

# Observations of BrO and (HOBr+Br<sub>2</sub>) by GT-CIMS during CONTRAST 2014

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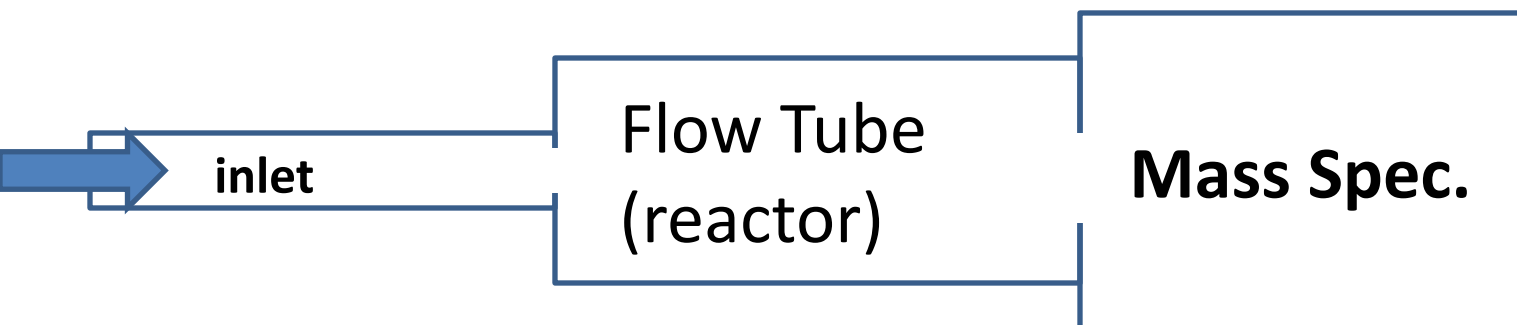
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U Miami

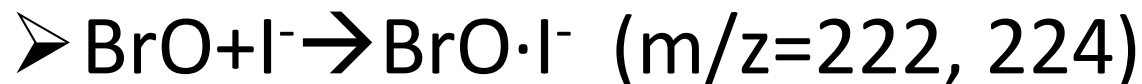
and CONTRAST team

# CIMS

## Chemical Ionization Mass Spectrometer



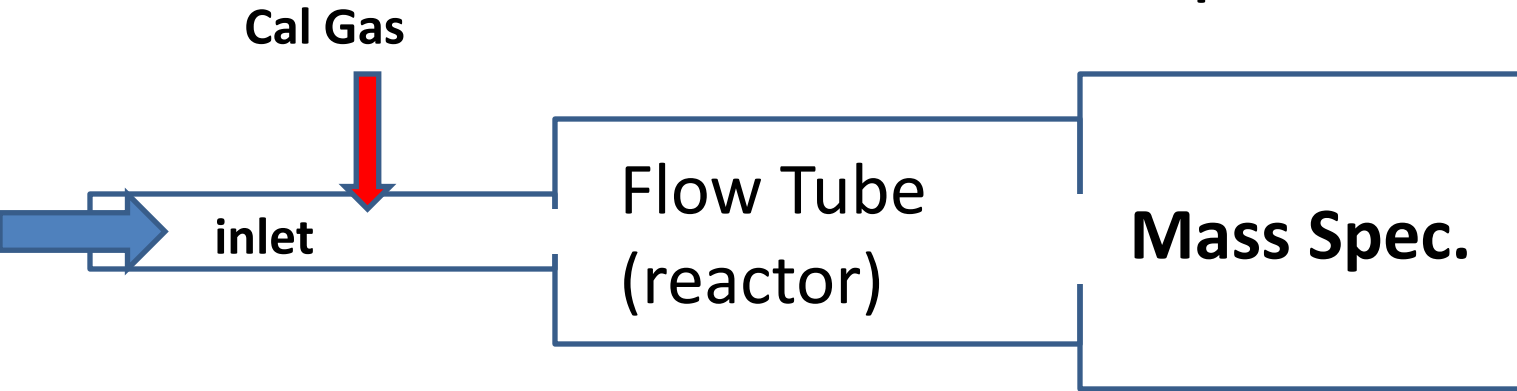
### Measurements:



( $\text{HOBr} \rightarrow \text{Br}_2$ , report the sum of  $\text{HOBr} + \text{Br}_2$ )

# CIMS

## Chemical Ionization Mass Spectrometer



### Calibrations:

- Online: periodically flowed cal gas ( $\text{Br}_2$ ,  $\text{Cl}_2$ ) into the CIMS
- Offline: compared sensitivities of  $\text{BrO}$ ,  $\text{HOBr}$  to sensitivities of the cal gas (in the lab)

## Measurement Issues

During the field campaign we became concerned that Br<sub>2</sub> calibration gas could contaminate inlet walls.

i.e. Br<sub>2</sub> →→→ BrO

Problem alleviated by switching to Cl<sub>2</sub> calibration gas at RF09.  
For now only reporting data for RF09-RF16

Very high O<sub>3</sub> levels may also lead to BrO artifact during RF15.  
Needs work but more importantly comparison to DOAS data.

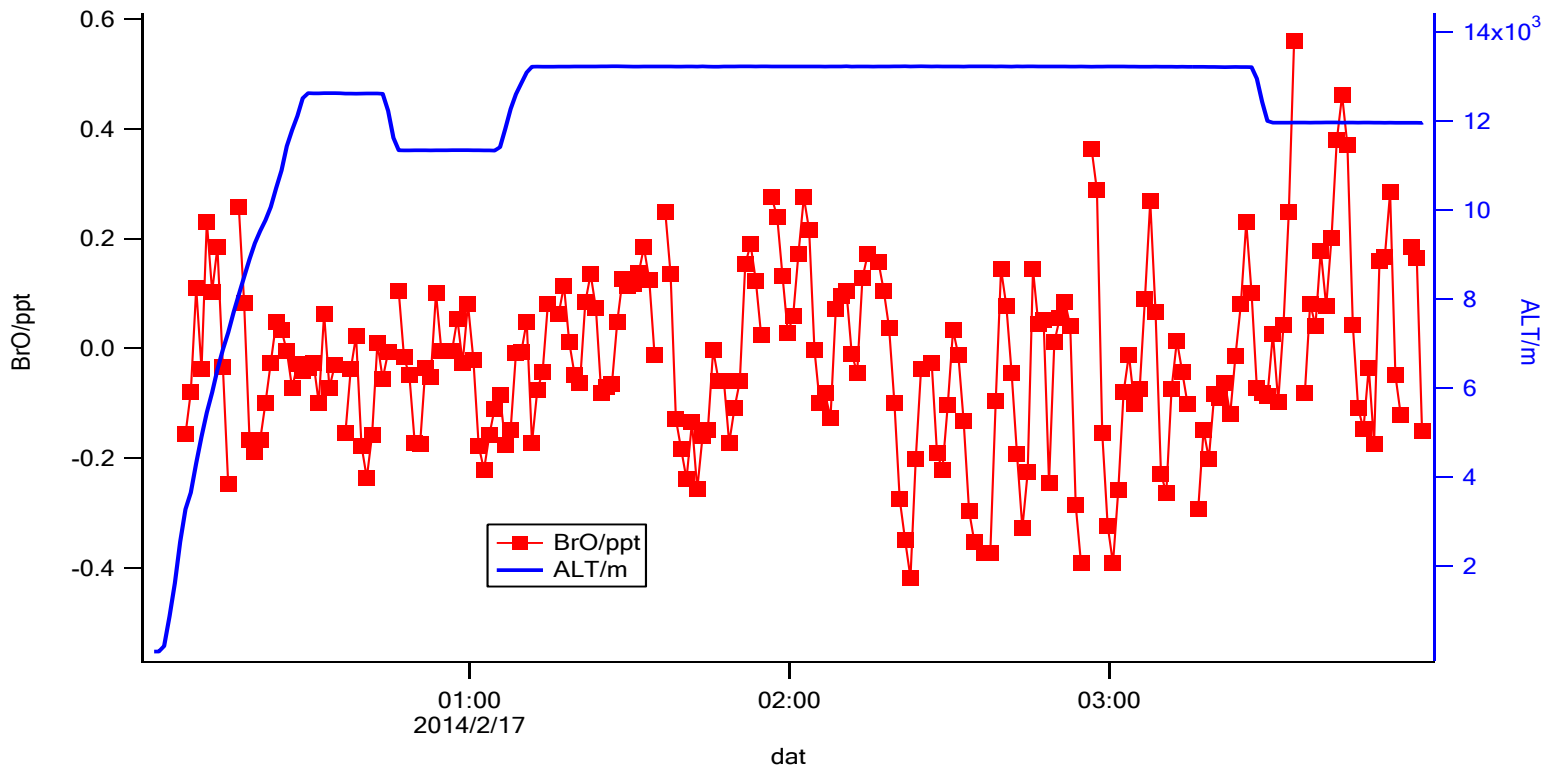
# Most of the time...

