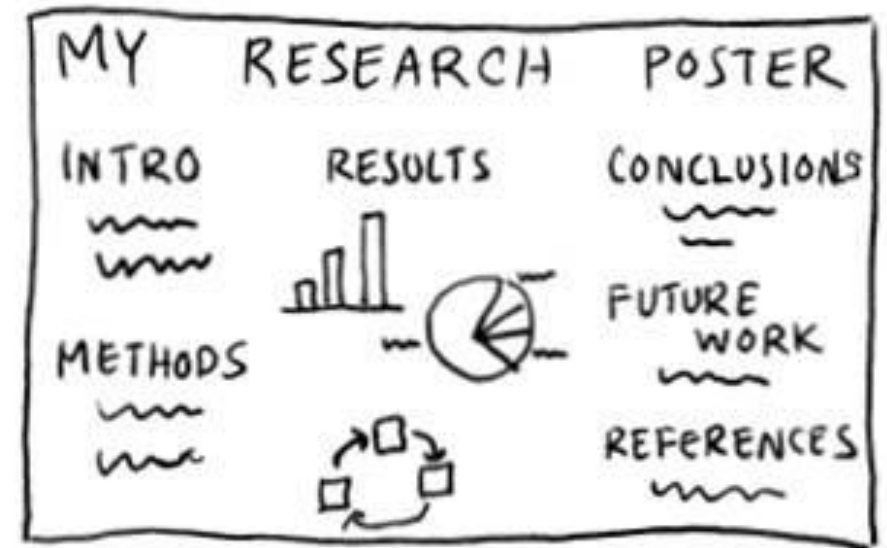


How to make a NICE poster presentation

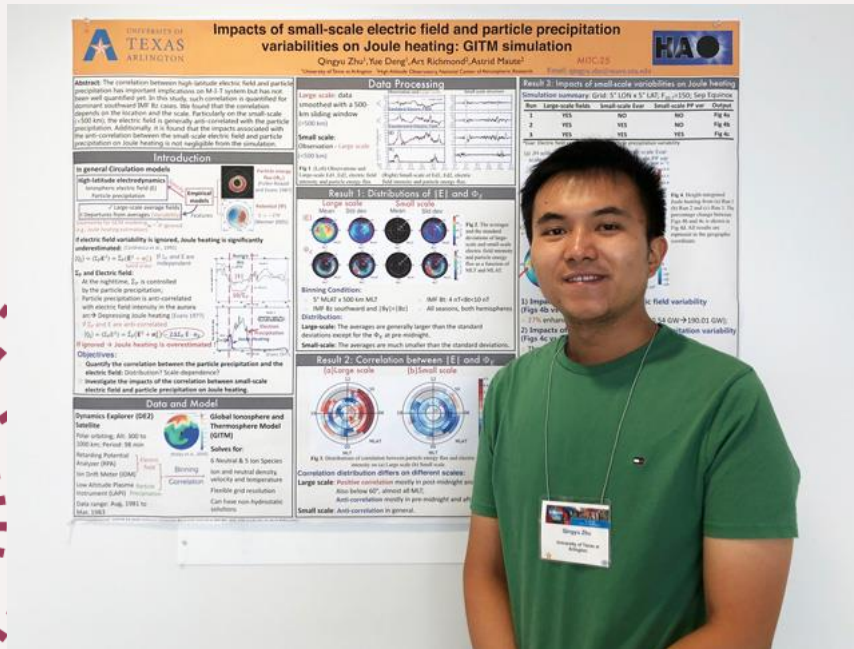
Qingyu Zhu (NCAR ASP)



[<https://guides.lib.berkeley.edu/posters>]

