

# Acetate Ion Time-of-Flight Chemical Ionization Mass Spectrometry (Acid TOF CIMS)

Patrick Veres  
James Roberts

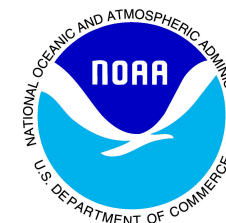
*NOAA CSD/CIRES*  
*NOAA CSD*

Joel Thornton  
Ben Lee  
Felipe Lopez-Hilfiker

*U. of Washington*  
*U. of Washington*  
*U. of Washington*

## Calibration Support:

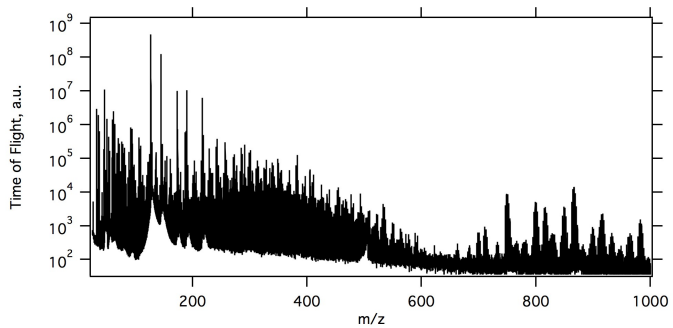
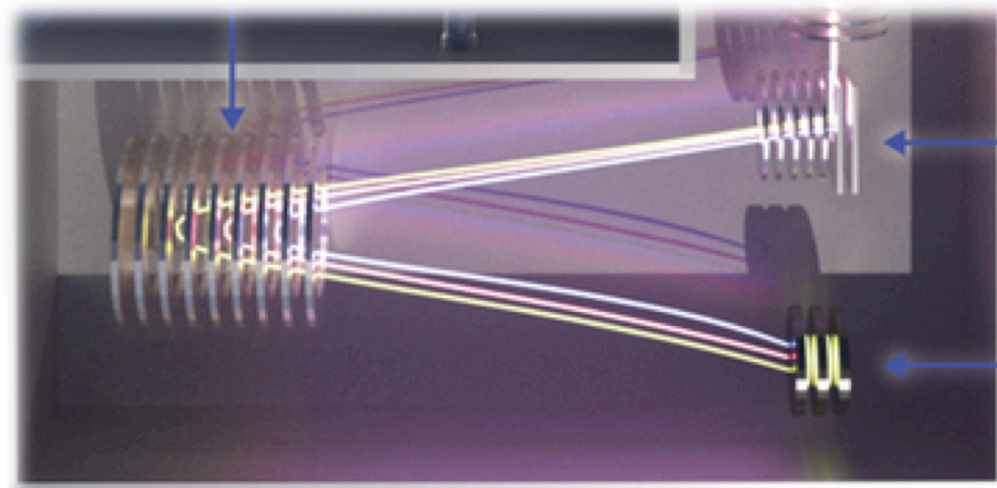
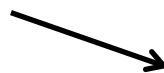
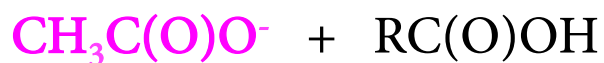
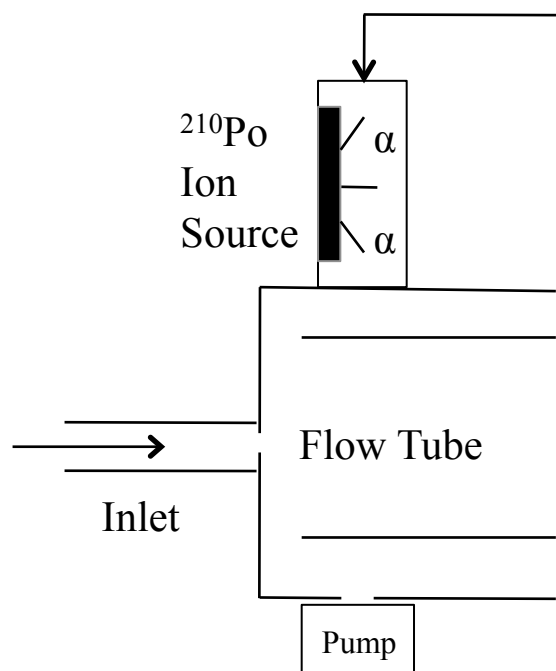
- Rob Wild
- Max McGillen
- James Burkholder
- Andy Neuman