Levels of BrO and HOBr+Br<sub>2</sub> near the limits of detection (LOD)

LOD for BrO, 0.3-1.5 ppt

LOD of HOBr+Br<sub>2</sub>, 0.5-2 ppt

e.g., RF12 (2/16-2/17)

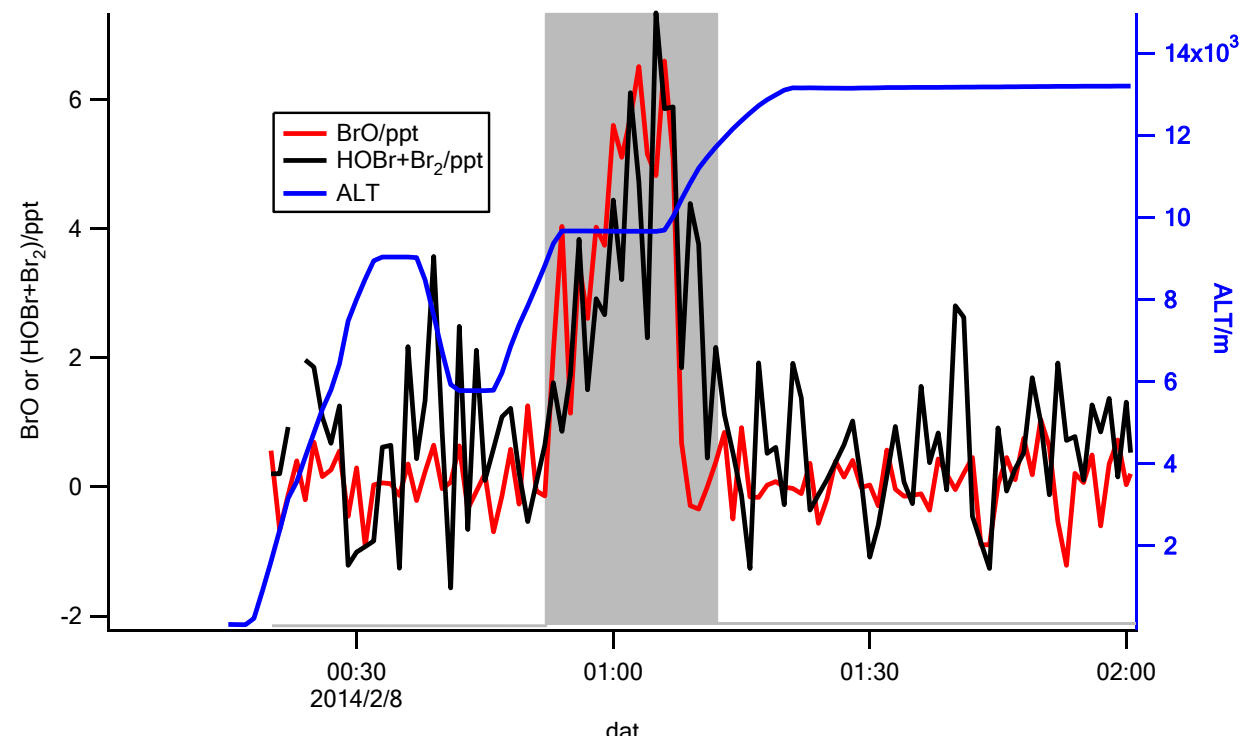
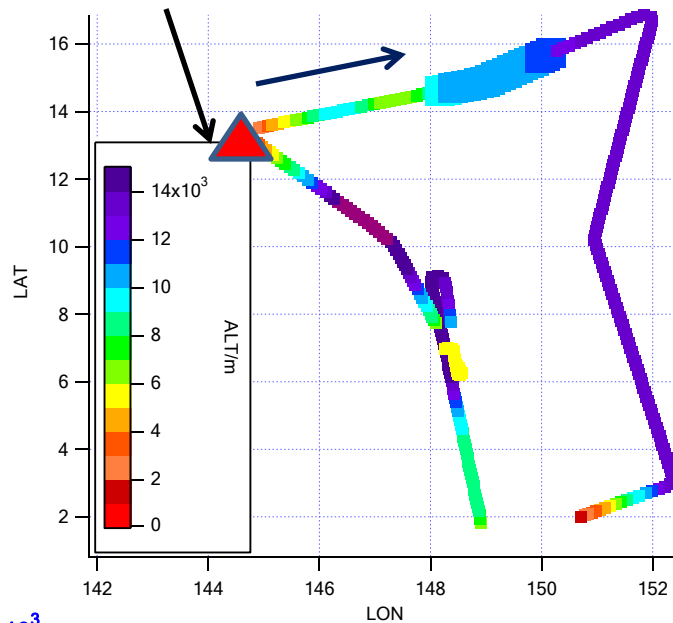