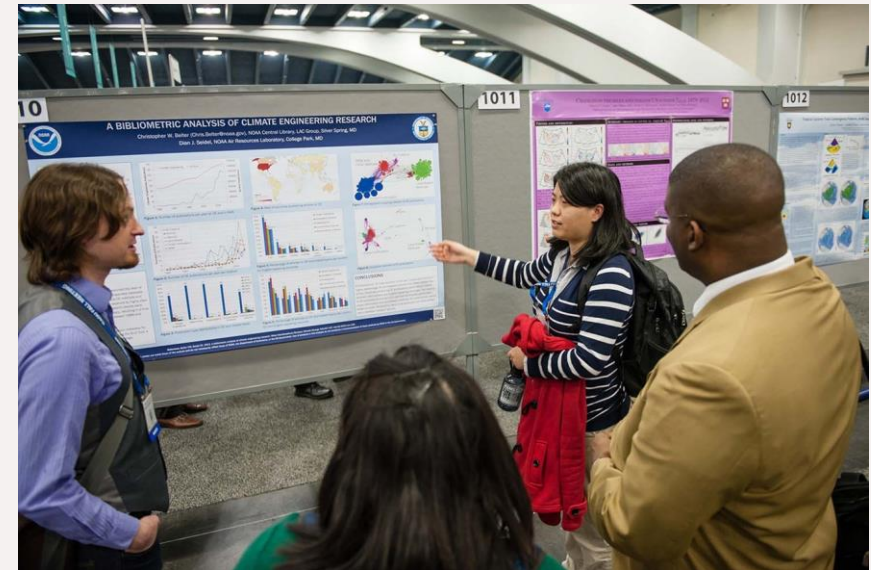
Poster Presentation

Poster



- Limited space

Presentation



- Presentation + discussions

Plan for your poster

- What are the major findings from your research project?
 - Select those with new insights
 - Observations
 - Simulations
 - Approaches

Plan for your poster

- **What are the major findings from your research project?**
 - Select those with new insights
- **How do you present them to the conference attendees?**
 - Figures, tables, text ...
 - Select necessary figures/tables
- **Let's start the journey of making a poster!**

Design your poster

- **Arrange the contents in blocks**
 - Introduction, methodology, results ...
 - Headings
- **Organize the blocks in orders**
 - Have some obvious flows
 - Top to bottom
 - Left to right

Text & Visuals



Poster



- Components are complete
- Title
- Abstract
- Introduction & Motivation
- Methodology
- Results
- Conclusion
- Flow is quite obvious
- Numbers in headings
- Arrows between blocks

Indirect Momentum-Energy Coupling in the F-region Ionosphere-Thermosphere System



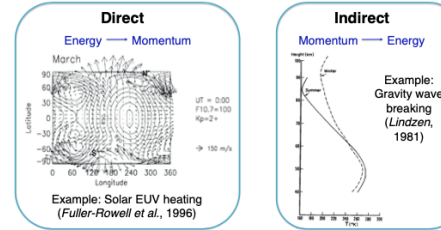
Vicki W. Hsu¹, Jeffrey P. Thayer¹, Wenbin Wang², Alan Burns²
¹University of Colorado at Boulder, Department of Aerospace Engineering Sciences (vicki.hsu@colorado.edu)
²High Altitude Observatory, National Center for Atmospheric Research



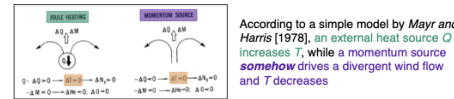
Abstract

Thermospheric neutral properties, such as wind, temperature, and neutral mass density, are influenced by momentum and energy sources. Much work has focused on the response of the thermosphere when driven by energy sources from the magnetosphere that result in direct heating of the neutral gas. This leads to a dynamical response of the thermosphere described as a direct circulation. However, sources that change the momentum transfer to the neutral gas can lead to thermal changes through a dynamical response that would be characterized as an indirect circulation. The ionosphere-thermosphere (I/T) system is tightly coupled by momentum and energy, thus the path for a direct energy source is to change the energy and then the momentum, while the route for an indirect source is to change the momentum and then the energy. For the indirect energy source, changes in the ion drag force modify the neutral wind field, which causes adiabatic heating or cooling, leading to variations in the thermal energy of the system. All of the important forces and processes exist for describing both the direct and indirect energy sources, but it is the time evolution of the processes that will define how the thermosphere responds. In this work, we present an indirect energy mechanism that can alter the thermospheric neutral mass density and temperature. We use the NCAR TIEGCM to demonstrate the processes in the mechanism and its contribution to the formation of I/T neutral structures on a global scale. This study illustrates how changes in the ion drag force can indirectly affect the energy of the F-region I/T system, and

1. Indirect vs. Direct Energy Mechanism



Previous Work



2. Momentum Source: Ion Drag

Ion drag is the force acting on neutral particles due to collisions with the ions

$$\rho_n \frac{D\mathbf{u}_n}{Dt} = -\nabla p_n - \nabla \cdot \tau_n + \rho_n [\mathbf{G} - 2\Omega \times \mathbf{u}_n - \Omega \times (\Omega \times \mathbf{r})] - n_n m_n \nu_{in} (\mathbf{u}_n - \mathbf{u}_i)$$

