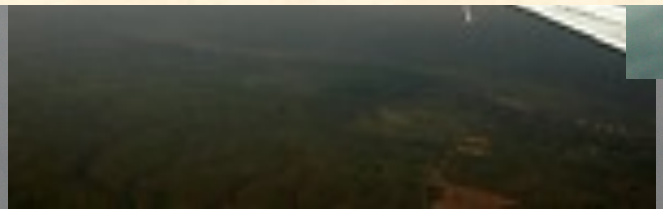
Thunderstorms and atmospheric composition:
A meeting of cloud physics, dynamics, lightning and chemistry

1. AGU Eos Editor's Vox: *Connecting Thunderstorms and Climate Through Ozone*
2. Lab. Aerologie, Toulouse seminar: *Role of Thunderstorms on Upper Troposphere Ozone – What We Have Learned from DC3*
3. IGAC conference talk: *Role of Thunderstorms on Upper Troposph[illegible]ne – What We Have Learned from DC3*
4. AGU meeting talk: *Analysis and Modelin[illegible]on: The 22 June 2012 DC3 Case*
5. AMS meeting talk: *[illegible]ere Convection: The 22 June*
6. Texas A&M s[illegible]*torms on the Composition of the Troposphere – What We Have Lea[illegible]*
7. U. Michigan se[illegible]nar: *Thunderstorms and Atmospheric Composition: A Meeting of Cloud Physics, Dynamics, Lightning and Chemistry*
8. NCAR Day of Discovery and Networking *Thunderstorms and Atmospheric Composition: A Meeting of Cloud Physics, Dynamics, Lightning and Chemistry*

Who is the audience?

What do they know already?



Thunderstorms and atmospheric composition:
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1. AGU Eos Editor's Vox: *Connecting Thunderstorms and Clim*	Geoscientists
2. Lab. Aerologie, Toulouse seminar: *Role of Thunderstorms (What We Have Learned from DC3*	Atmospheric Scientists
3. IGAC conference talk: *Role of Thunderstorms on Upper Tr Have Learned from DC3*	Atmospheric Chemists
4. AGU meeting talk: *Analysis and Modeling of Trace Gases i The 22 June 2012 DC3 Case*	Atmospheric Scientists
5. AMS meeting talk: *Analysis and Modeling of Trace Gases i The 22 June 2012 DC3 Case*	Atmospheric Chemists
6. Texas A&M seminar: *Role of Thunderstorms on the Compo We Have Learned from DC3*	Dept. Atmospheric Scientists
7. U. Michigan seminar: *Thunderstorms and Atmospheric Co Physics, Dynamics, Lightning and Chemistry*	Dept. Climate and Space Sciences and Engineering
8. NCAR Day of Discovery and Networking *Thunderstorms ar Meeting of Cloud Physics, Dynamics, Lightning and Chemis*	Upper Atmosphere, Climate, Weather, Chemistry Scientists Administrators, Software Engineers, …

Thunderstorms and atmospheric composition:
A meeting of cloud physics, dynamics, lightning and chemistry

Deep Convective Clouds and Chemistry (DC3) Field Proj

- Supported by NSF, NASA, DLR
- DC3 co-Principal Investigat , Jim Crawford, Heidi Huntrieser (D
- DC3 Sc

Acknowledgements First

Why?

It is important to thank the funding agencies.

It is better to end with your summary as the last slide.

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Deep Convective Clouds and Chemistry (DC3) Field Proje