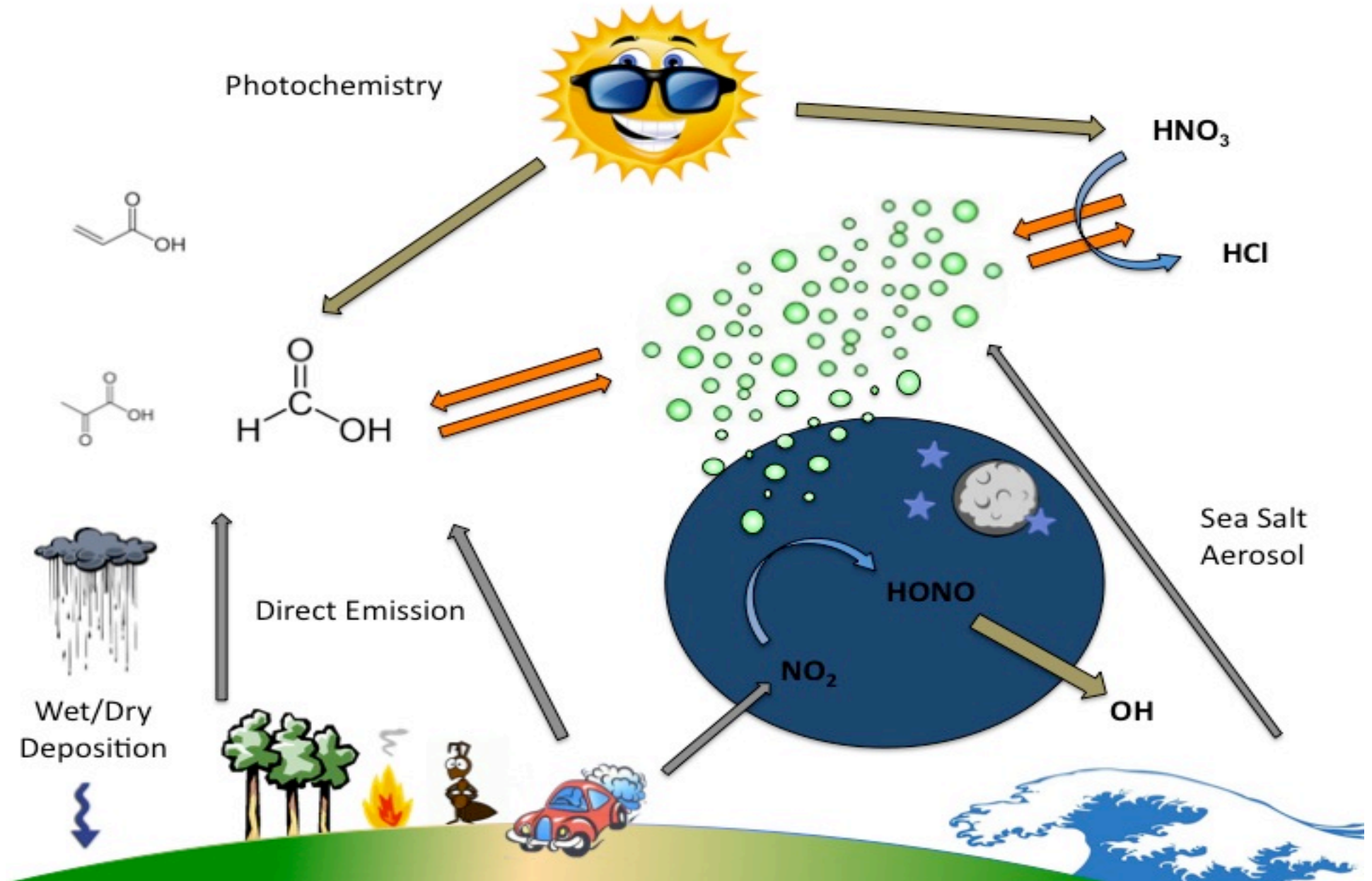
# Acid TOF CIMS, How it works.

Organic acids, e.g. formic, pyruvic, lactic, inorganic acids (HNO<sub>3</sub>, HCl, HONO), HNCO...