Momentum

$$\frac{\partial \omega}{\partial t} = -\nabla_p \cdot \mathbf{u}_{n,H}$$

Continuity

$$\left(\frac{\partial \rho_n}{\partial t} \right)_{ad} = -W_n \left(\frac{\partial \rho_n}{\partial z} + \frac{\partial \rho_n}{\partial r} \right) = Q_{ad}$$

Energy

$$\frac{D_n}{Dt} \left(\frac{3}{2} p_n \right) + \frac{5}{2} p_n (\nabla \cdot \mathbf{u}_n) + \nabla \cdot \mathbf{q}_n + (\nabla_n \cdot \nabla) \cdot \mathbf{u}_n = \sum Q_n - \sum L_n$$

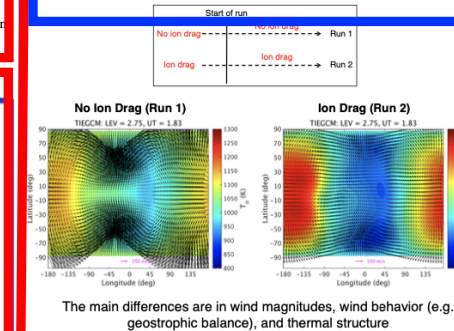
Temperature

3. Numerical Experiments

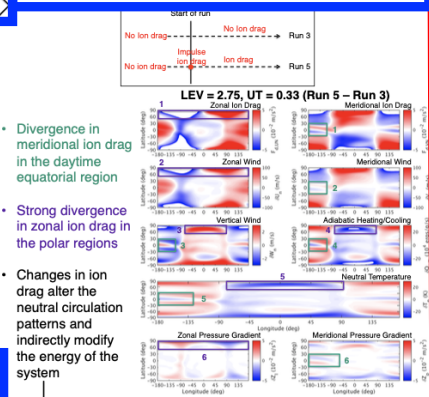
- The National Center for Atmospheric Research (NCAR) Thermosphere-Ionosphere-Electrodynamics General Circulation Model (TIEGCM) is a global 3D numerical model that simulates the coupled I/T system from ~97 km to ~600 km
- TIEGCM self-consistently solves the nonlinear, hydrodynamic, thermodynamic, and continuity equations for the neutral gas, and includes the electrodynamic interactions between the thermosphere and ionosphere
- The TIEGCM is used to demonstrate the effects of ion drag on the I/T system for the following conditions:
 - March equinox (DOY 80)
 - High solar activity (F10.7 = 180)
 - Low geomagnetic activity

Description of Numerical Experiments				
Run	Source Run	Ion Drag	Impulse Ion Drag	Description
1	X	X	-	Basic state without ion drag
2	✓	✓	-	Basic state with ion drag
3	X	X	X	Steady-state without ion drag
4	✓	✓	✓	Steady-state with ion drag
5	X	✓	✓	Impulsive ion drag

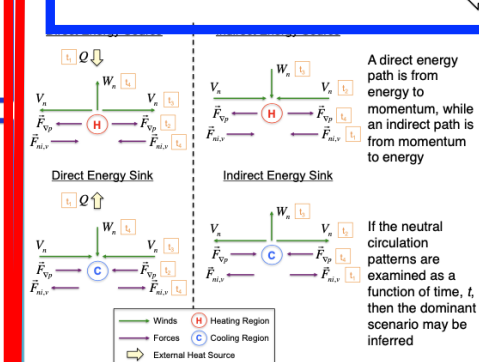
4. Global Impact of Ion Drag on Basic State of Thermosphere



5. Global Hydrodynamic Response to Ion Drag Force



6. Summary of Indirect vs. Direct Energy Sources and Sinks



Conclusions

- The structure of the F-region ionosphere-thermosphere system is modified through direct and indirect energy mechanisms
- Indirect momentum-energy coupling mechanisms are an important modifying process of the upper atmosphere
 - Changes in the ion drag force (a momentum source) alters the neutral winds, which produces adiabatic heating or cooling, causing neutral temperature anomalies
- The induced neutral circulation patterns caused by indirect momentum-energy coupling are time evolving and dependent on the scale and magnitude of the ion drag force change relative to other hydrodynamic forces

Acknowledgements: This work was supported by the National Science Foundation Graduate Research Fellowship Program, Award No. DGE 1144083.