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- DC3 Science T

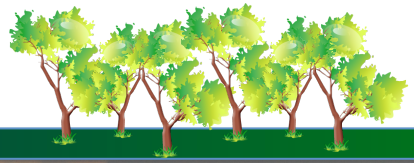
Heidi Huntrieser (D

, Jim Crawford,

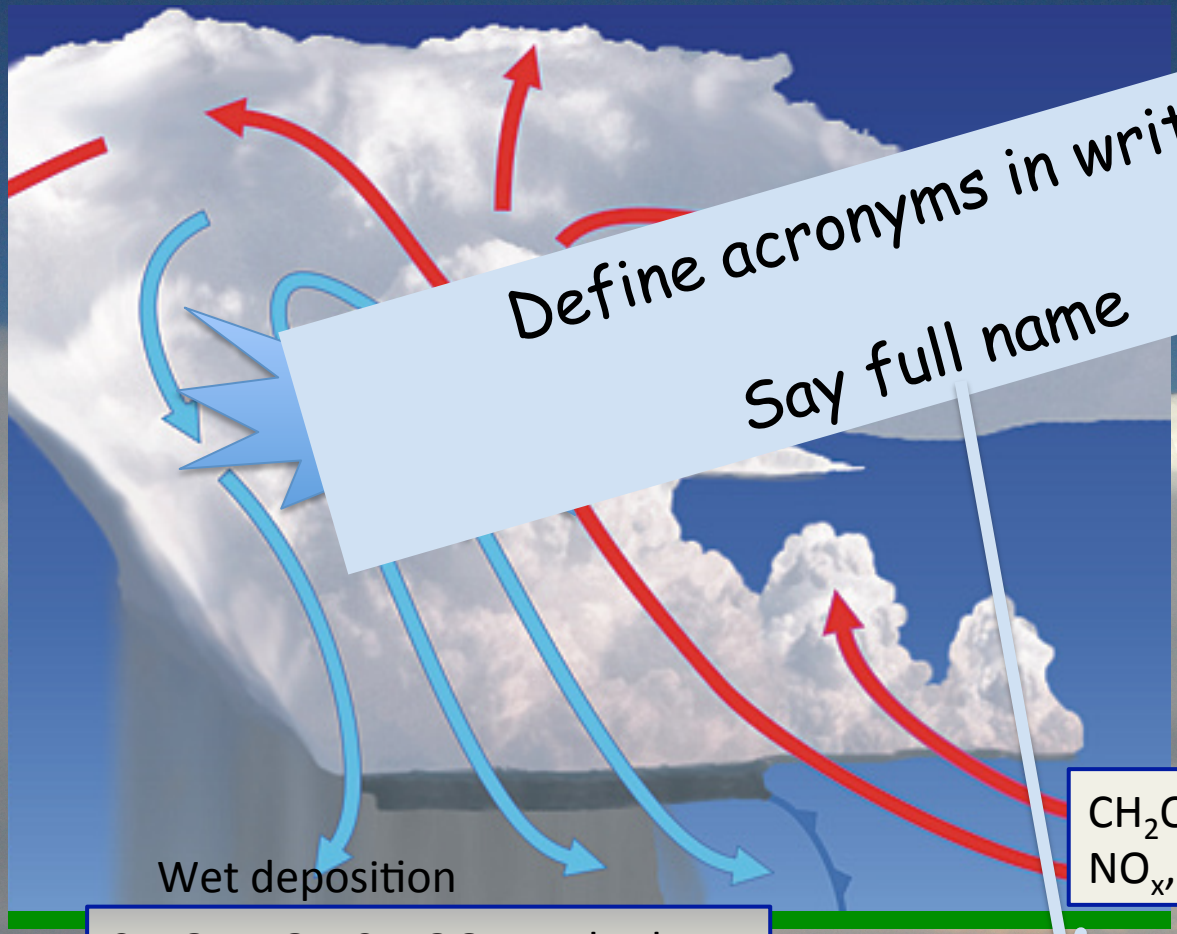
Basic Definition That Audience Should be Familiar with
(start with something the audience should know)

Nitrogen Oxides (NO_x = NO + NO_2)
Volatile Organic Compounds (VOCs)

Ozone (O_3)



