



The Long-Lived Plume of the Pacific Northwest PyroCb Event: Composition Evolution from MLS Observations

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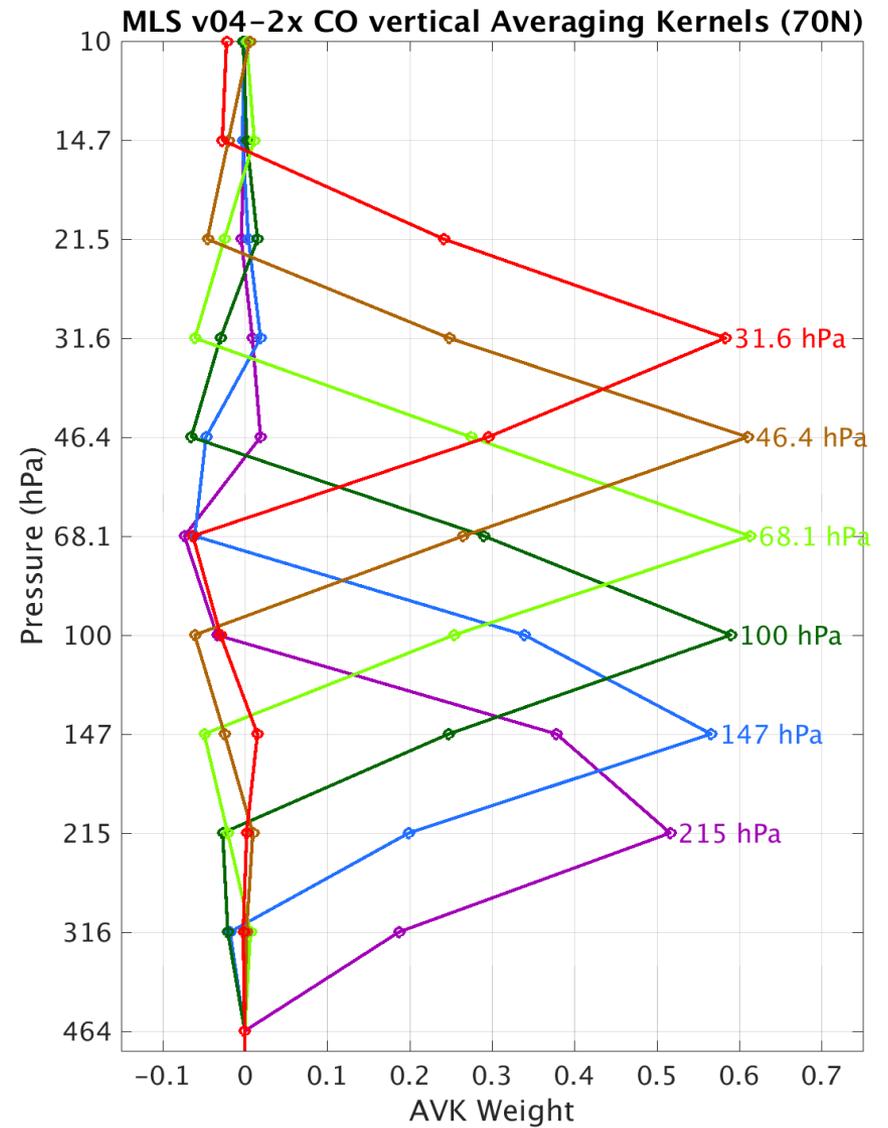
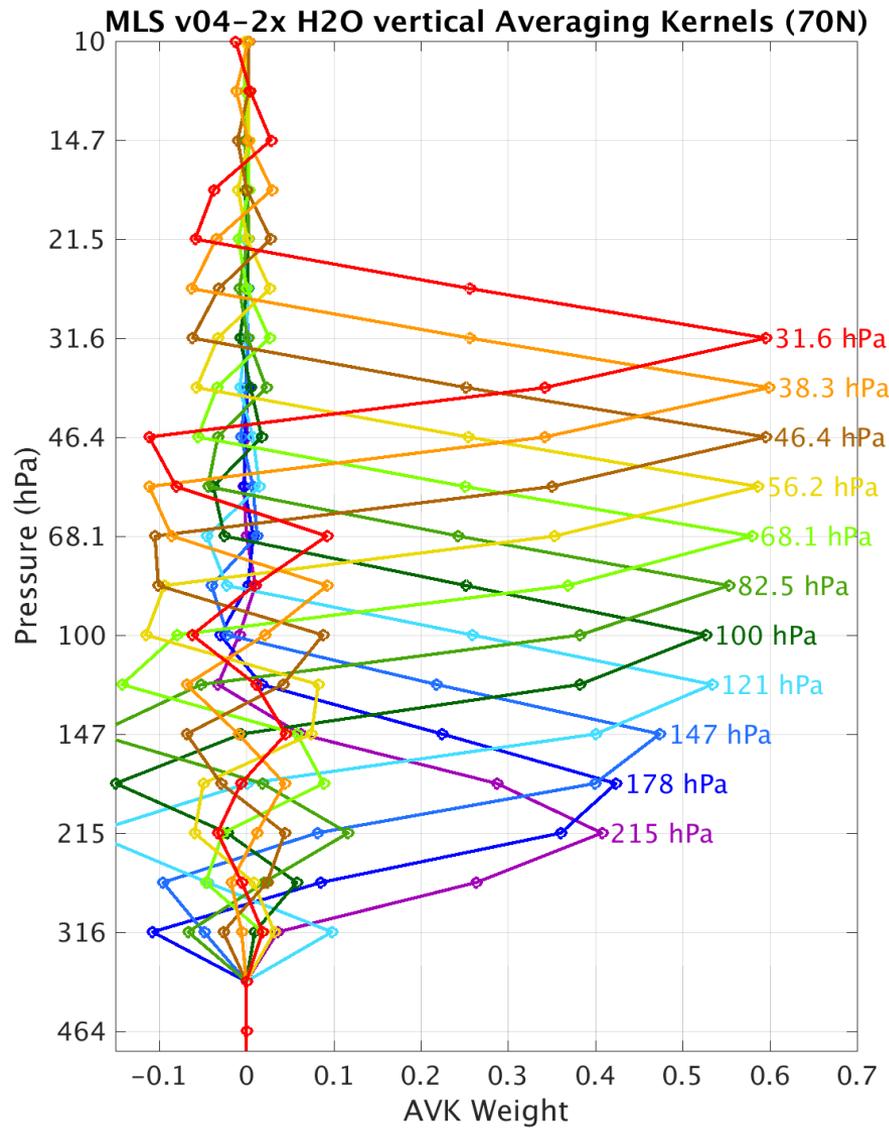
- The 14+ year record of composition measurements from Aura MLS is an extraordinary resource.
- MLS has provides 3500 daily, global profiles along the suborbital track of ~18 atmospheric constituents and Temperature and GPH
- Profiles are inferred from measured thermal emission from constituent spectral lines, so are made day and night.
- The Aura orbit is sun-synchronous, so profiles are at fixed local times along the orbit.
- Retrievals are nearly linear, so averaging kernels do not change much with scene.
- The limb-viewing geometry gives good vertical resolution at the expense of poor resolution along the viewing (along-track) direction
- The instrument is still largely functioning well and the satellite has fuel to allow for at least another 5 years.
- There is no similar instrument in the works as a follow-on.
- The science team is happy to consult/ collaborate/ share insights.



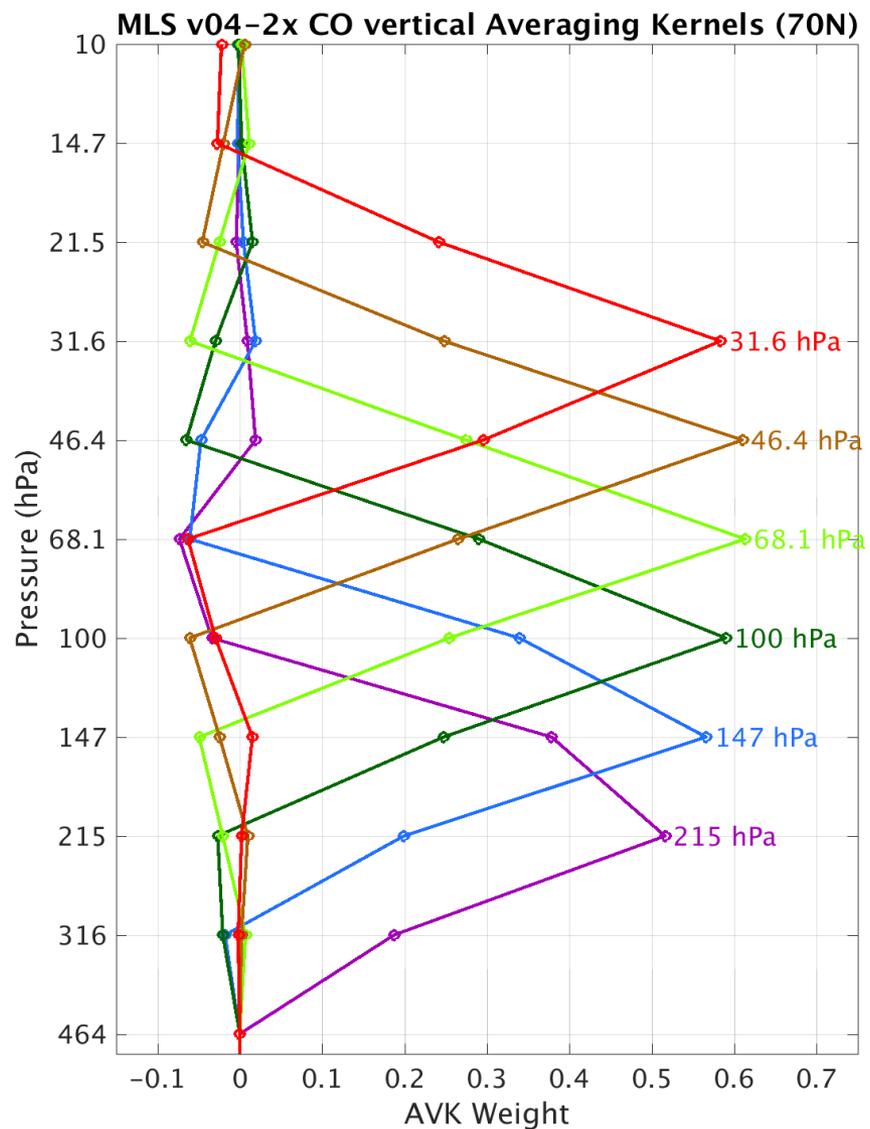
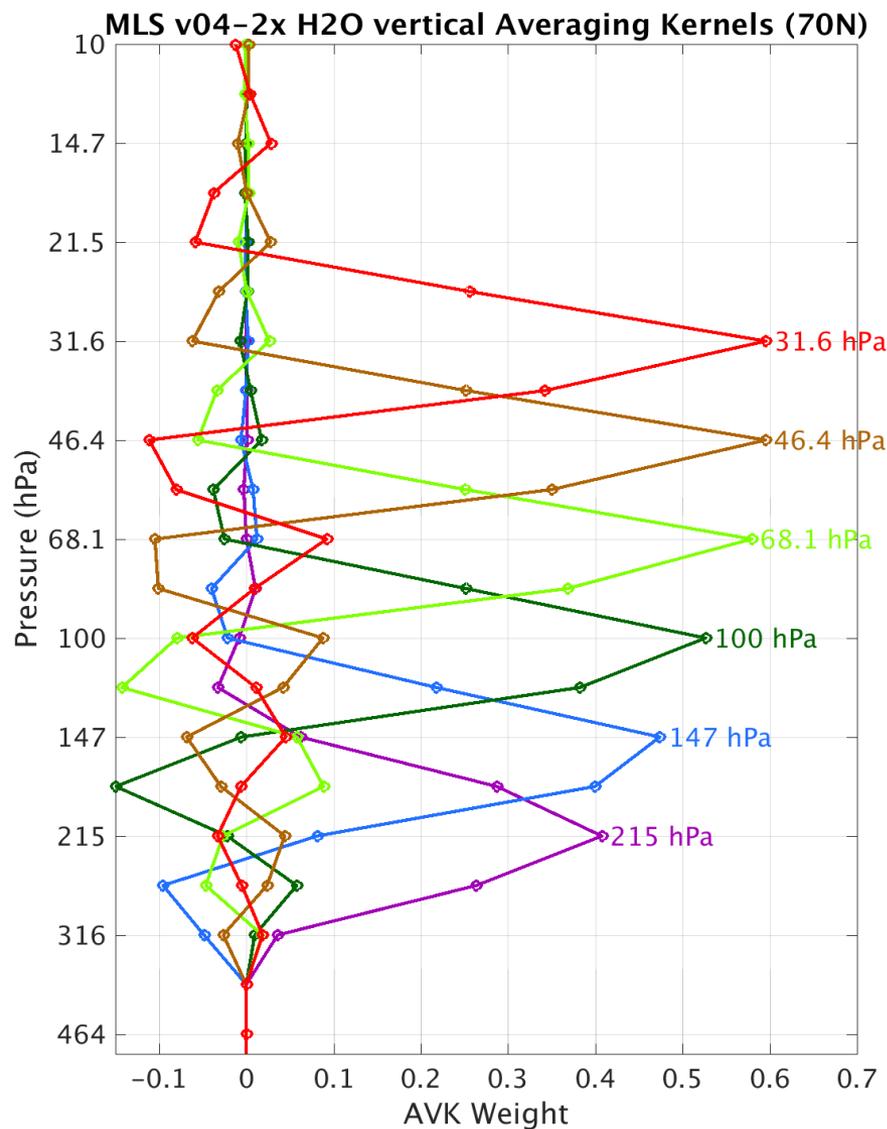
DOWNLOAD AND READ THE DATA QUALITY DOCUMENT
Contact the science team if you have questions