[Vicki Hsu, 2015 CEDAR]

Design your poster

- **Visuals are important**
 - Figures, tables ...
 - **Largest area**
- **Text is also needed**
 - e.g., Annotations, conclusions ...
 - **Concise**
- **Balance visuals and text**
 - e.g., 50% visuals : 30% text : 20% space

A Picture

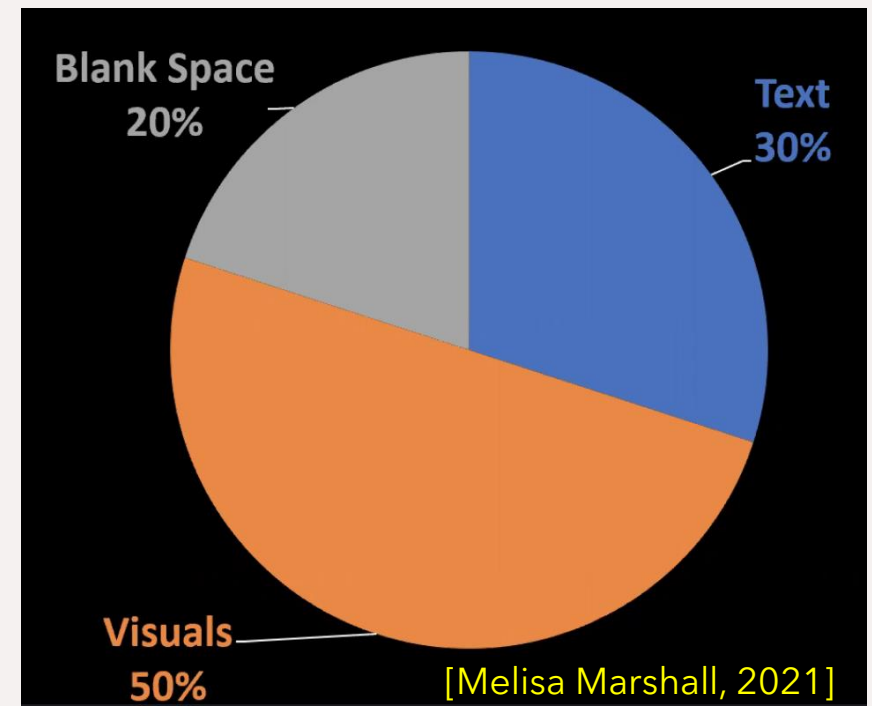


is worth
=

Creamy, delicious, yummy, fudge ice cream, smooth, chocolate-chip mint ice cream, strawberry ice cream with real chunks of strawberry, colored sugar sprinkles, waffle sugar cone, sweet, wonderful, tastes great, cold, nice to eat, dessert, good yummy toppings, chocolate sprinkles, comforting, good, fun, dipping, terrific,

A thousand words.

©2003 E. Aoyama



Work on your poster

- **Figures**

- Simple and illustrative
- Make text shown in the figure large enough
- Caption the figure clearly and as concisely as you can
- Try to use thicker lines, ticks and axes
- Choose colors carefully (Contrast)
- Part of an existing figure might be better than a full figure