A meeting of cloud physics, dynamics, lightning and chemistry



Define acronyms in writing

Say full name

CH_2O, H_2O_2, CH_3OOH,
NO_x, O_3

Wet deposition

CH_2O, H_2O_2, CH_3OOH and other soluble trace gases and aerosols

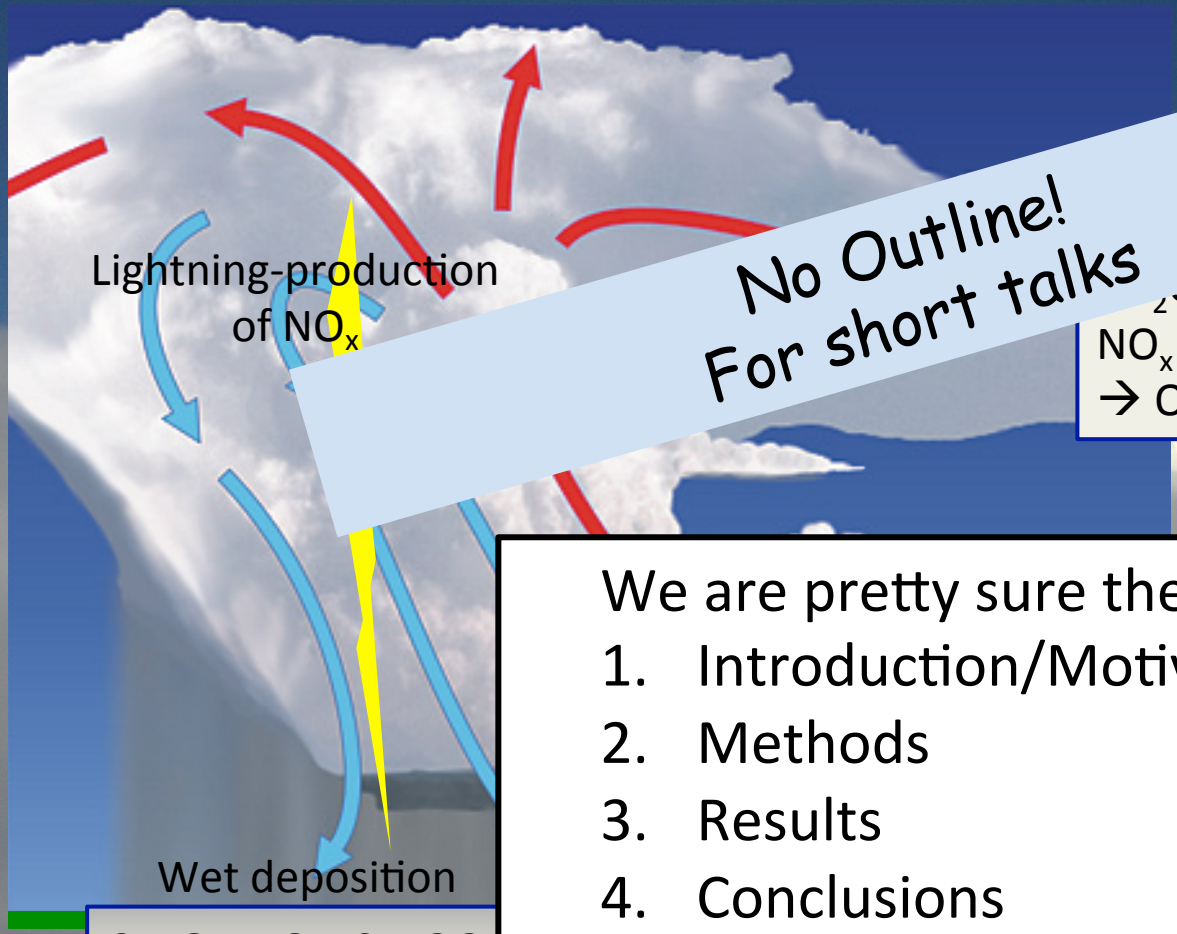
Important ozone precursors that are soluble:

CH_2O = formaldehyde

H_2O_2 = hydrogen peroxide

CH_3OOH = methyl hydrogen peroxide

A meeting of cloud physics, dynamics, lightning and chemistry



No Outline!
For short talks

...ily-active plumes
...$_2O$, H_2O_2, CH_3OOH, other VOCs, NO_x
→ O_3 **GHG in Upper Troposphere**

We are pretty sure the outline is this:

1. Introduction/Motivation
2. Methods
3. Results
4. Conclusions

CH_2O, H_2O_2, CH_3OOH
soluble trace gases a...

...important ozone precursors that are soluble:
CH_2O = formaldehyde
H_2O_2 = hydrogen peroxide
CH_3OOH = methyl hydrogen peroxide

Deep Convective Clouds and Chemistry (DC3) Field Experiment

Aimed to Learn How Thunderstorms Affect the Composition of the Troposphere

Sampled Storms in

- Northeast Colorado
- West Texas to Central Oklahoma
- Northern Alabama

Supplemental Information at the bottom which is usually harder to see by the audience

- Weather balloon [illegible] environment
- Radars and Lightn[illegible]apping Arrays to characterize storm and lightning
- Aircraft to characterize composition in the inflow and outflow regions of storm

Overview Paper: Barth et al. (2015) *BAMS*

DC3 Special Issue in JGR

Retention of Methyl Hydrogen Peroxide in Freezing Drops

→ WRF-Chem simulation also predicts CH_3OOH scavenging efficiencies greater than expected (<10%)