	LS VAvk FWHM	LS HAvk FWHM	Useful Vertical range	Precision	Estimated Accuracy	Retrieval resolution
CO	5 km	425 km	215-0.0046 hPa	9—14 ppbv	~50%	6/decade
H ₂ O	3.1 km	190 km	316—0.002 hPa	5—10%	4—9%	12/decade
O ₃	2.5 km	350 km	261—0.02 hPa	60 ppbv + 3%	100 ppbv + 7%	12/decade
HNO ₃	4 km	400 km	215—1 hPa	0.6 ppbv	1—1.5 ppbv	6/decade
CH ₃ CN	5.5 km	500 km	147—1 hpa	50 pptv	100%	6/decade
CH ₃ Cl	5.5 km	450 km	147—4.6 hPa	100 pptv	30--50%	6/decade
CH ₃ OH	5 km	350 km	Contact MLS	1 ppbv	100 %	6/decade
HCl	3 km	300 km	147—0.32 hPa	0.2ppbv, 50%	0.2 ppbv, 25%	6/decade
HCN	10 km	300 km	21—0.1 hPa (HCP)	50%	poor*	6/decade
ClO	3 km	~400 km	147—1 hPa	0.1 ppbv	0.2 ppbv*	6/decade
T	3.7 km	165 km	261—0..001 hPa	0.6 K	1—2 K	12/decade

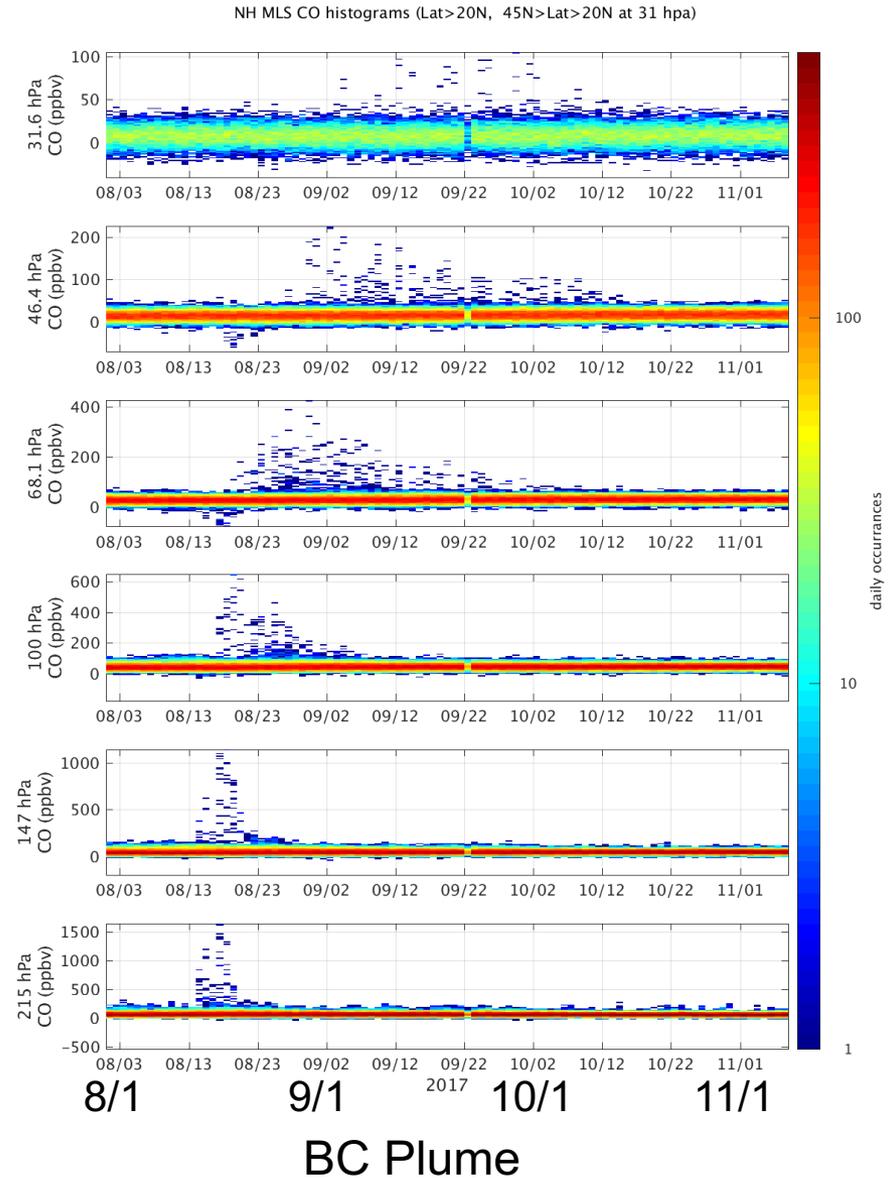
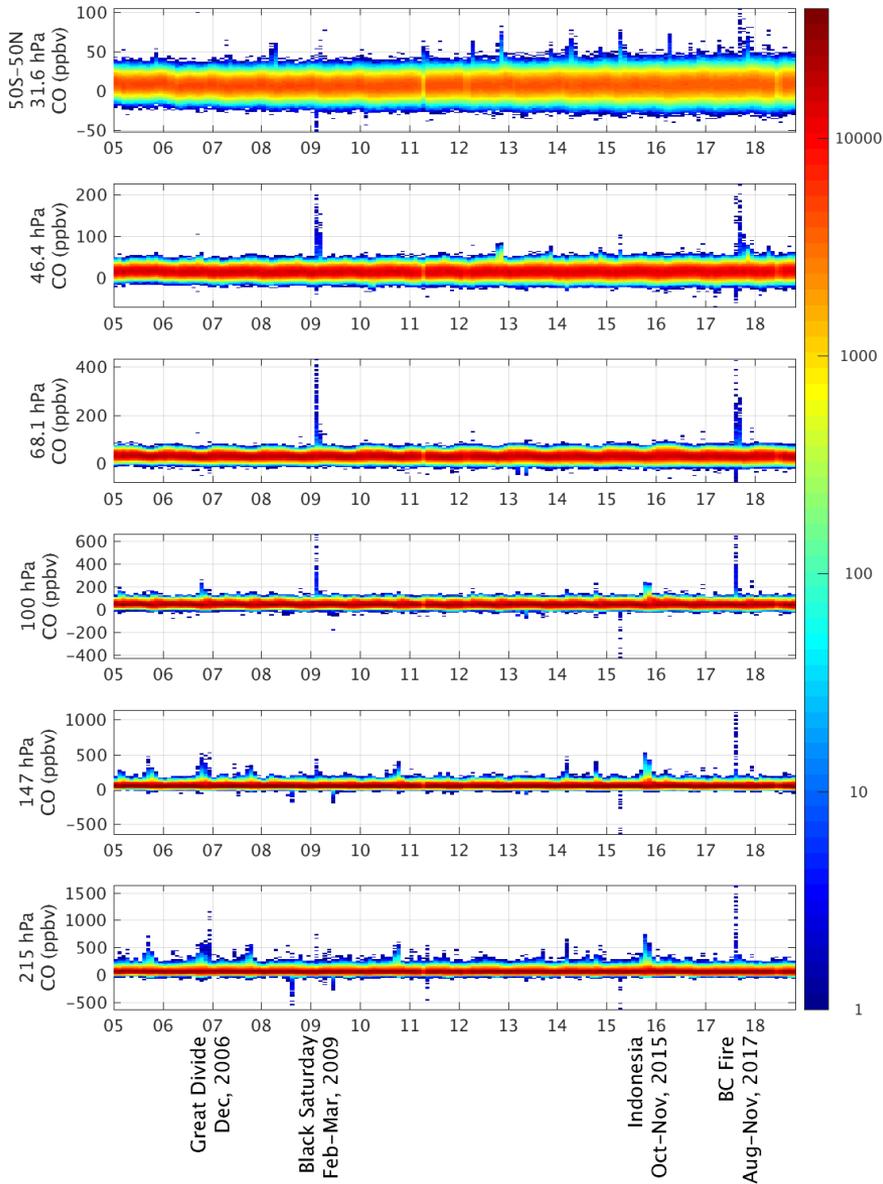
H2O and CO Vertical Averaging Kernels (70N)



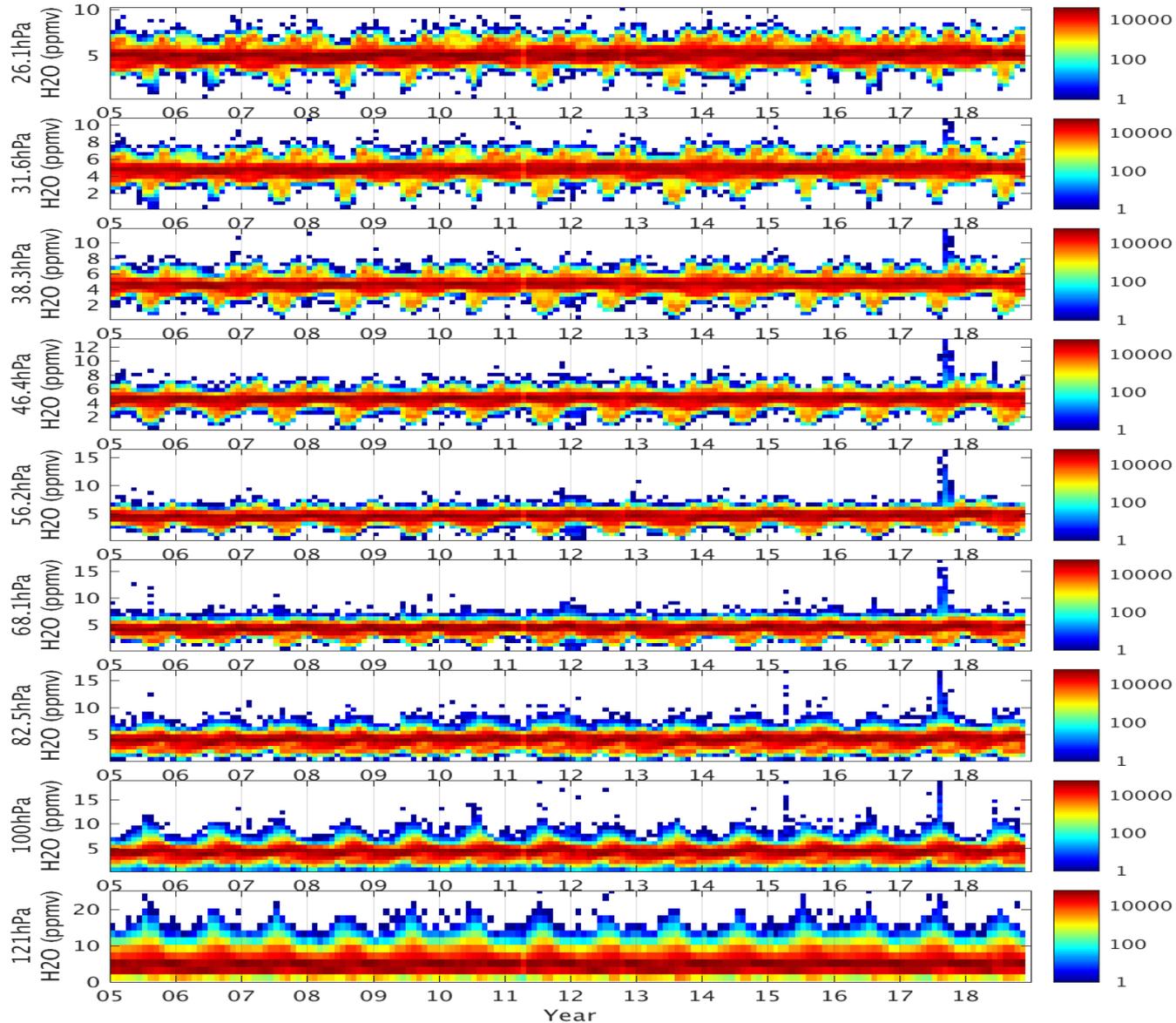
H2O and CO Vertical Averaging Kernels (70N)