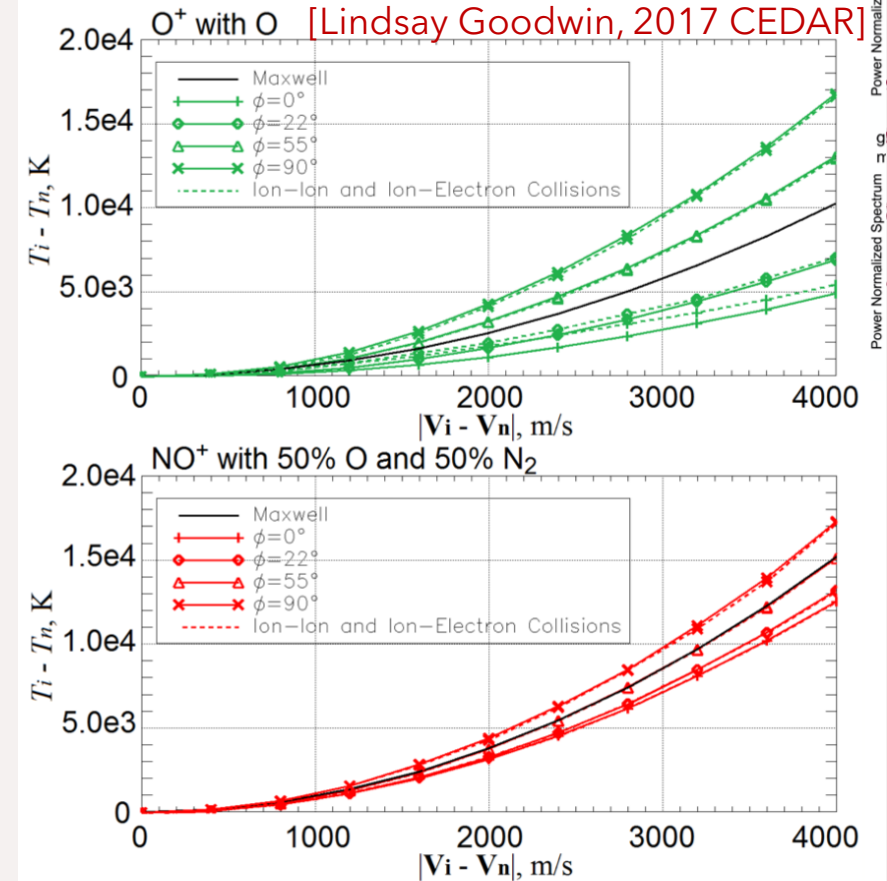
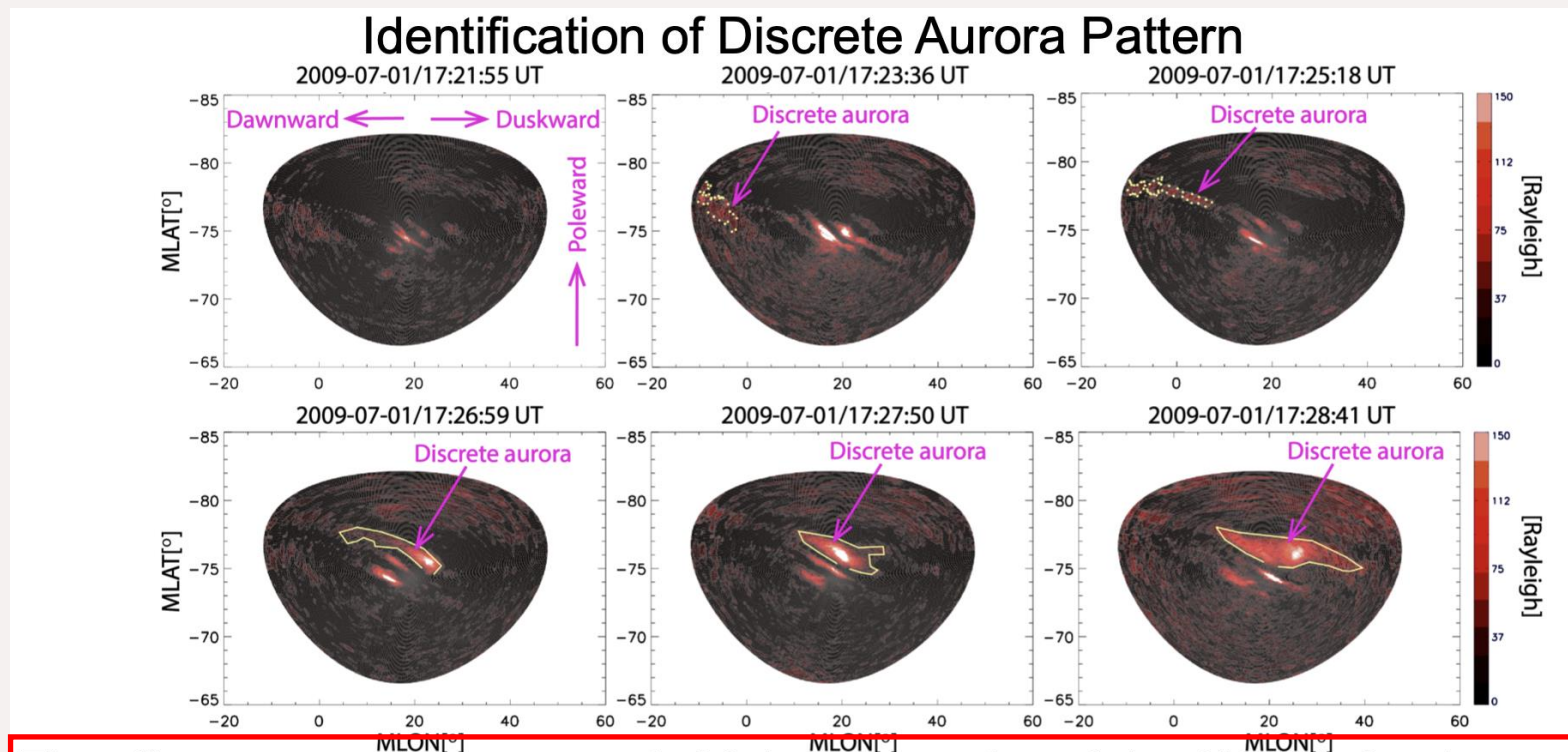


