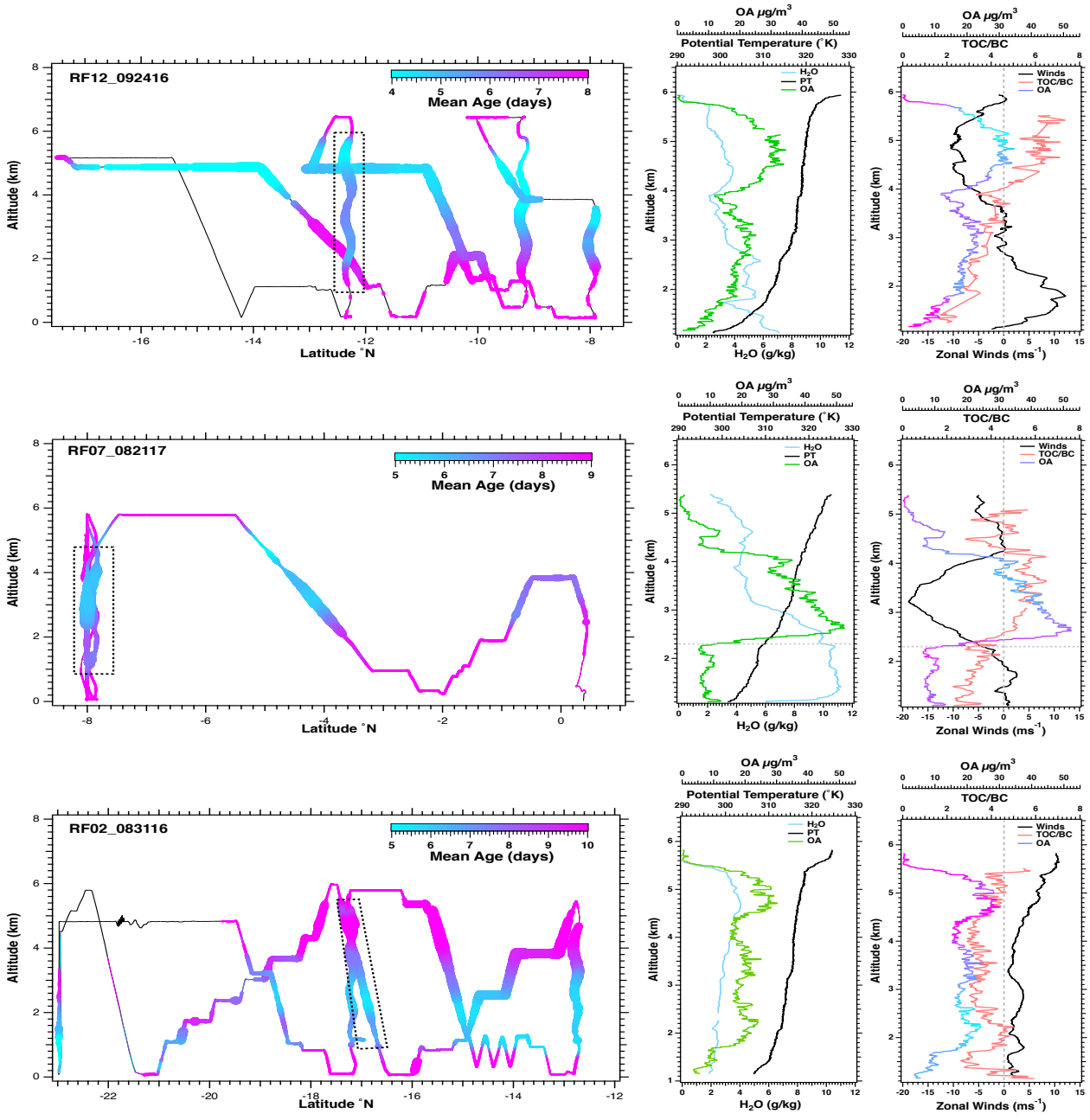
For my class project I would like to utilize IDV to look at back trajectories. If it's possible I'd like to look at back trajectories for 3-4 specific cases over the three year observation period (at least one from each year). I'd like to see if there's evidence of source region differences. We see very different plumes structurally, which we think we can attribute to a combination of meteorology and atmospheric chemistry. However, due to the limitations of ORACLES we know nothing about the burning conditions at the source, or even where the source is. Below I've attached and annotated three different vertical profiles to show what differences we observe, and where I think back trajectories can help broaden our analysis on the biomass burning plumes over the southeast Atlantic Ocean. Ideally I'd like to incorporate more back trajectory work into my research. I am aware of the limitations and uncertainties associated with back trajectories, but I think if I can use IDV and learn how to do this analysis, it could provide important insights to my research overall. I've taken a very crude look at HYSPLIT back trajectories along the flight path, but those results were inconclusive. This time around I'd like to be more diligent and really tease apart profiles from single flights.



Top profile is the ideal case we are working with. Younger aerosol seen higher in the plume with lower aerosol below.

Middle profile has older aerosol above and below, with youngest aerosol seen where the easterly winds are the strongest. Also have a very high inversion layer around 2.3km. H2O profile is much higher.

Bottom profile – older aerosol on top of younger. Neutral winds. Low H2O.

All 3 cases are unique. The structural differences can be attributed to a combination of photochemistry and meteorology. As organic aerosol ages on the order of 4 to 9 days over 50% of the mass is lost (we believe due to photochemistry). However, knowing where the aerosol came from and perhaps a different estimate of how long it has traveled using back trajectories could provide more insight on both the chemistry and meteorology of the southeast Atlantic.

Data :

- ORACLES AMS DATA from 2016, 2017, 2018 to identify chemical differences within the plumes (not to be incorporated into IDV)
- Back trajectory data from IDV. I'm guessing wind data would also be important. Not sure what I need to run the back trajectories, but I will look into it.
- If possible, I'd like to incorporate MODIS/AQUA/TERRA fire data. I think if we take back trajectories from a certain plume from a particular flight and say we do 5 day trajectories, I can load in the total fire counts from those 5 days to see if we can identify specific burning regions.