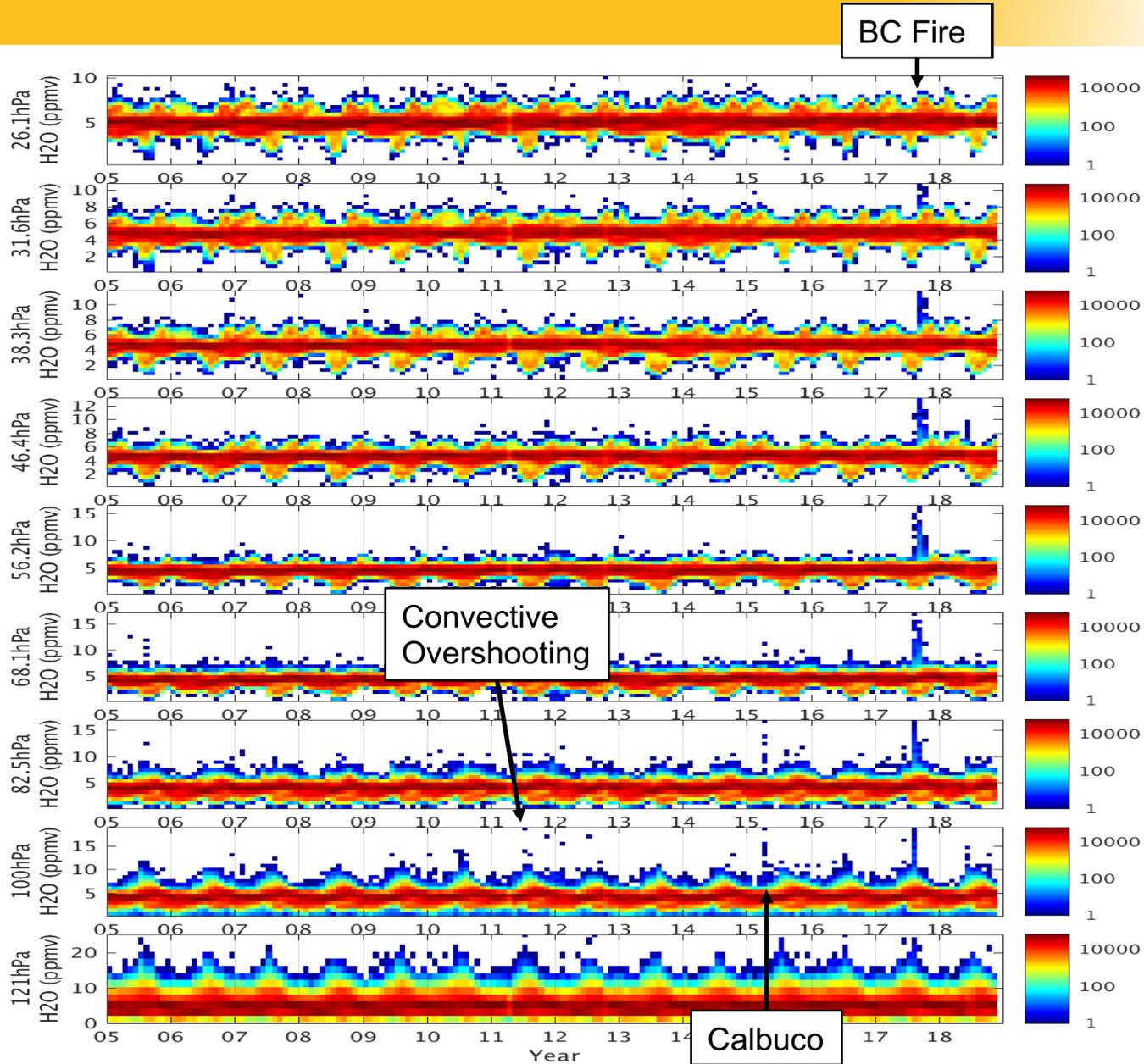
CO Timeseries 215 hPa—31 hPa



Monthly Histograms of MLS LS H2O (2005-2018)



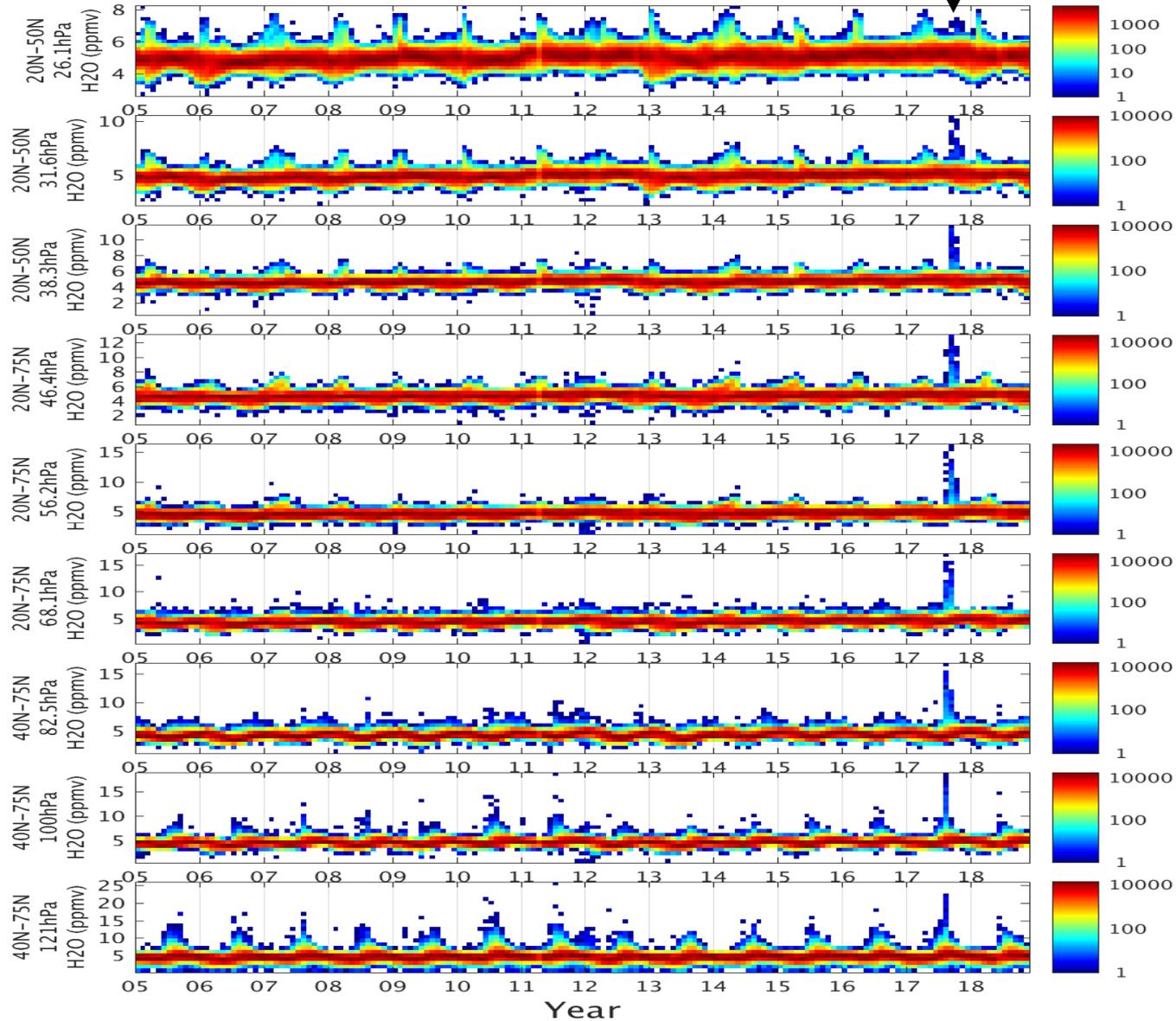
Monthly Histograms of MLS LS H2O (2005-2018)



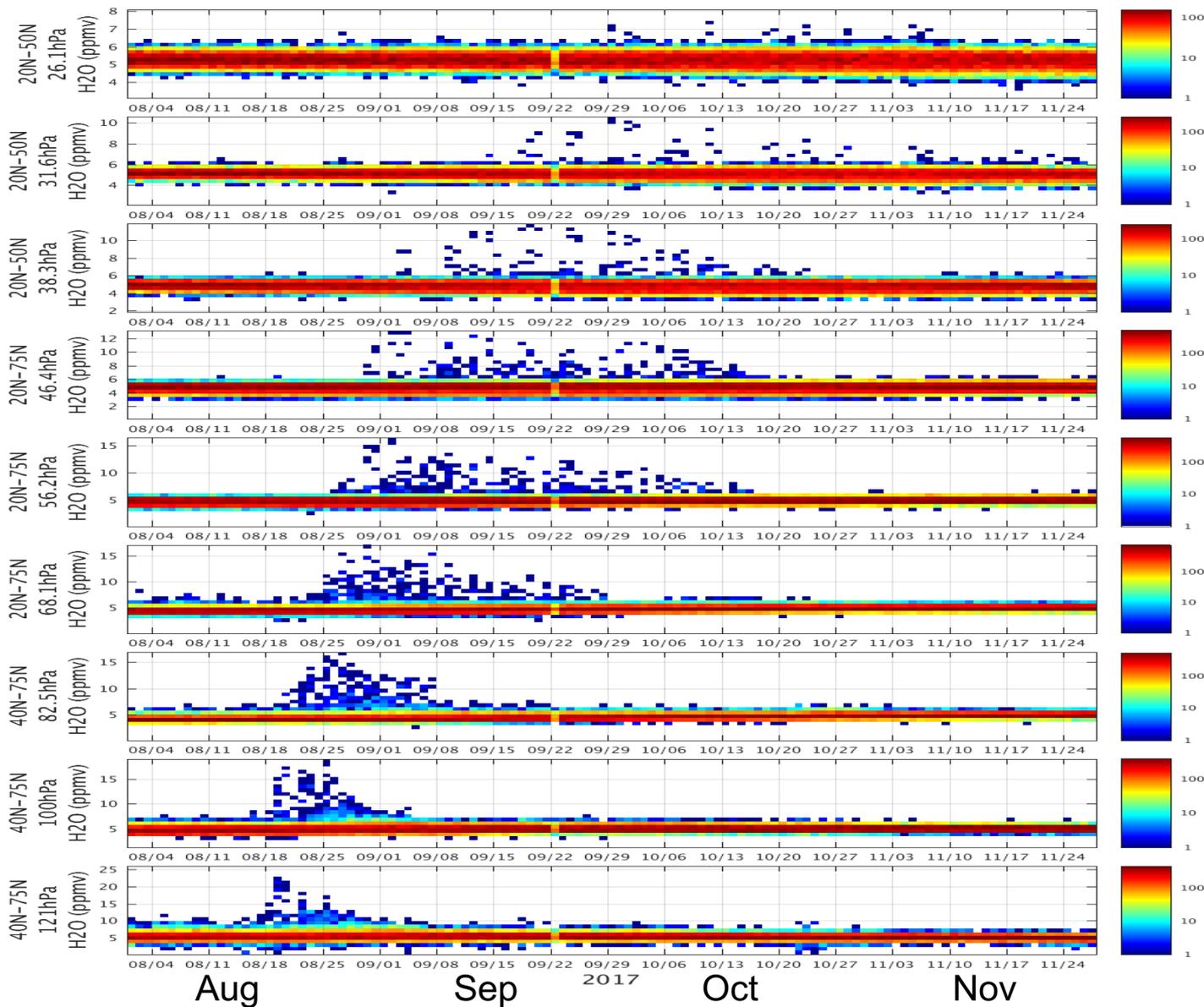
Monthly H2O Histograms, Restricted Latitudes