# RF10(2/8)

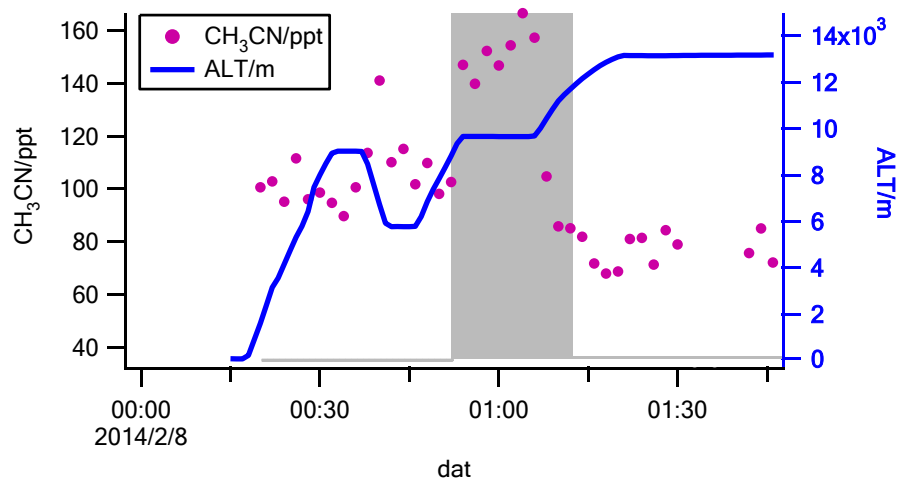
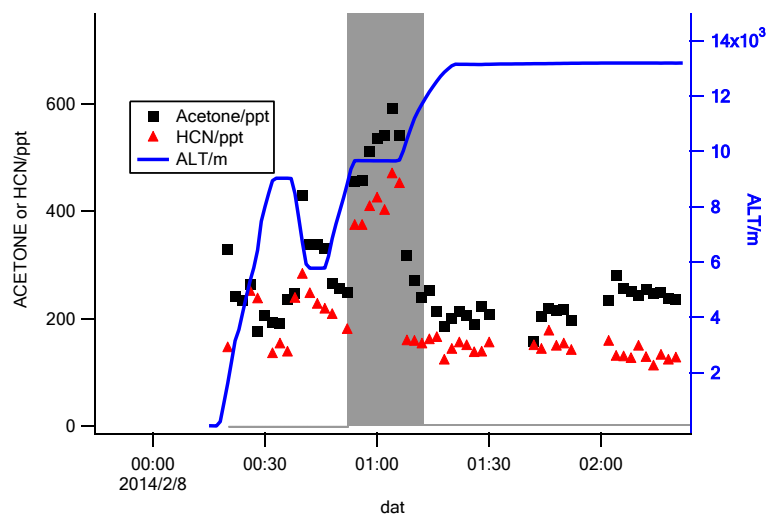
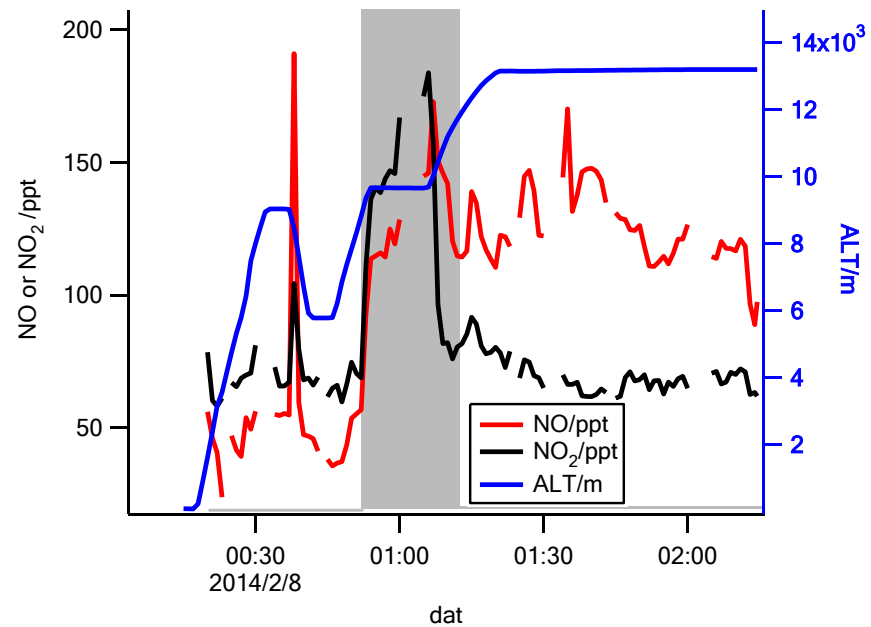
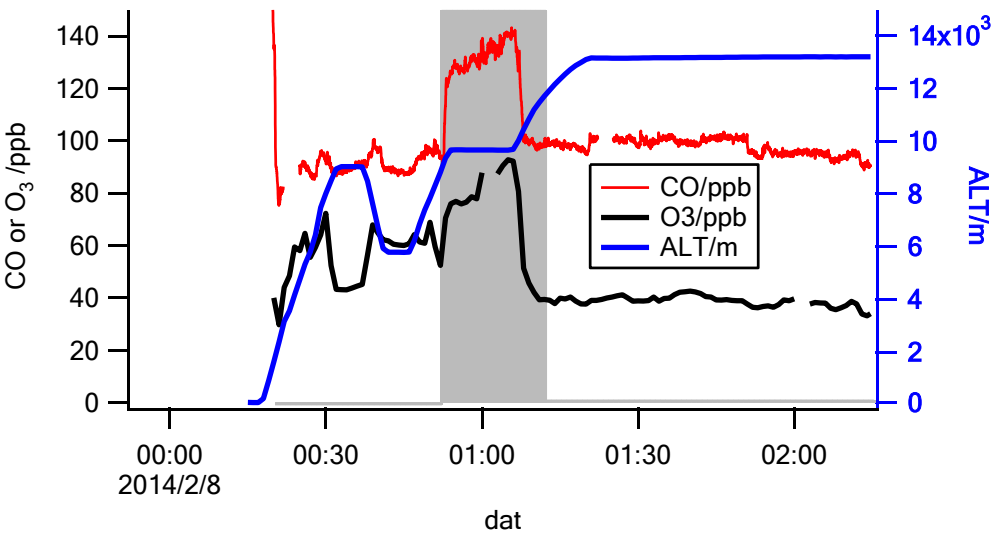
□ Flight Goal