2 slpm Acetic Anhydride (C<sub>4</sub>H<sub>6</sub>O<sub>3</sub>)/N<sub>2</sub>



# The Acid CIMS TOF window into the atmosphere


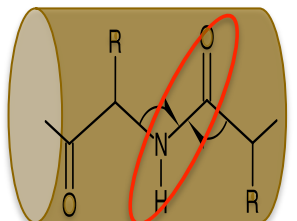


# Isocyanic Acid (HNCO) in the atmosphere

Atm. Lifetime Days to Weeks

1.5 Tg(HNCO)/yr

HNCO

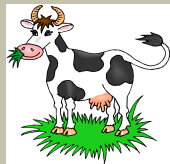
HNCO

$\text{OH} \uparrow$  etc.

$\text{HC(O)NH}_2$

$\text{OH} \uparrow$  etc.

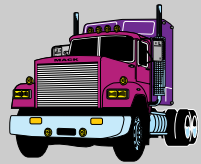
$\text{CH}_3\text{NH}_2$



HNCO


Selective Catalytic Reduction

$\text{H}_2\text{NC(O)NH}_2$

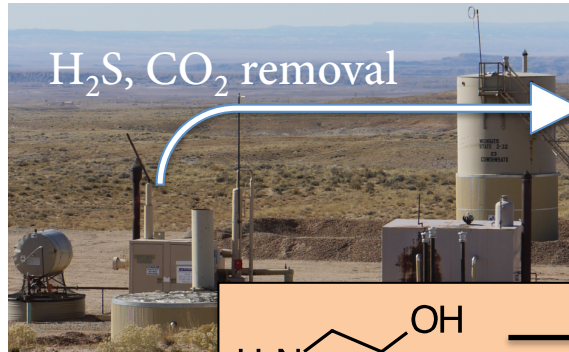
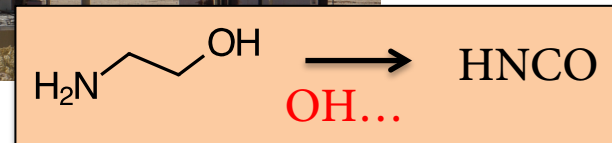


HNCO

$\text{H}_2\text{NC(O)NH}_2$



$\text{H}_2\text{S, CO}_2$  removal

# Isocyanic Acid (HNCO) in the atmosphere

Atm. Lifetime Days to Weeks

1.5 Tg(HNCO)/yr

HNCO

HNCO

$\uparrow$  OH etc.

HC(O)NH<sub>2</sub>

$\uparrow$  OH etc.

CH<sub>3</sub>NH<sub>2</sub>

HNCO

Selective Catalytic Reduction

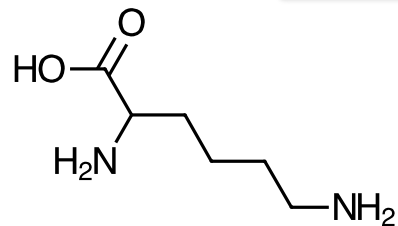
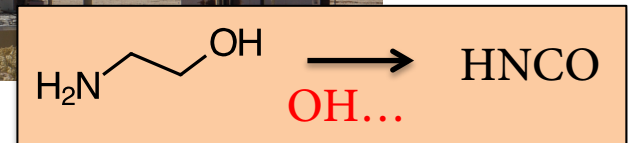
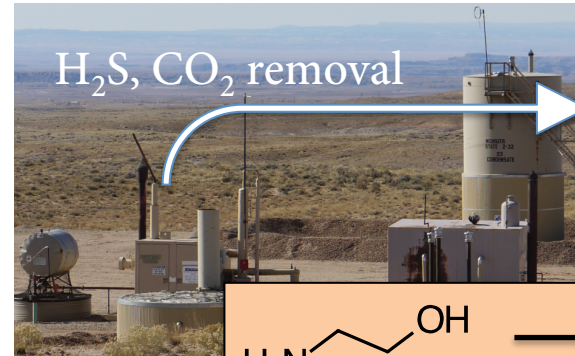
$\uparrow$

H<sub>2</sub>NC(O)NH<sub>2</sub>

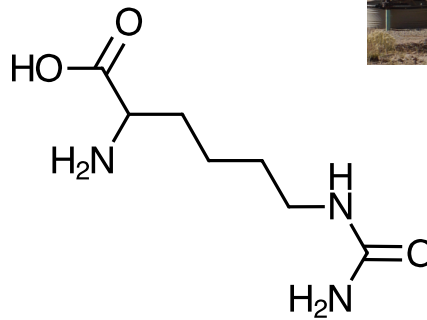
HNCO

$\uparrow$

H<sub>2</sub>NC(O)NH<sub>2</sub>



+ HNCO



Lysine

Homocitrulline

Protein Citrullination: Inflammation, Auto-immune diseases, Rheumatoid Arthritis