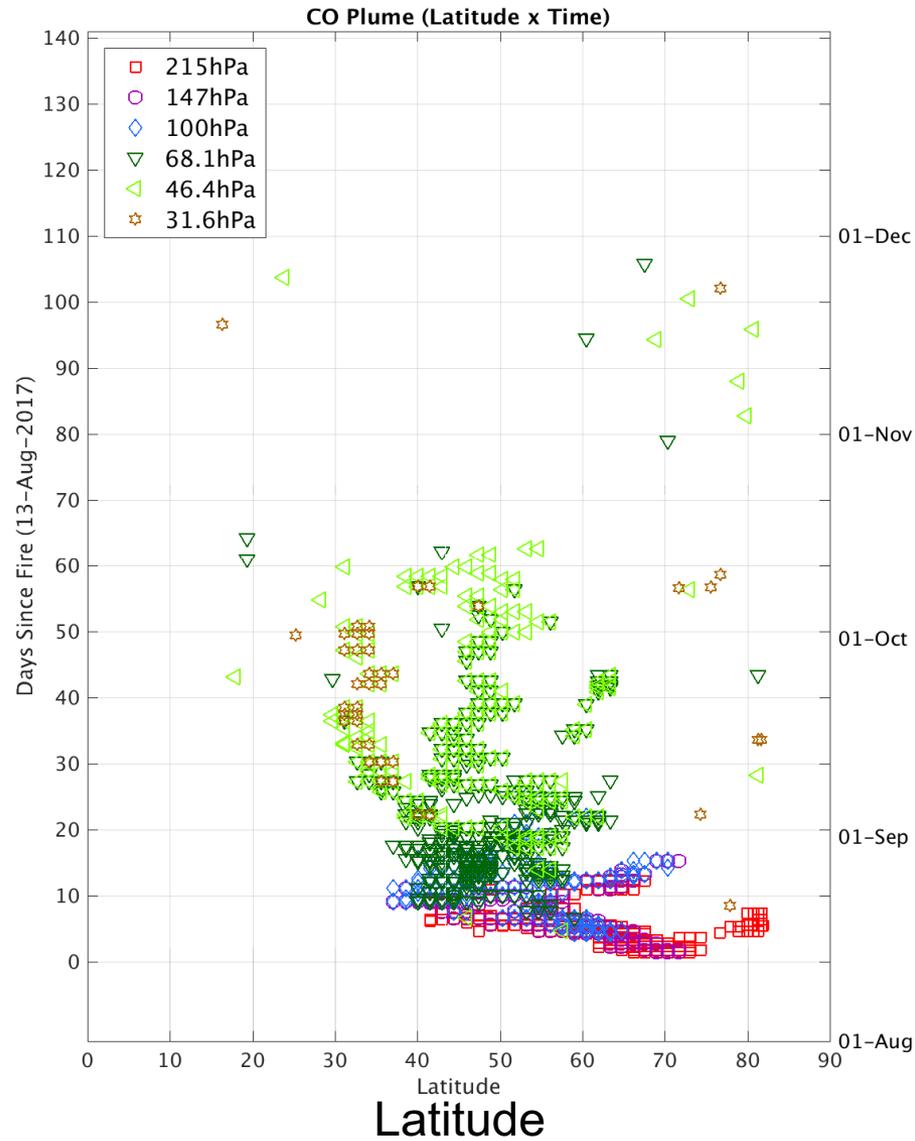
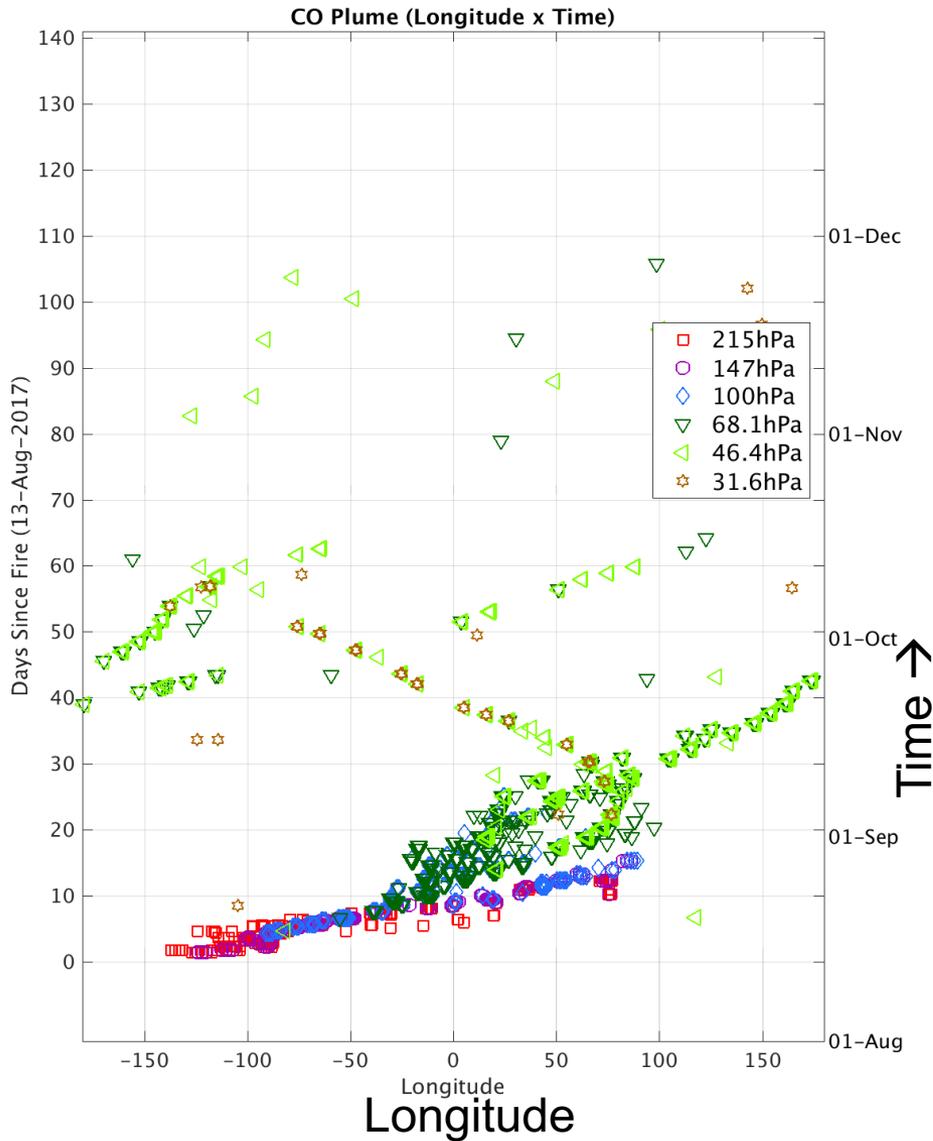
BC Fire



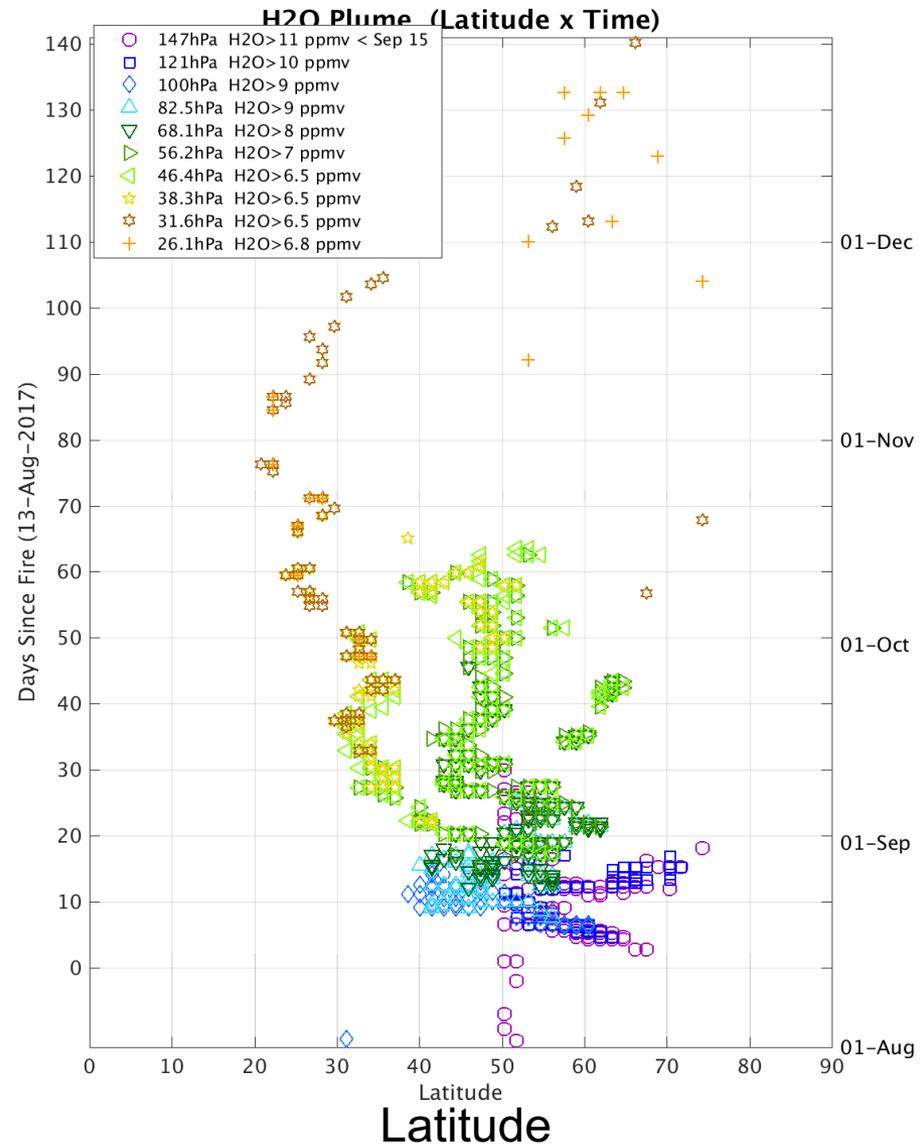
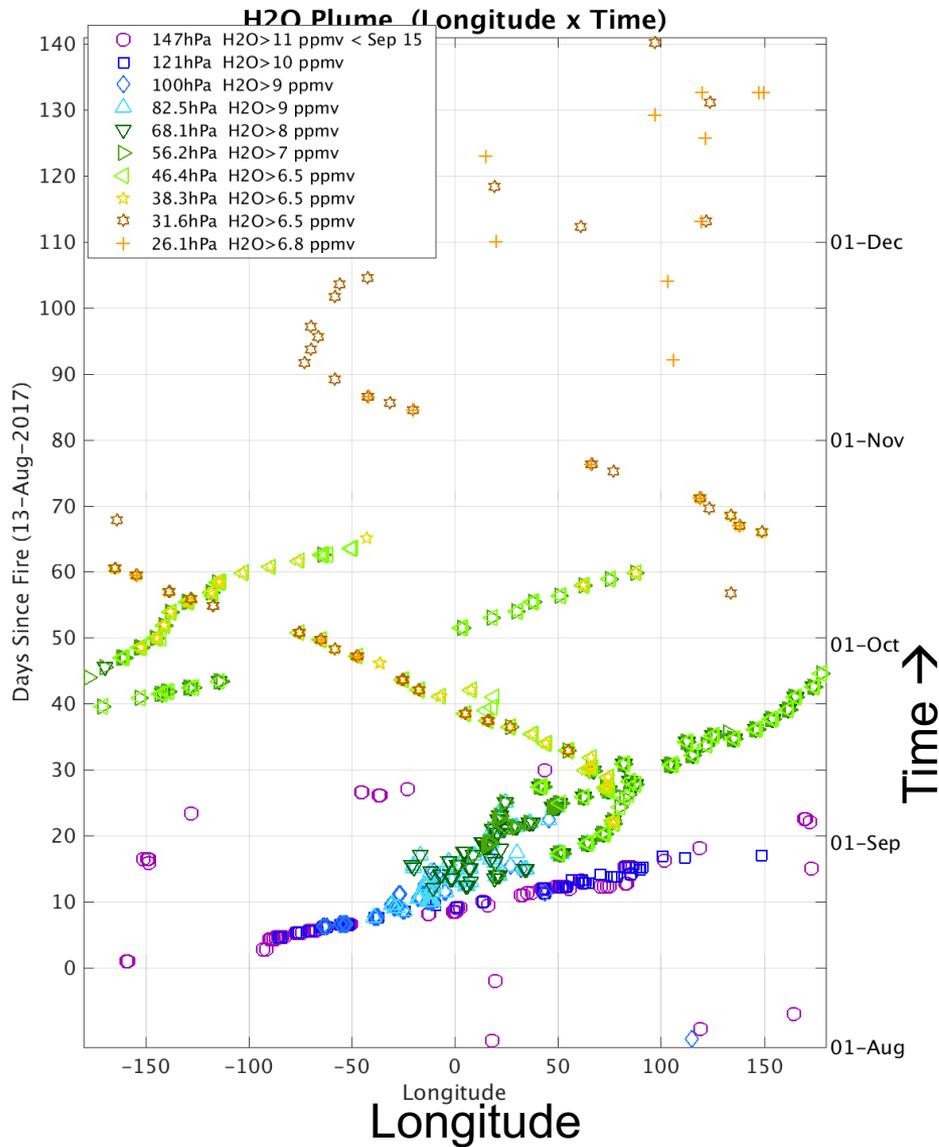
Daily H2O Histograms: August-November 2017