Sample a large pollution plume

GUAM



# RF10 (2/8)

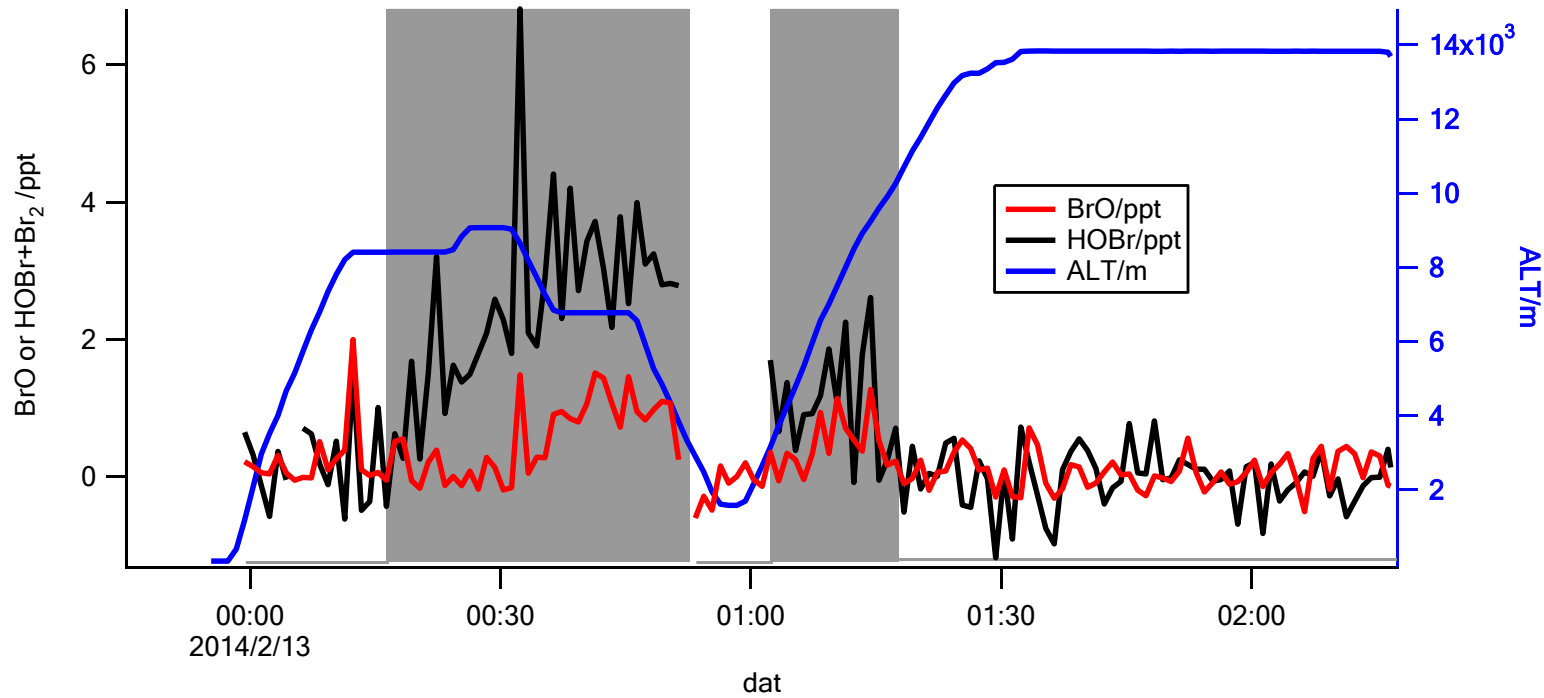
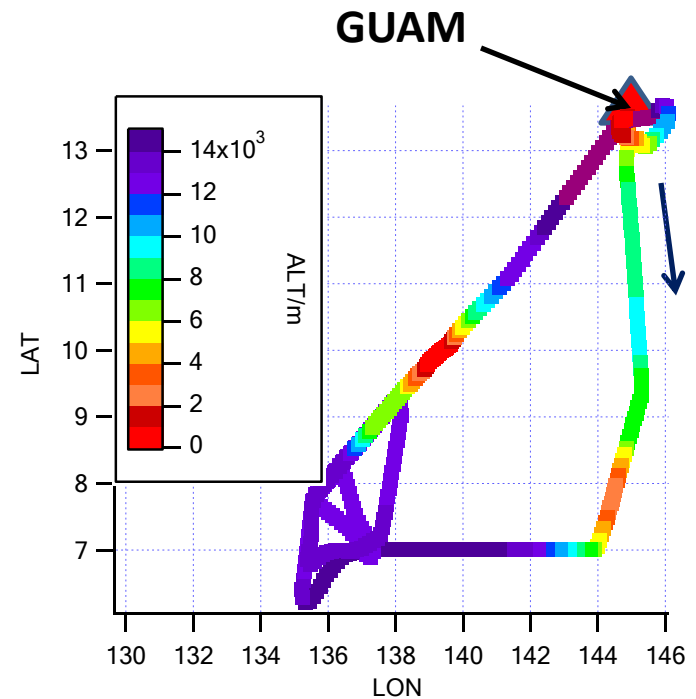


# RF11 (02/12-0213)

□ Flight Goal

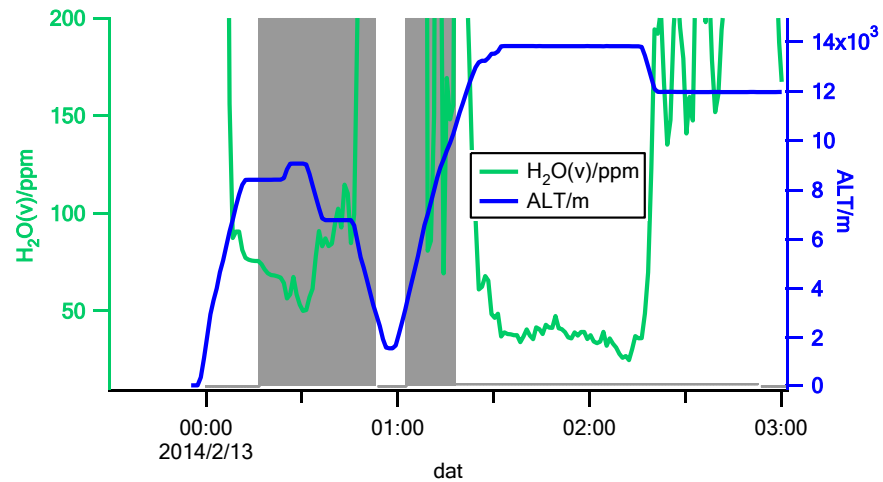
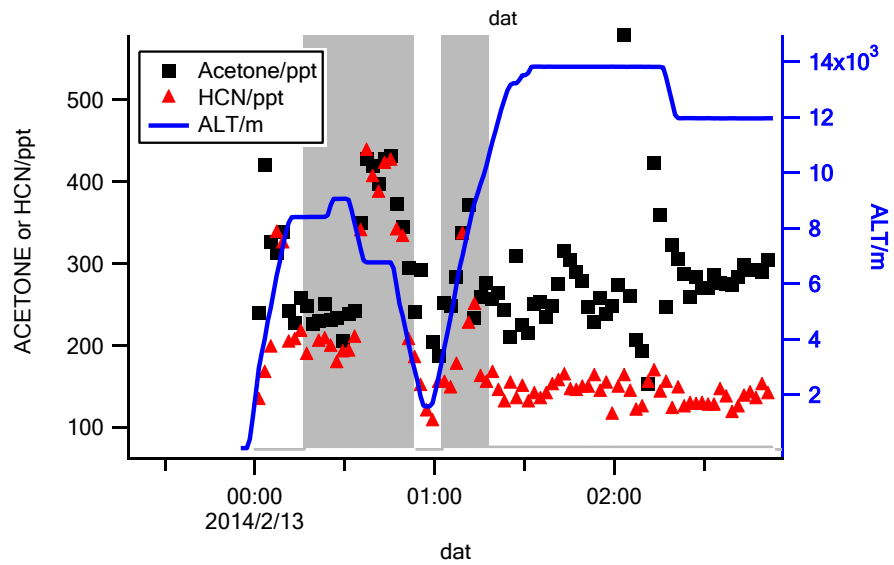
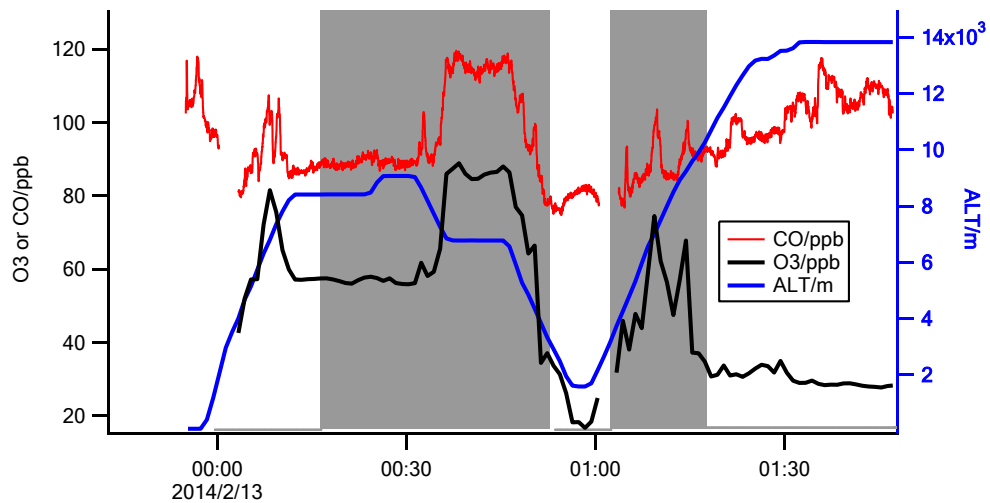
Sample the O<sub>3</sub> layer south of Guam