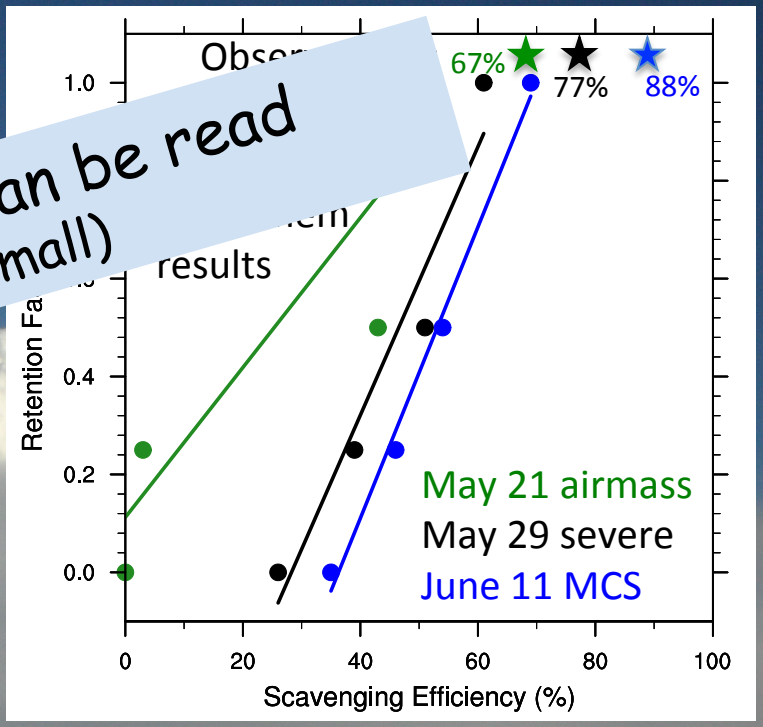
→ CH_3OOH scavenging effici… ice retention fa…

50-100% CH…

H_2O_2 retention factor < 25%

CH_2O retention factor < 10%

Be sure axes labels can be read (these are too small)



Bela et al. (2016 and in preparation)

Observation results from Fried et al. (2016) and Barth et al. (2016)

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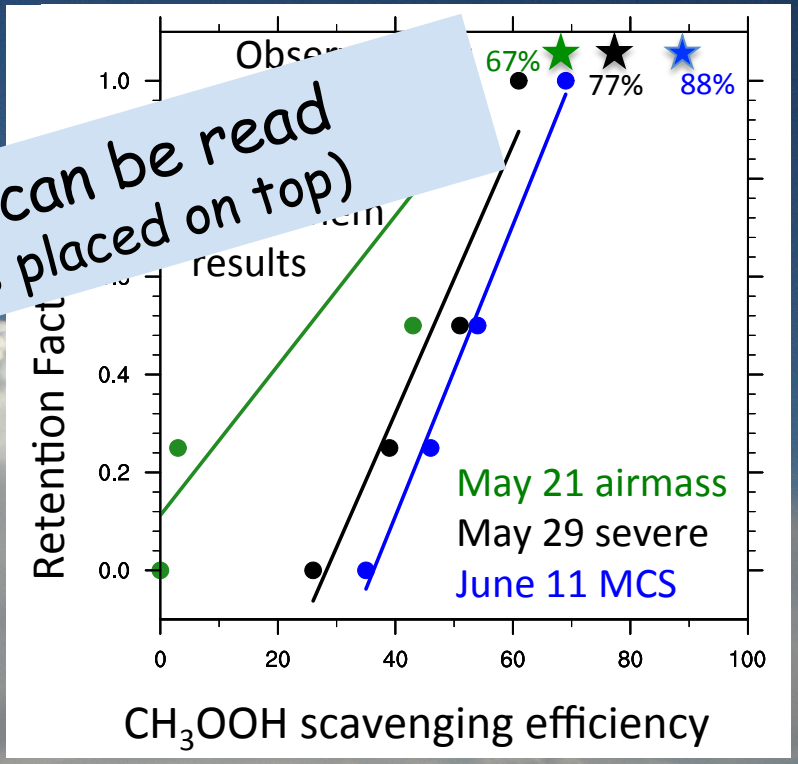

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1. In severe thunderstorms [illegible] re scavenged by th[illegible]
   → Cl[illegible]
2. Ligh[illegible] uct, affecting estimates of lightn[illegible]
3. Lightning-NO_x production could be influenced by the size of the lightning flash
4. Ozone is chemically produced in convective outflow regions, but small-scale mixing from the stratosphere also puts ozone into the upper troposphere

Ozone is a greenhouse gas in the upper troposphere

Last slide contains your conclusions

Why?

(allows audience to read them during questions)

Thank you!

Summary

- Who is the audience? What do they know already?
  - Helps to connect audience to your topic
- Acknowledgements first – not the last slide
- Begin with something everyone is familiar with
  - Helps to connect audience to your topic
- No outline for short talks – Saves time
- Supplemental information at bottom of slide
  - Bottom of slide may not be seen by everyone
- Make it easy for audience to read slides
  -- Axes labels large enough to be read by audience
  -- Dark letters on light background / light letters on dark background
  -- Define acronyms in writing as well as saying the full name
- Last slide should be your summary (3 points at most)
  - Allows audience to read during question and answer period

- Keep slides simple (determine main point and show only what supports your point)
- **Keep presentation simple** (tell a story with 1-2 main points)
- Be excited about your work (if you are not excited, who will be?)