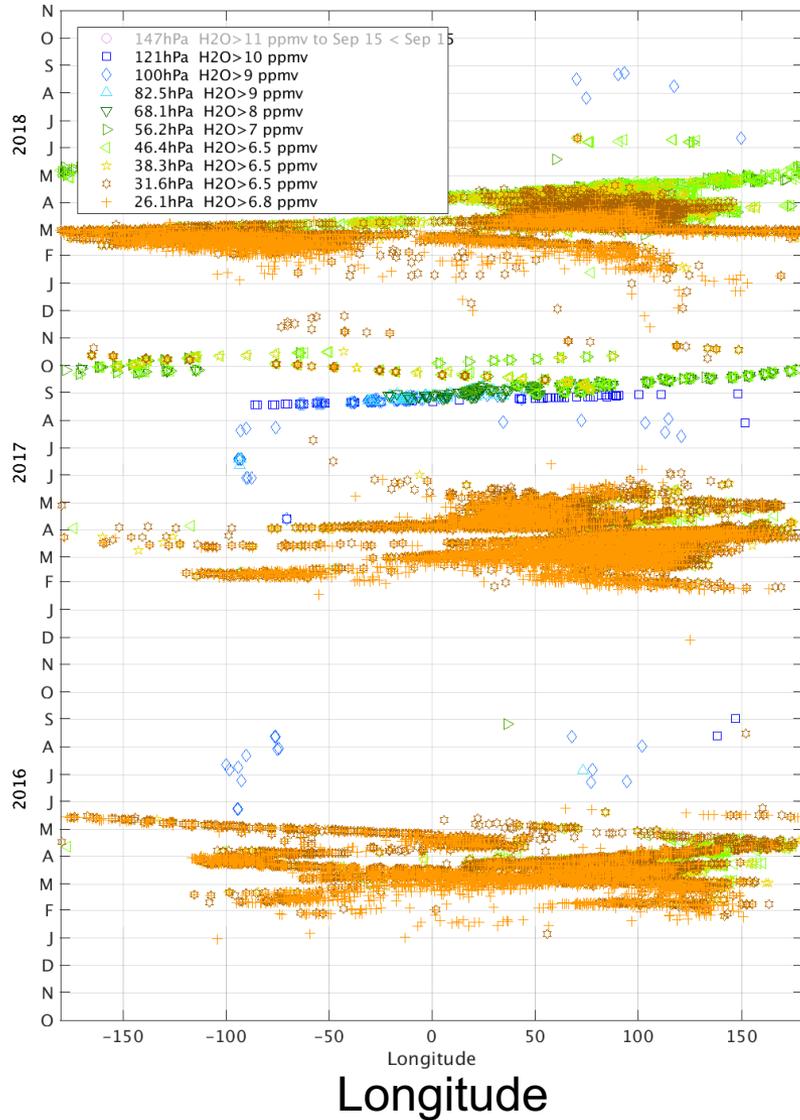
BC CO Plume



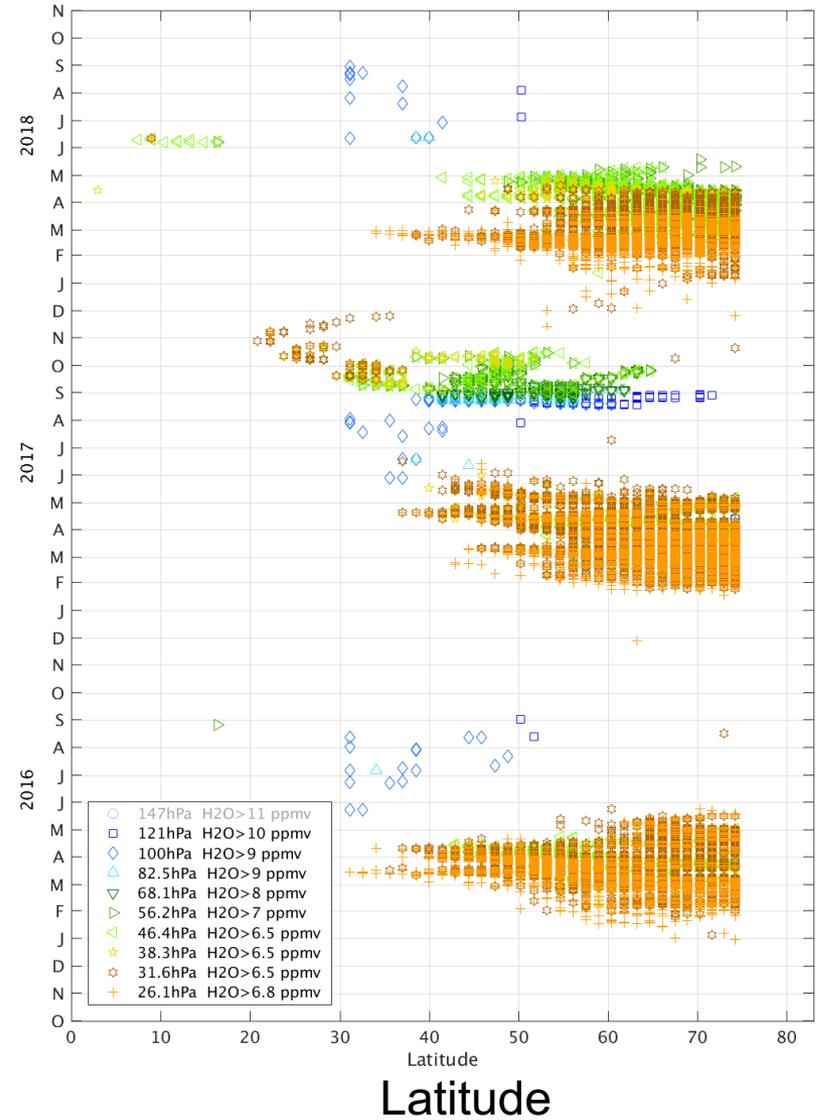
H2O Plume (Longitude Time) and (Latitude Time)



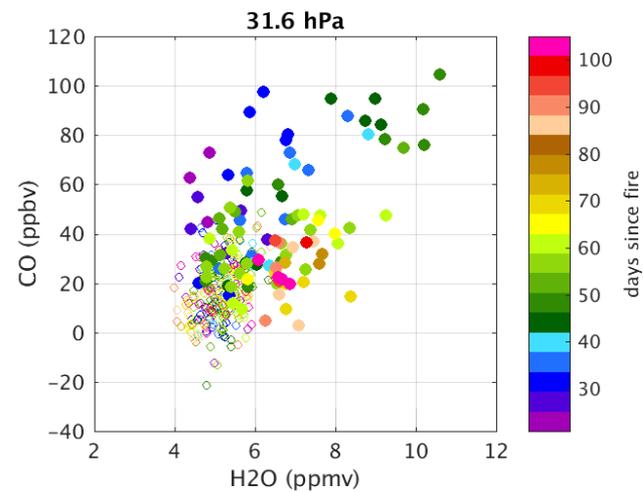
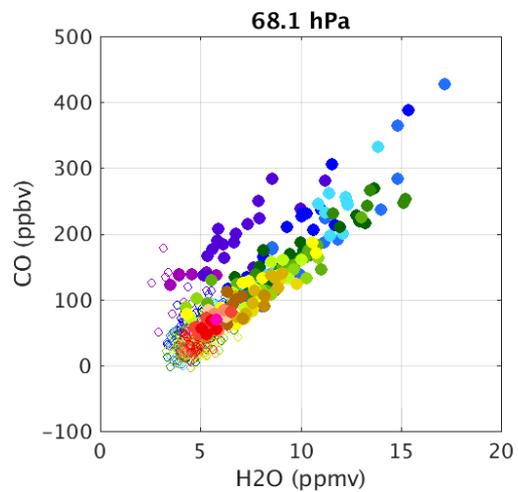
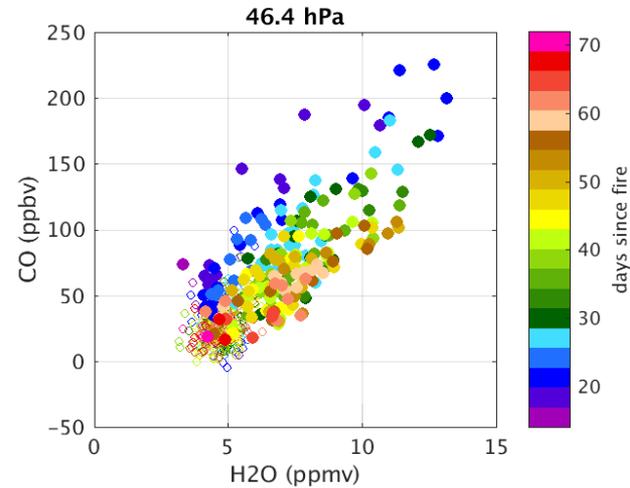
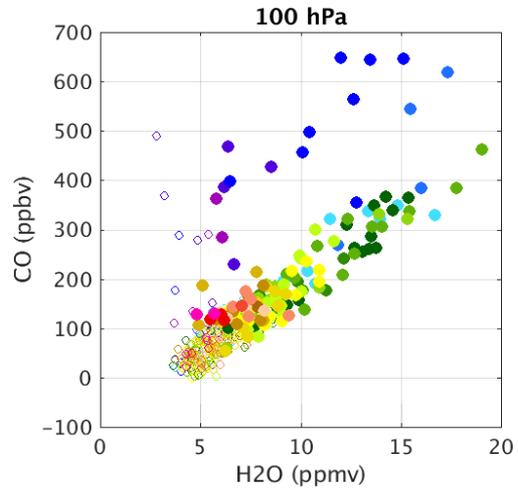
H2O Plume (Longitude Time) and (Latitude Time)



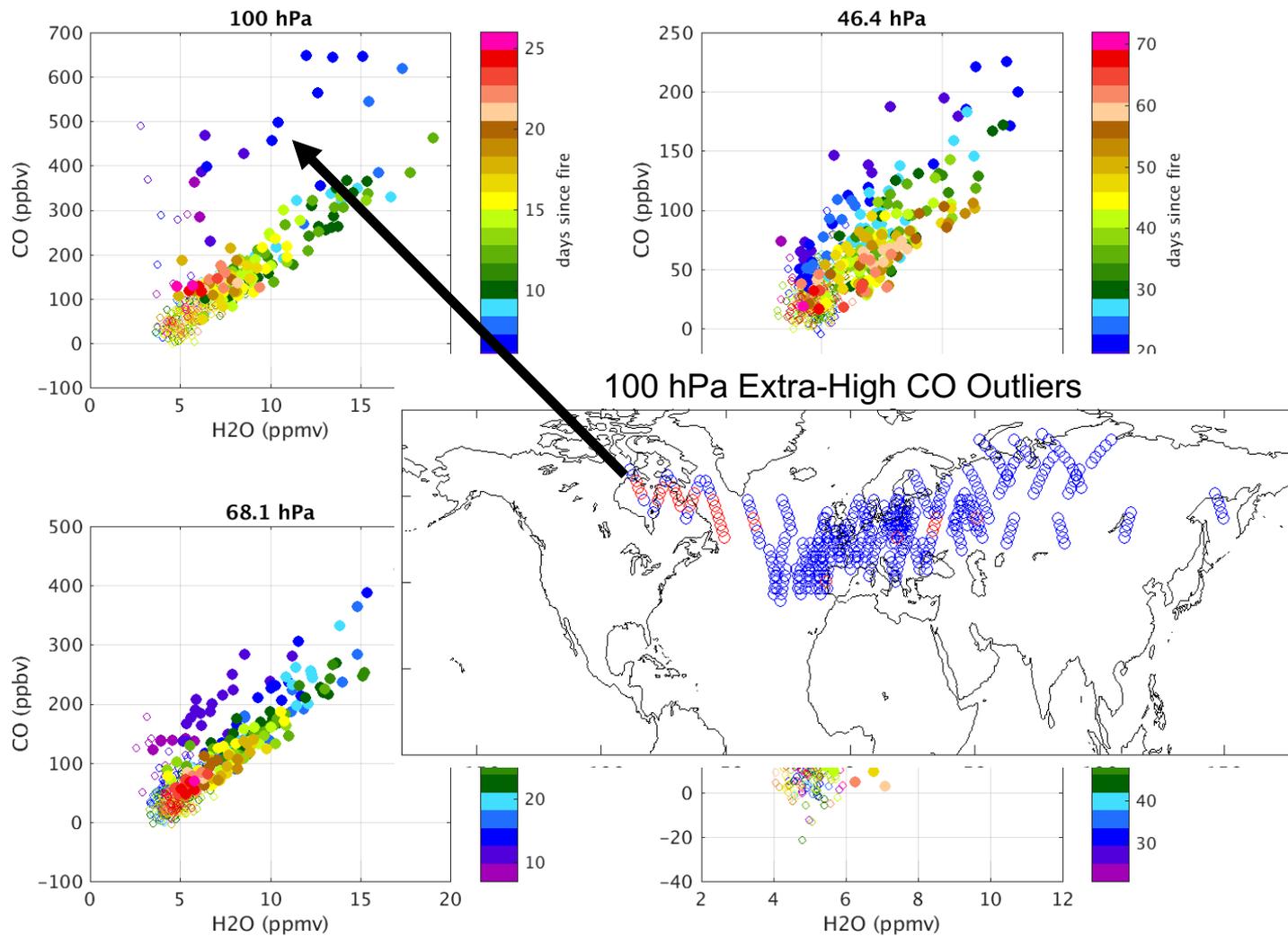
Time (3 years) →



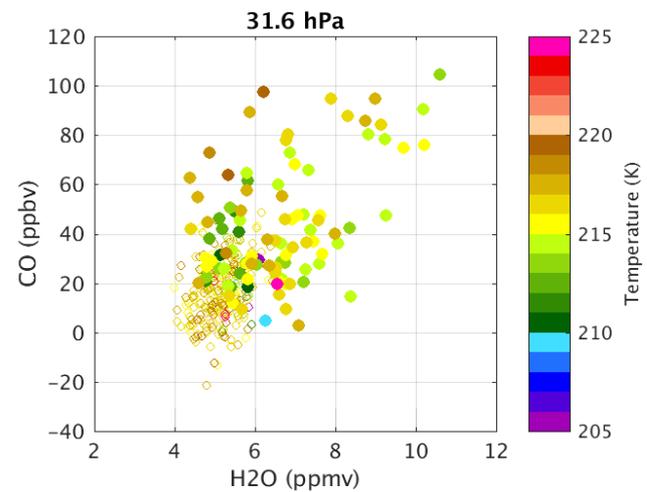
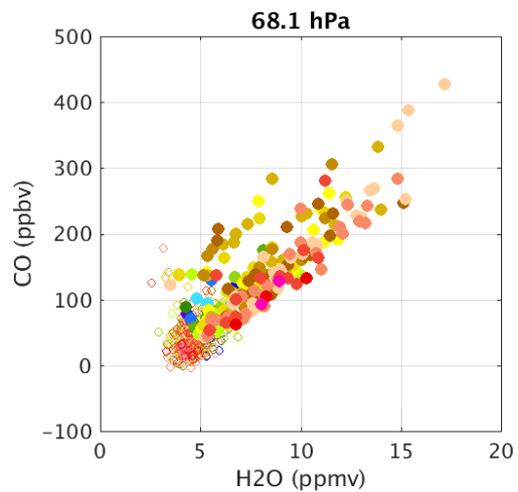
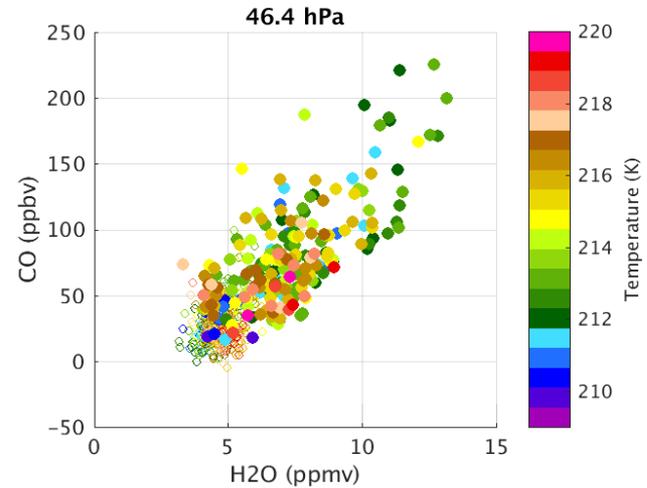
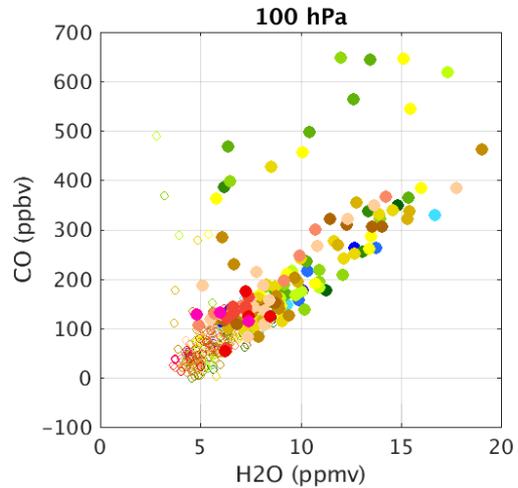
CO vs H2O Correlation (colored by time since fire)