Sample convective outflow





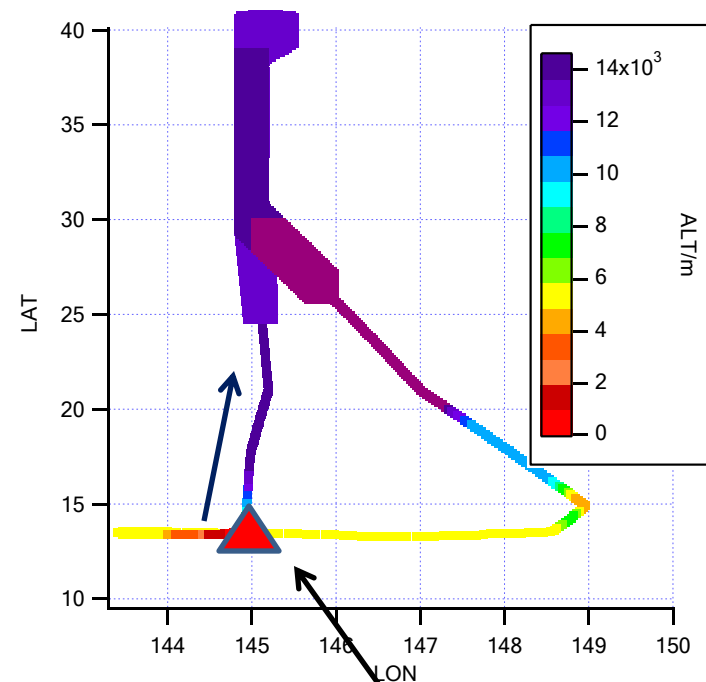
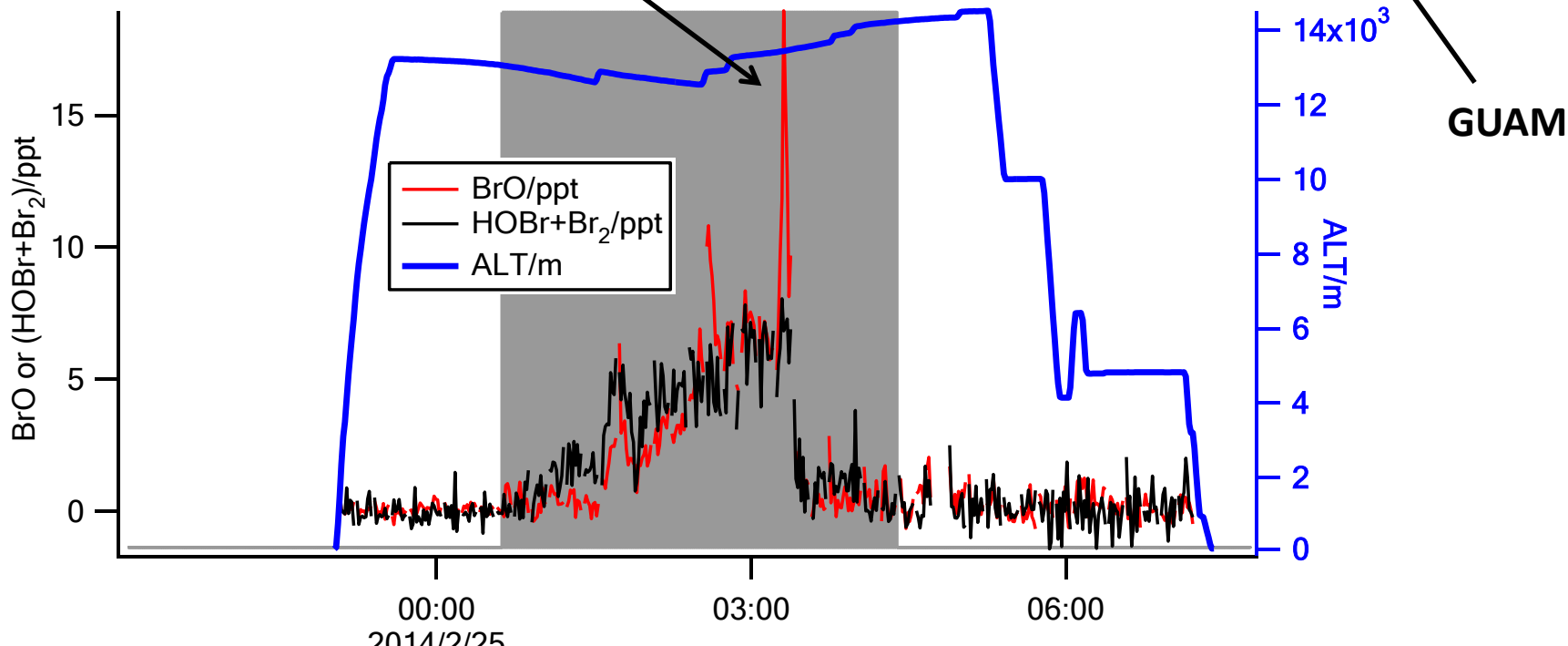
# RF11 (02/12-0213)



