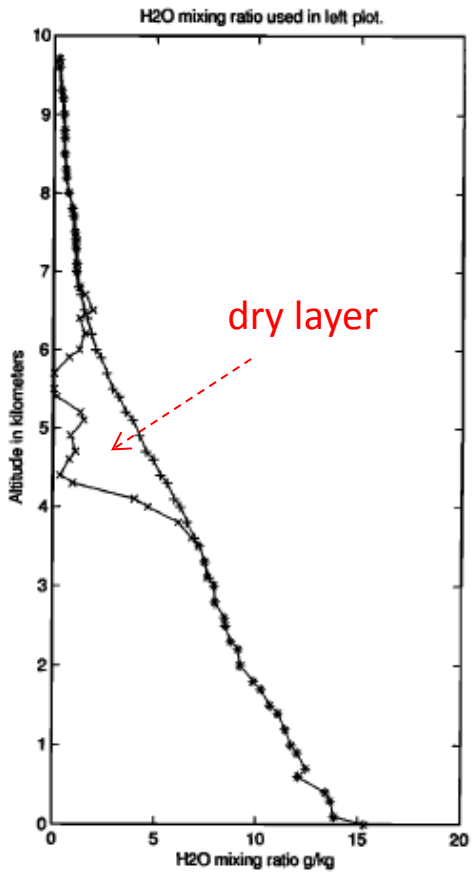


Figure 9. Radiative cooling rates for no-layer case (plusses) and layer case (crosses) using ozone and water vapor data from Figure 8.

Stoller et al, JGR, 1999

Lots of questions:

1) What is the climatology of this behavior ? Does this occur primarily during NH winter (strongest jet) ?

2) Can we derive (isentropic) mixing behavior from these observations ?

3) What are the other chemical signatures (besides ozone) ? Is anything interesting happening chemically?

4) What is the influence on the stability/general circulation of this region ? (and the tropics in general) ?

5) Can 'standard' radiosondes accurately capture the dry layers ?