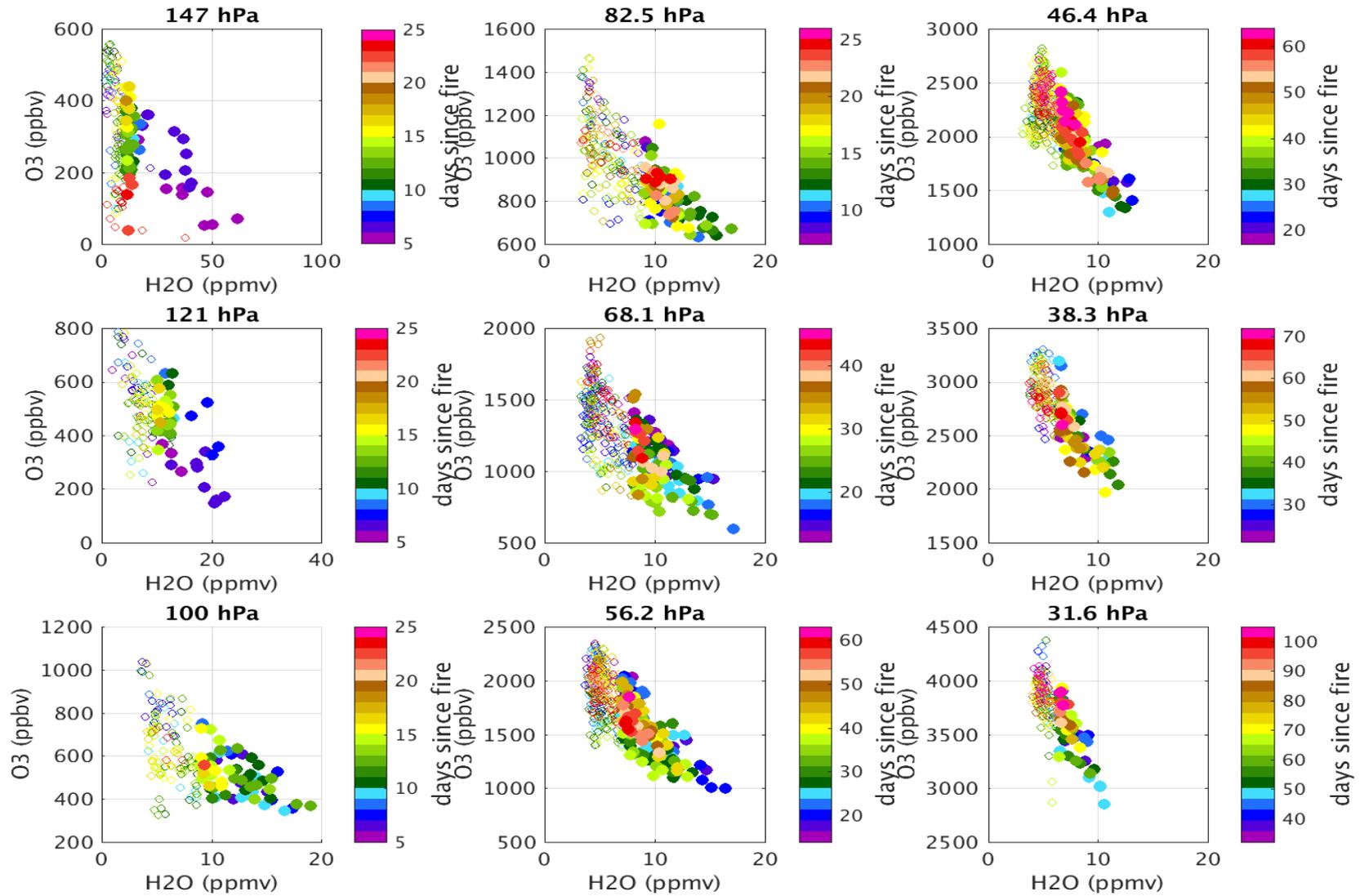
CO vs H2O Correlation (colored by time since fire)



CO vs H2O Correlation (colored by Temperature)

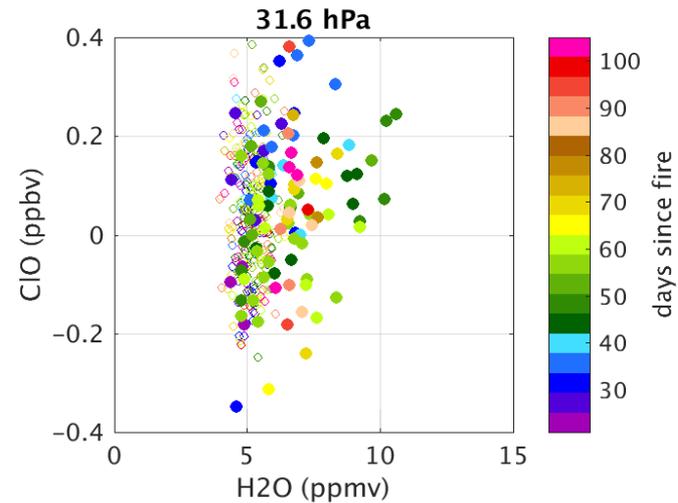
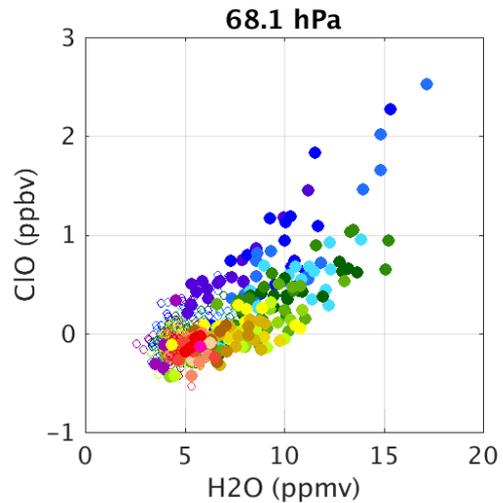
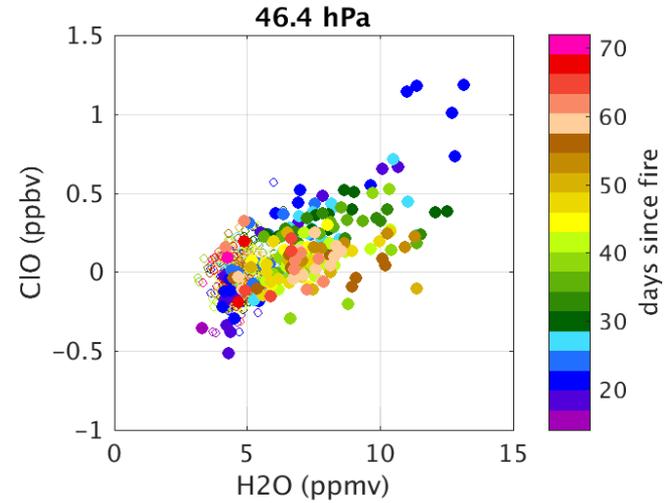
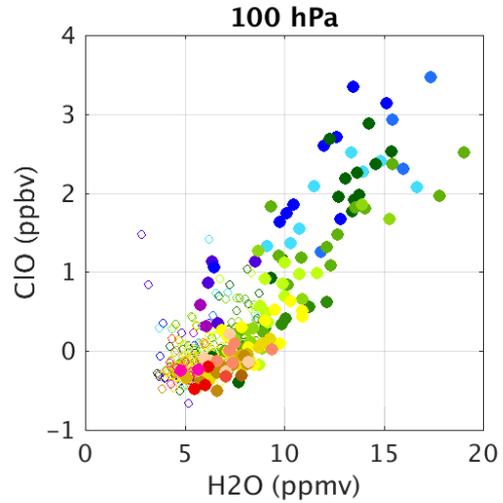


Ozone vs H2O

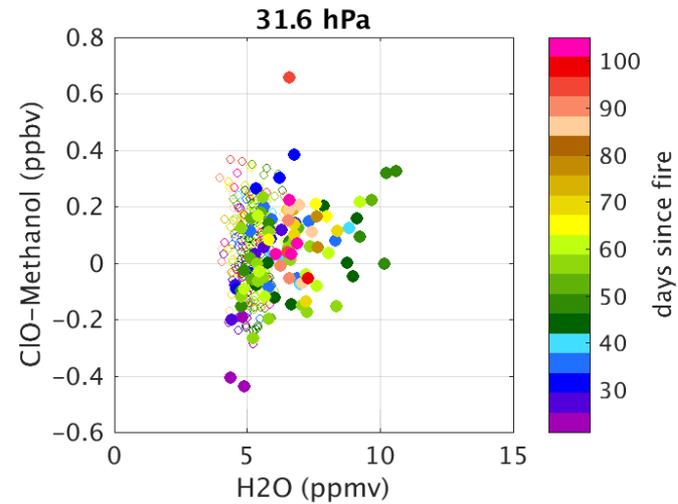
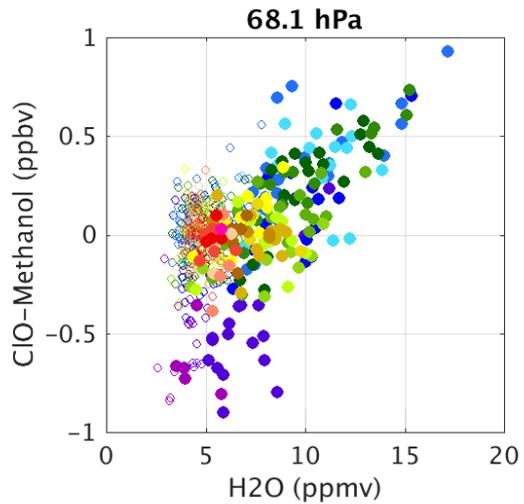
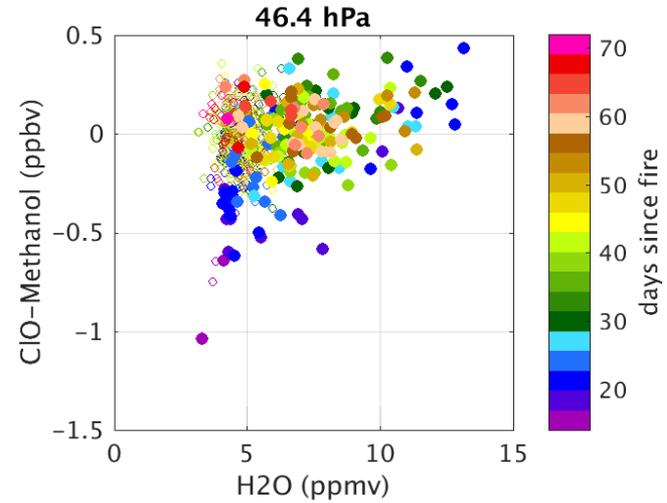
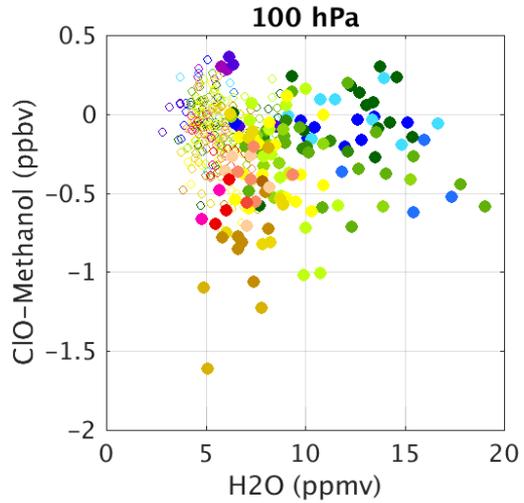


Plume ClO vs H₂O (640-GHz, CH₃OH Interference)