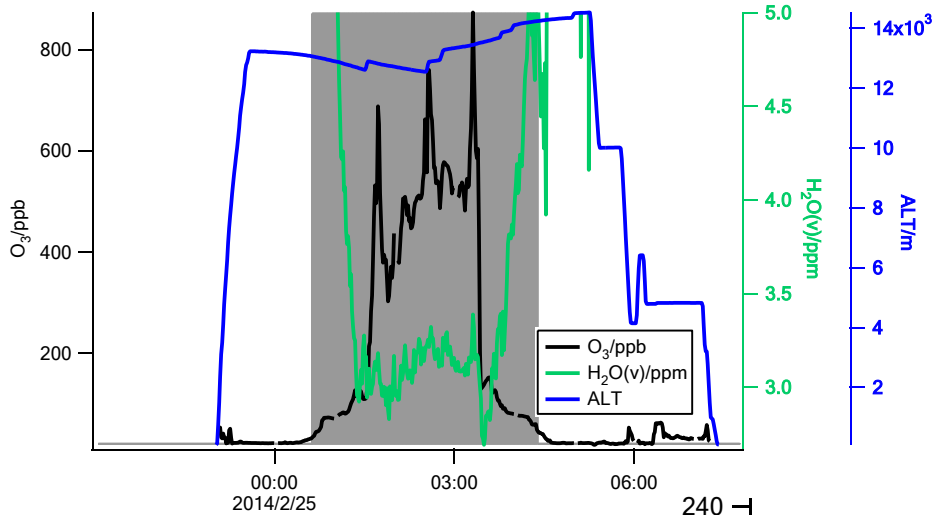
# RF15 (2/24-2/25)

□ Flight Goal  
Transect to Japan

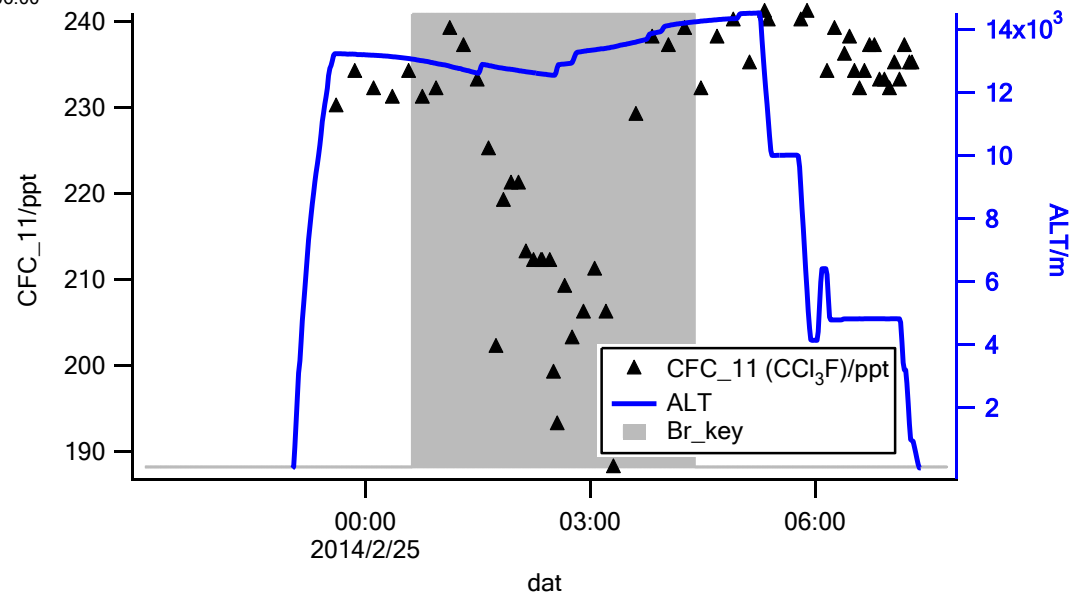
Spike in BrO w/o  
increase in HOBr?



# RF15(02/24)



dat



dat

# Summary

- Most of the time no significant levels of BrO and (HOBr+Br<sub>2</sub>) were observed
- There were a limited number of enhanced layers of BrO and HOBr. They correspond to either stratospheric air or tropospheric air impacted by biomass/pollution.

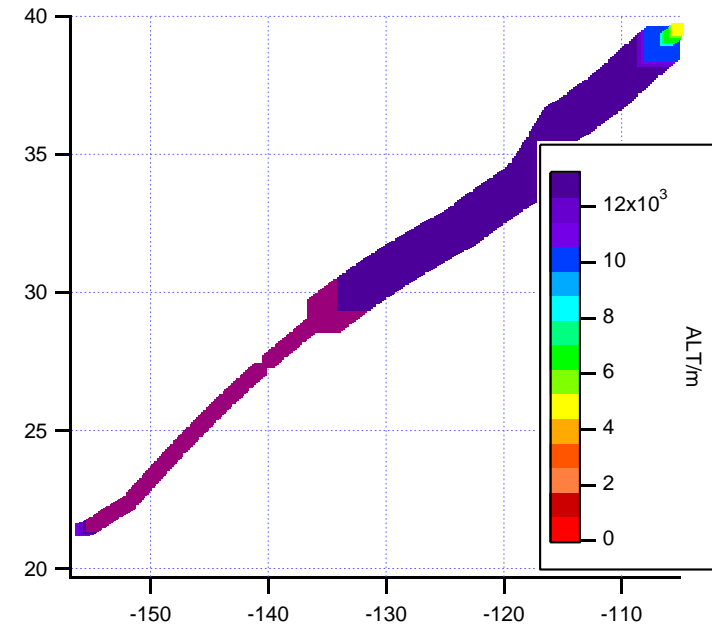
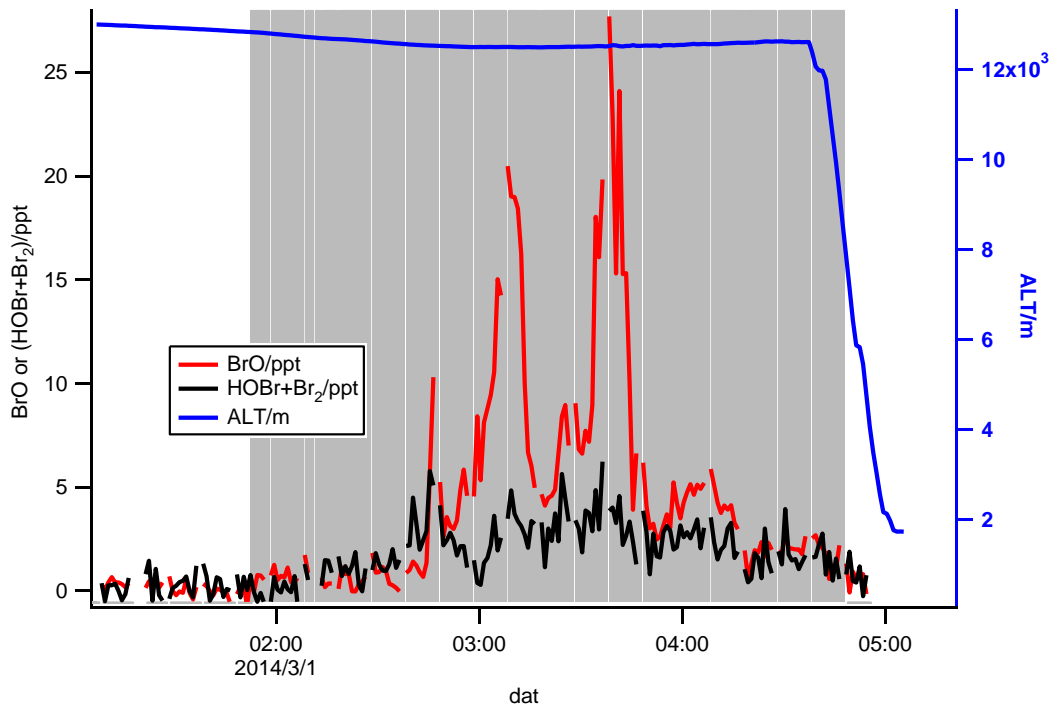
# Ongoing work...

- Comparisons needed with DOAS to confirm elevated BrO levels and to investigate possible high ozone issue. RF15, RF11, RF10, and transit are high priorities.
- Compare stratospheric BrO/HOBr to model calculations.
- Investigate origins of high tropospheric signals

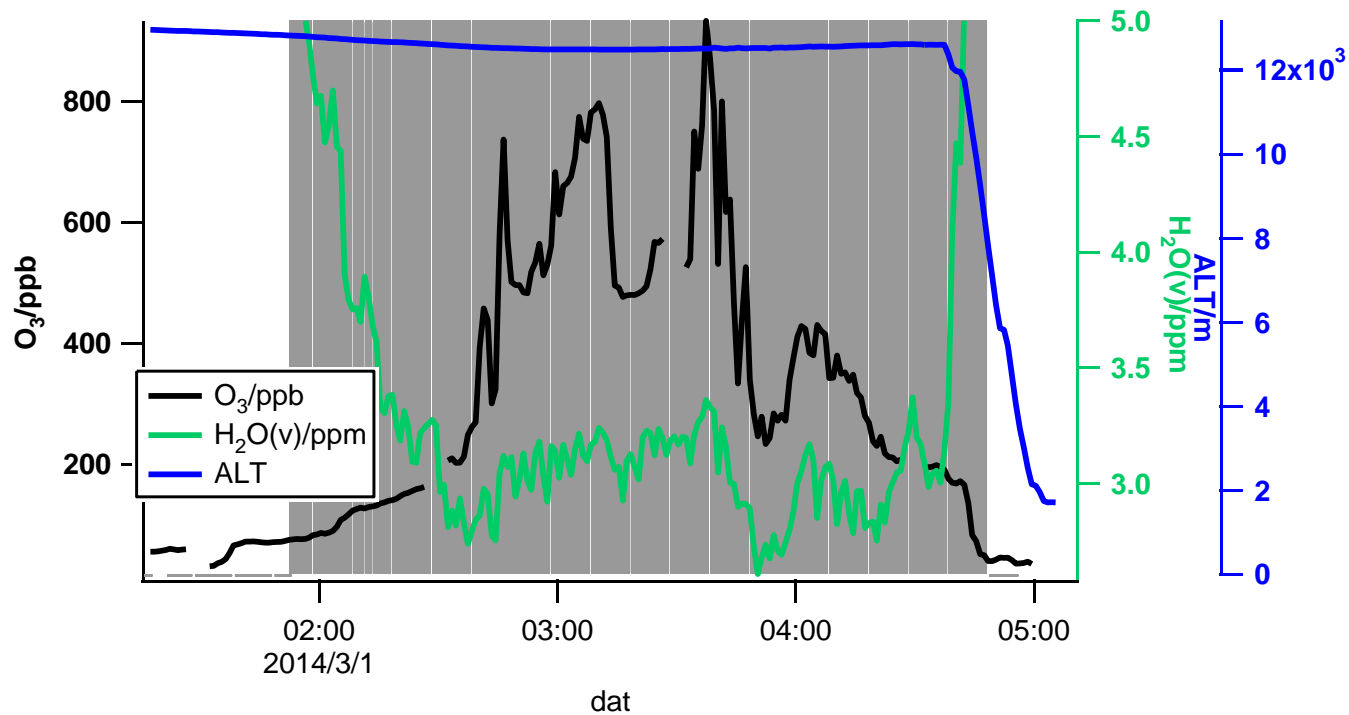
# Transit (2/28-3/1)

☐ GOAL OF FLIGHT

✓ Transit(Honolulu- Boulder)