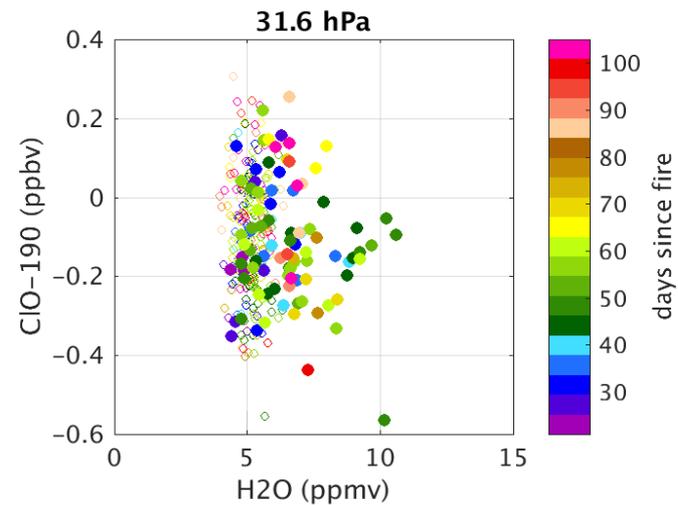
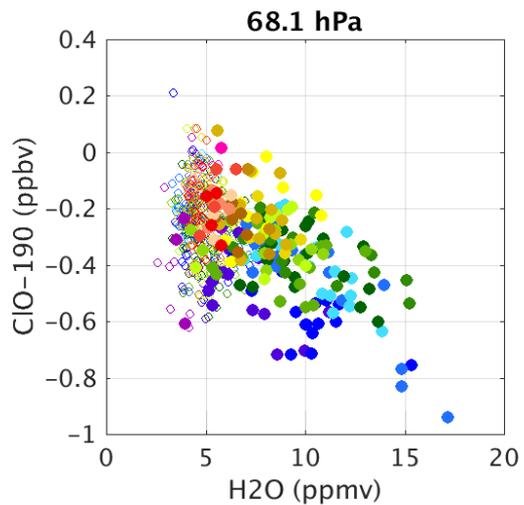
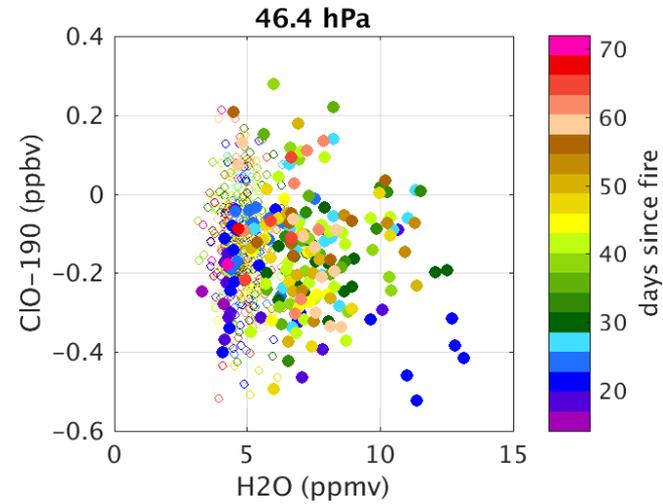
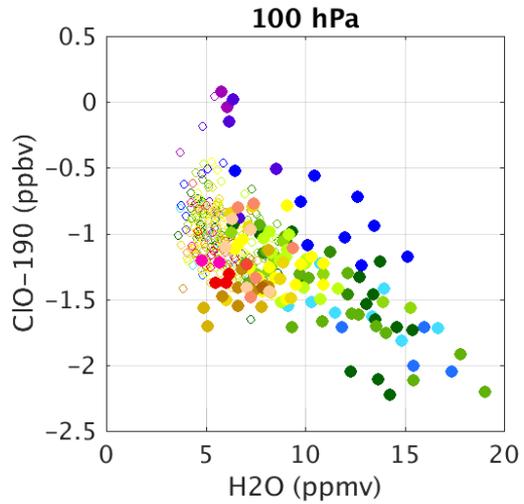
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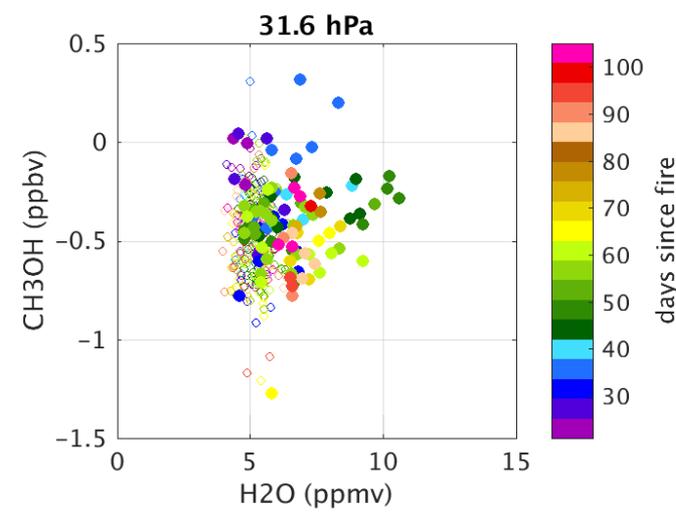
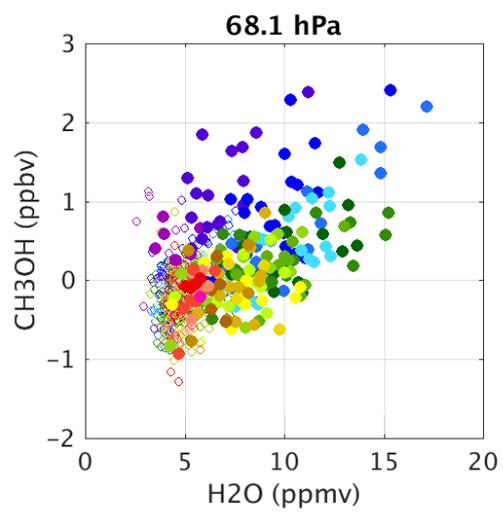
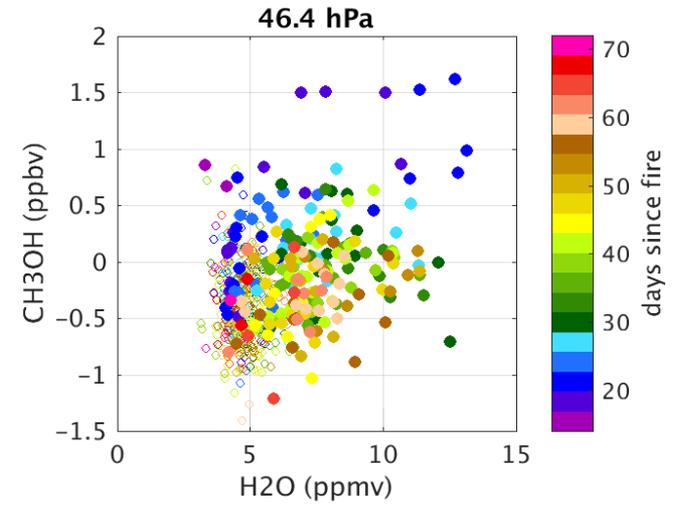
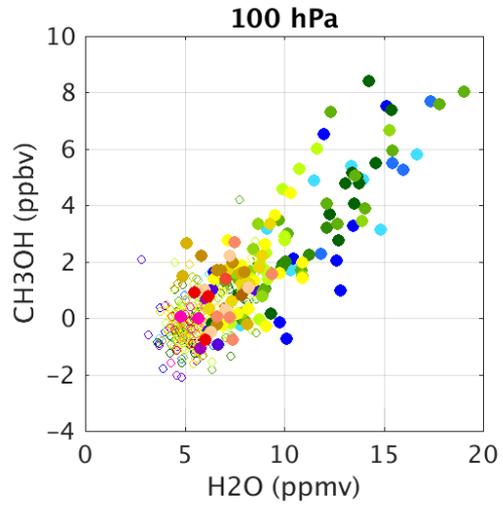
ClO-Methanol vs H₂O (640-GHz, retrieve CH₃OH)



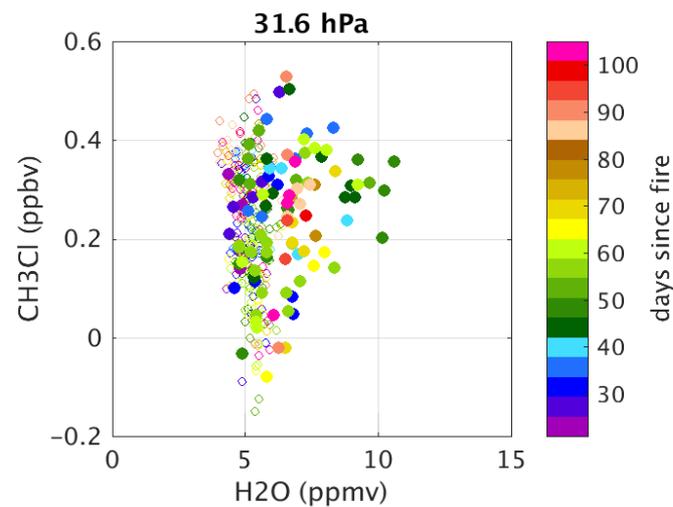
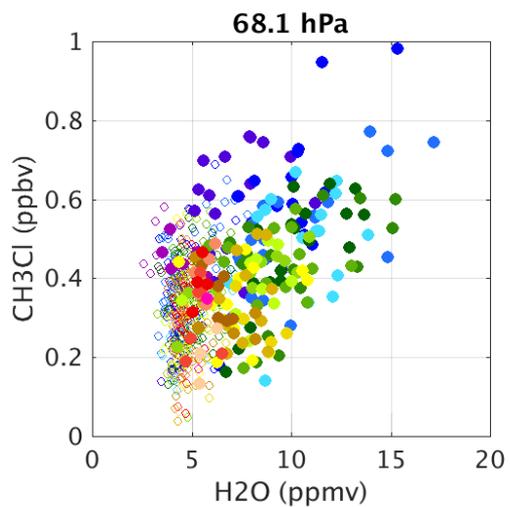
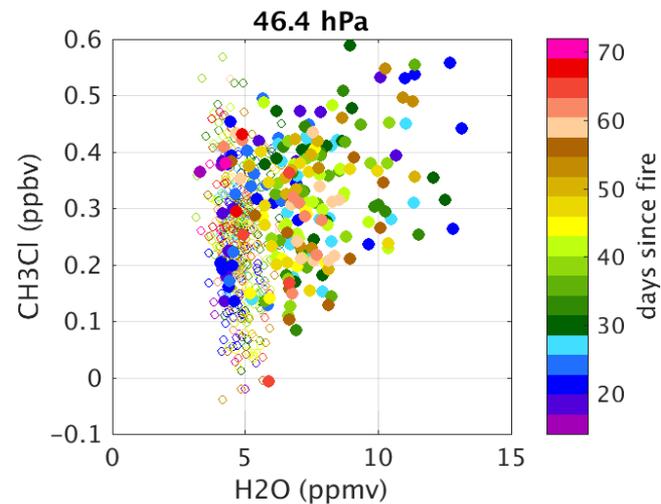
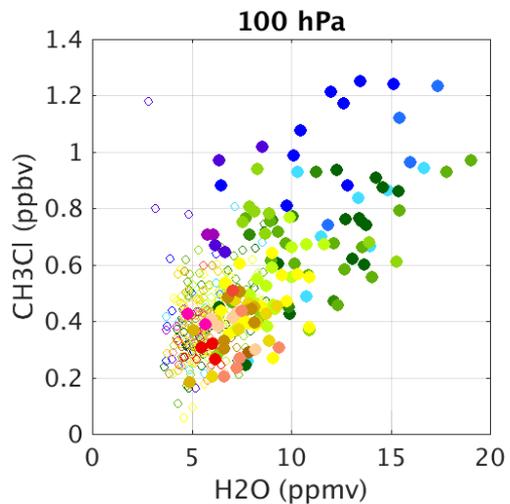
CIO-190 vs H2O (190-GHz, should show same correlation)



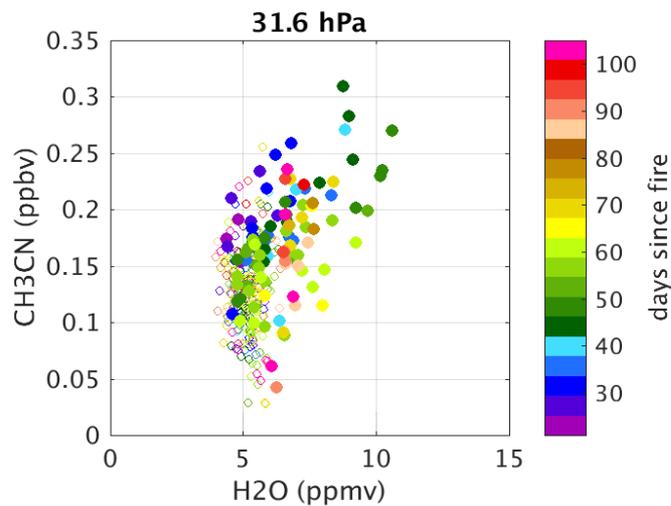
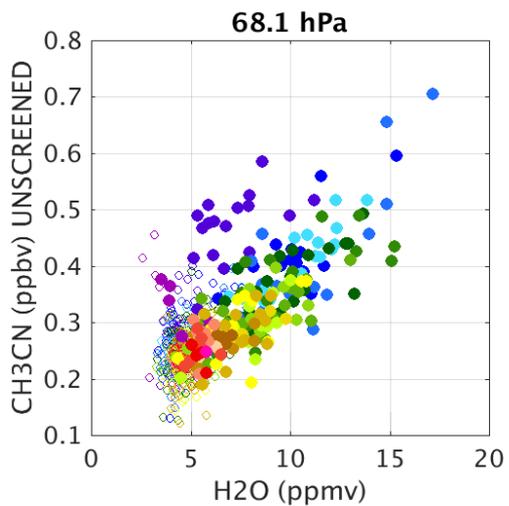
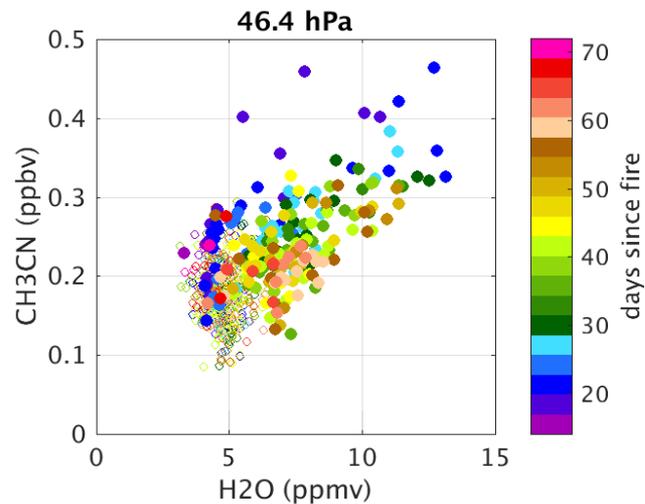
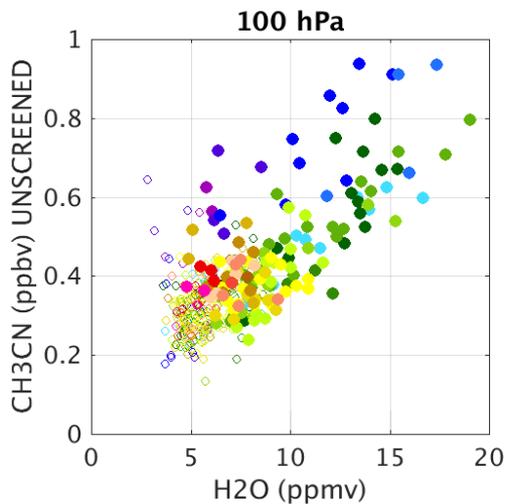
CH₃OH vs H₂O



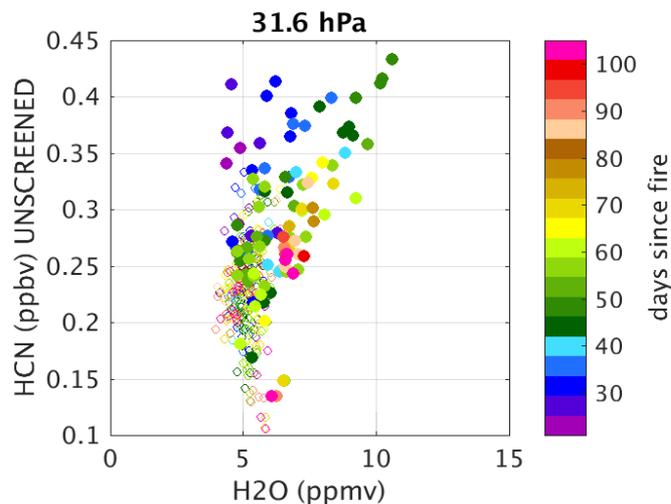
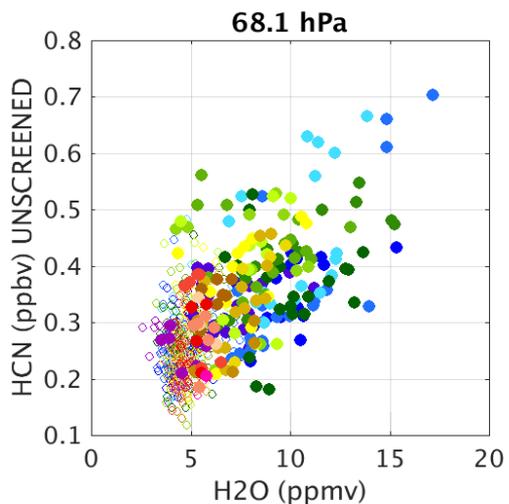
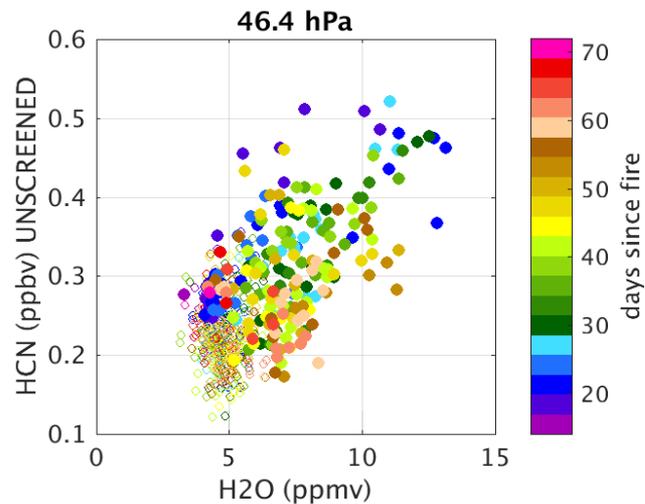
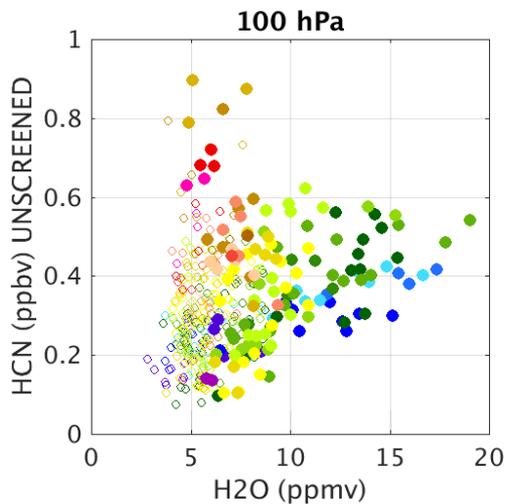
CH₃Cl vs H₂O



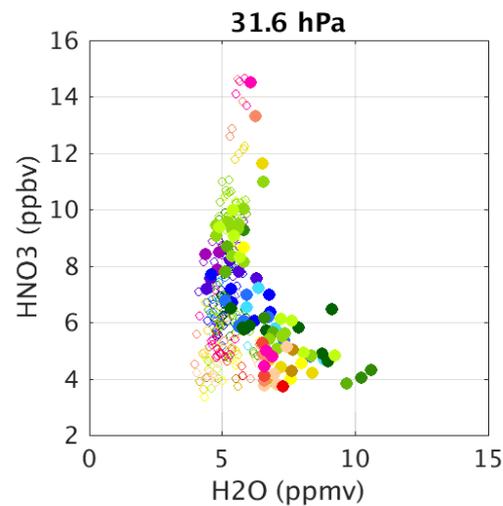
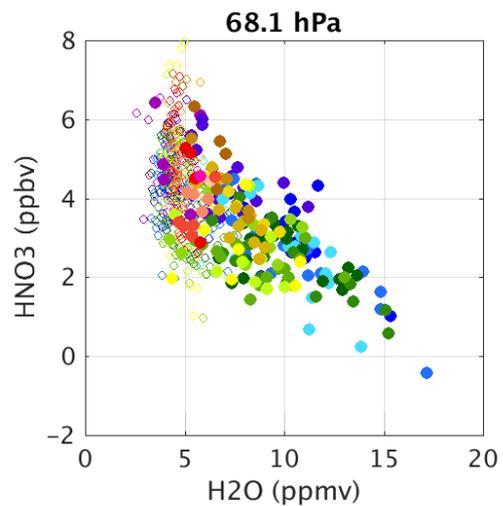
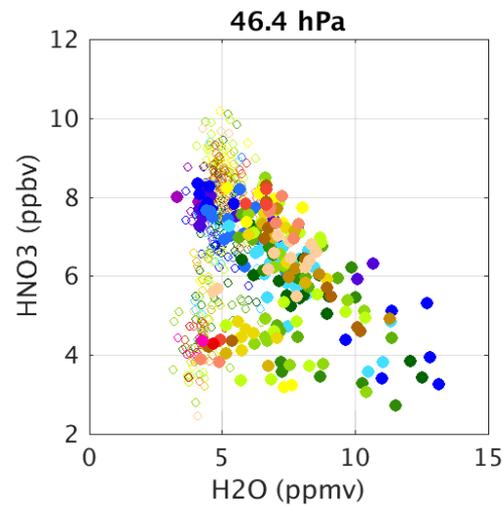
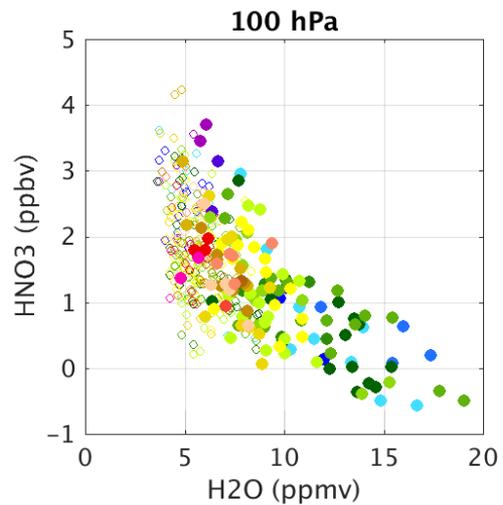
CH₃CN vs H₂O



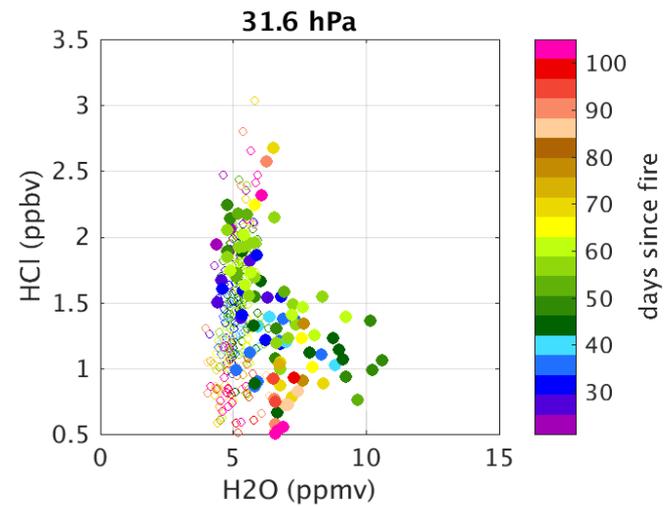
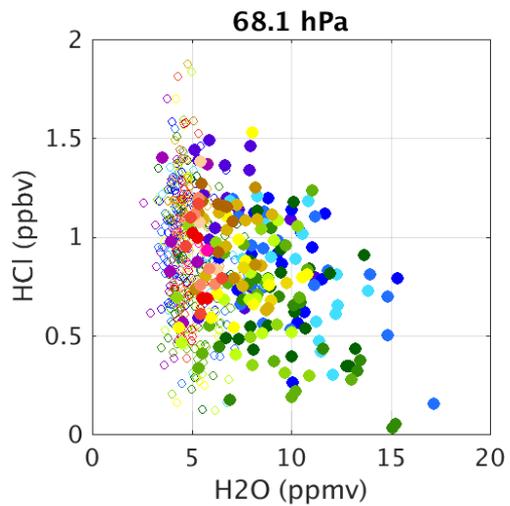
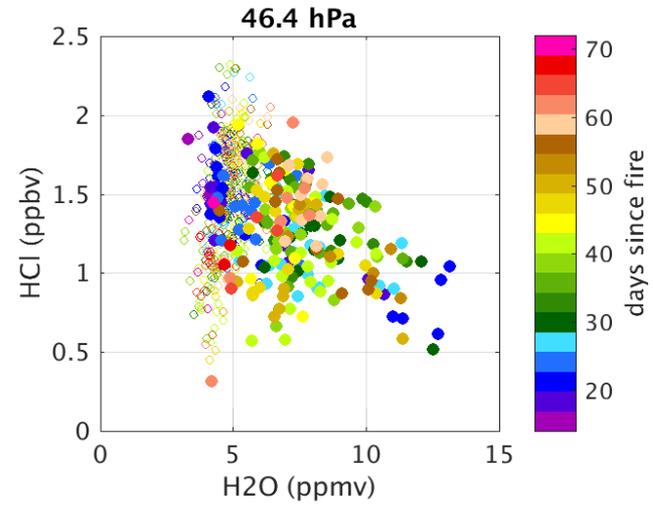
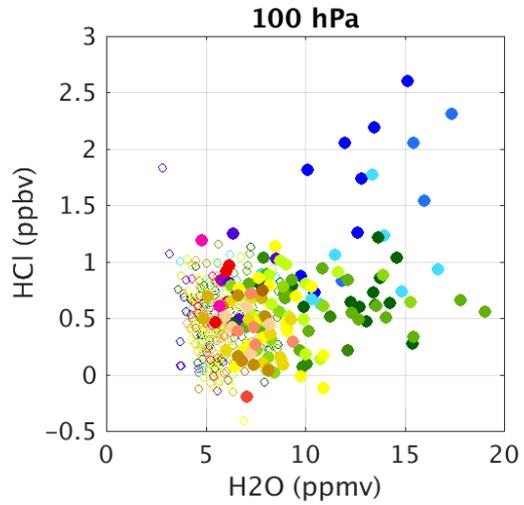
HCN vs H2O



HNO₃ vs H₂O



HCl vs H2O



Conclusions



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- MLS clearly provides a rich data set for investigation of the composition of the 2017 BC PyroCb plume.
- There is way too much to cover in a 15 minute talk.
- There are more talks coming that will look at MLS data.
- Generally, combustion products are enhanced and stratospheric sources are reduced in the plume.
- I look forward to hearing what the modelers have to say.