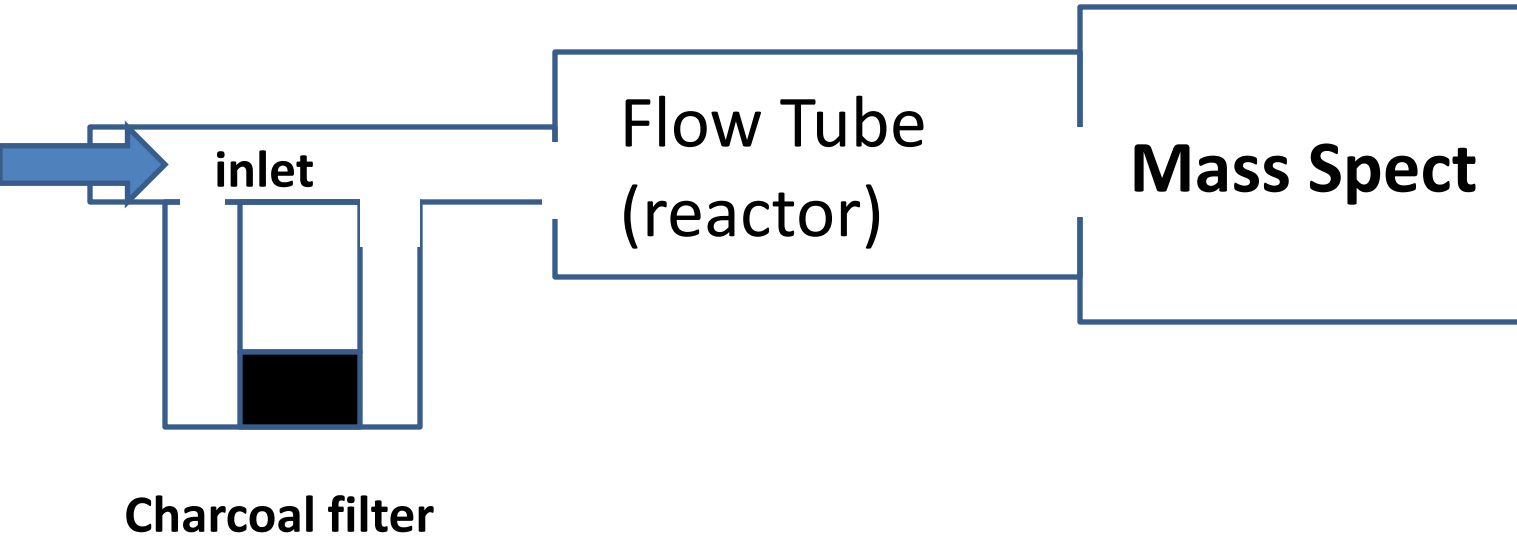


# Transit flight(02/28-03/01)



# CIMS

## Chemical Ionization Mass Spectrometry

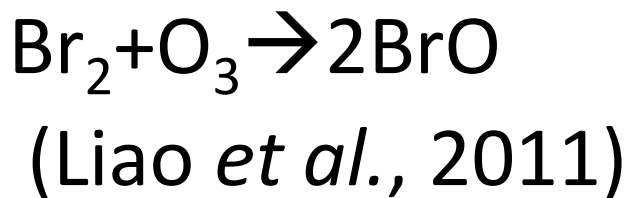
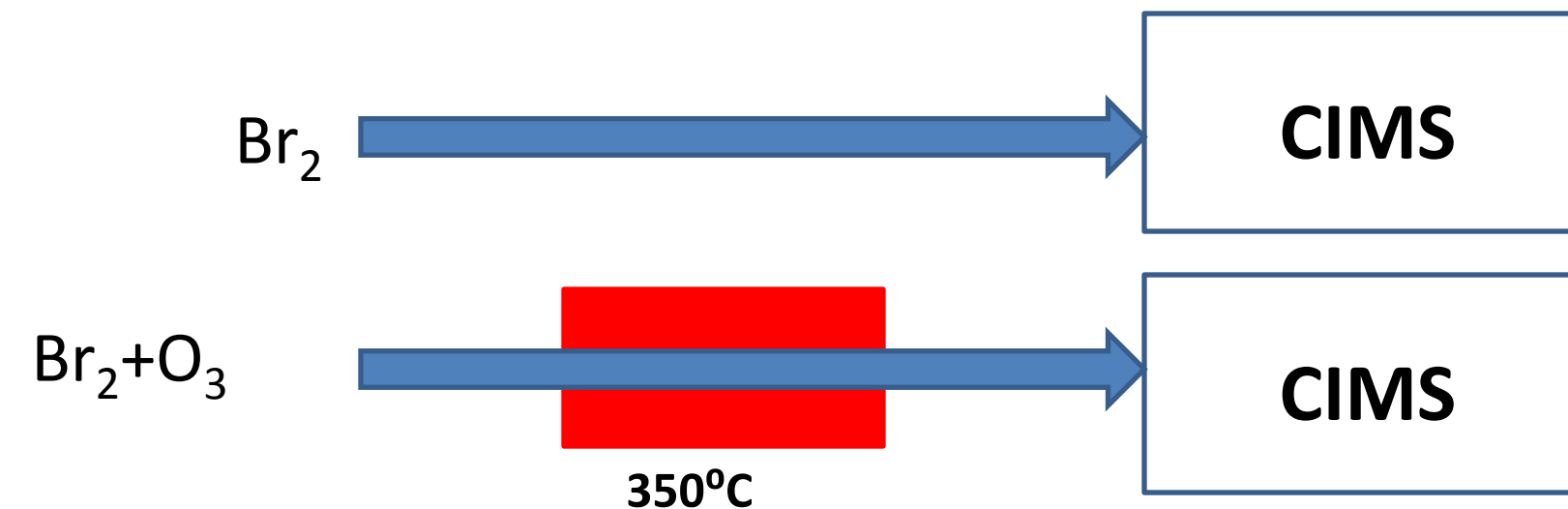


☐ backgrounding

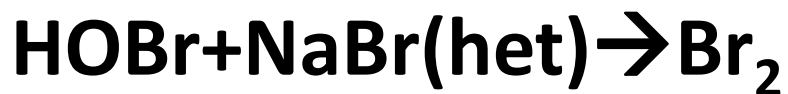
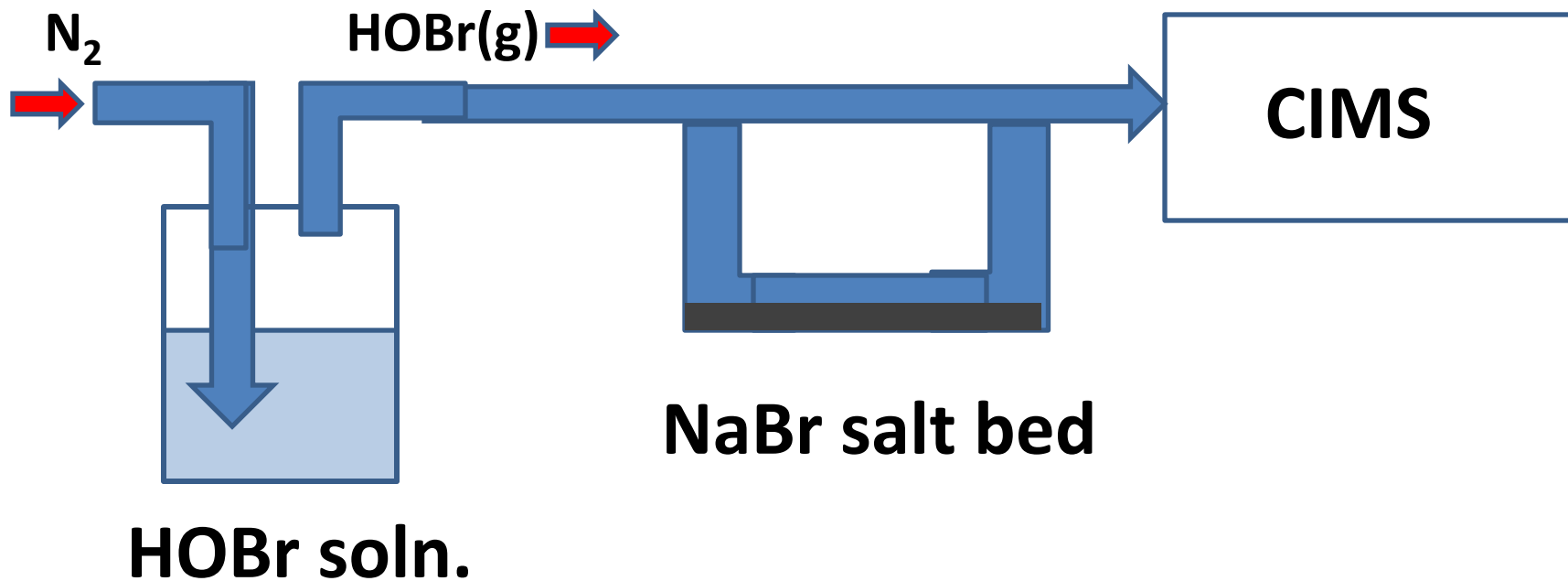
➤ Three way valve (periodical measurements mode and background mode)



## Offline calibrations in the Lab (BrO)



## Offline calibrations in the Lab(HOBr)



(Liao *et al.*, 2011)

## ☐ Limit of Detection (LOD)

- X