Figure 3: The ion-neutral relative temperature difference, $T_i - T_n$, as a function of the relative drift, $|\mathbf{V}_i - \mathbf{V}_n|$, at a variety of aspect angles. The top panel examines O⁺-O collisions using the “Pesnell” RCE cross-section, and the bottom panel examines NO⁺ collisions with 50% O and 50% N₂. The black lines give the average relative ion-neutral temperature difference according to the Maxwell molecule formulation ($T_i - T_n = |\mathbf{V}_i - \mathbf{V}_n|^2 m_n / 3k_b$, where m_n is the neutral mass and k_b is the Boltzmann constant). The solid lines reflect the influence of ion-neutral particle collisions, and the dashed lines incorporate self- and ion-electron collisions.



The discrete aurora pattern (which is associated the HSJs), is also identified with duskward motion. This is consistent with the azimuthal propagation of the diffuse aurora pattern and the V_y of the magnetosheath flow. [Boyi Wang, 2017 GEM]

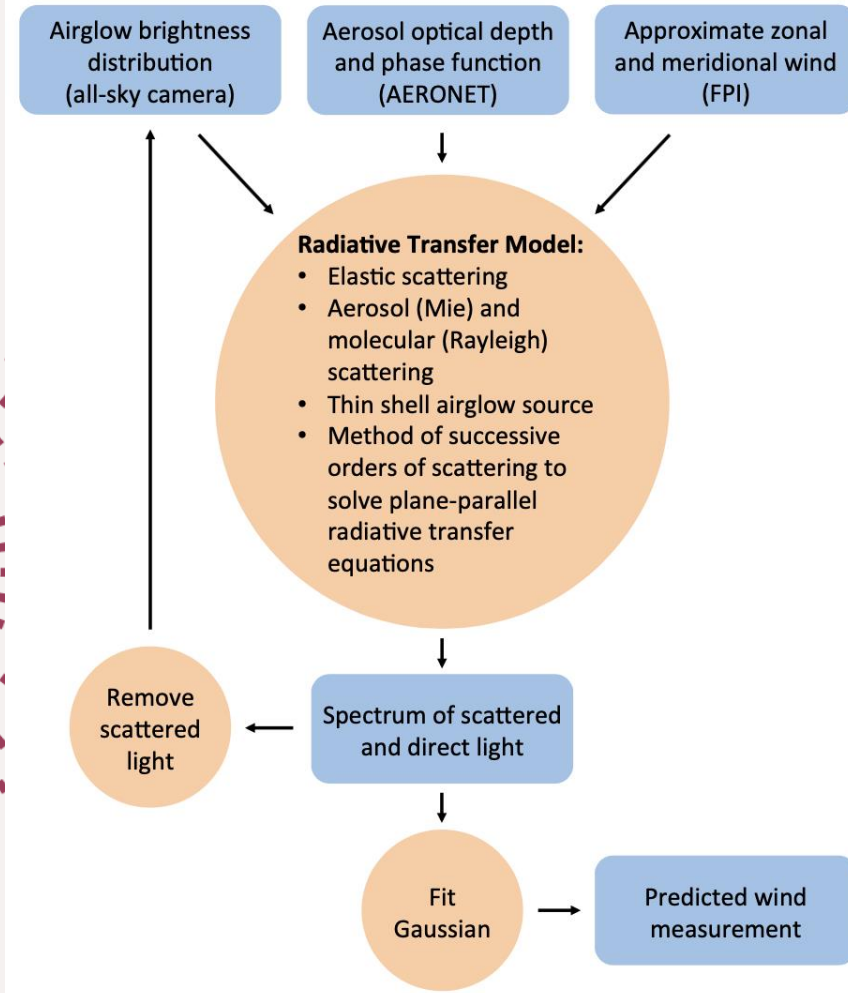
• Figures (Cont.)

- Add necessary annotations when making posters
- Put the points you want to convey through the figure nearby

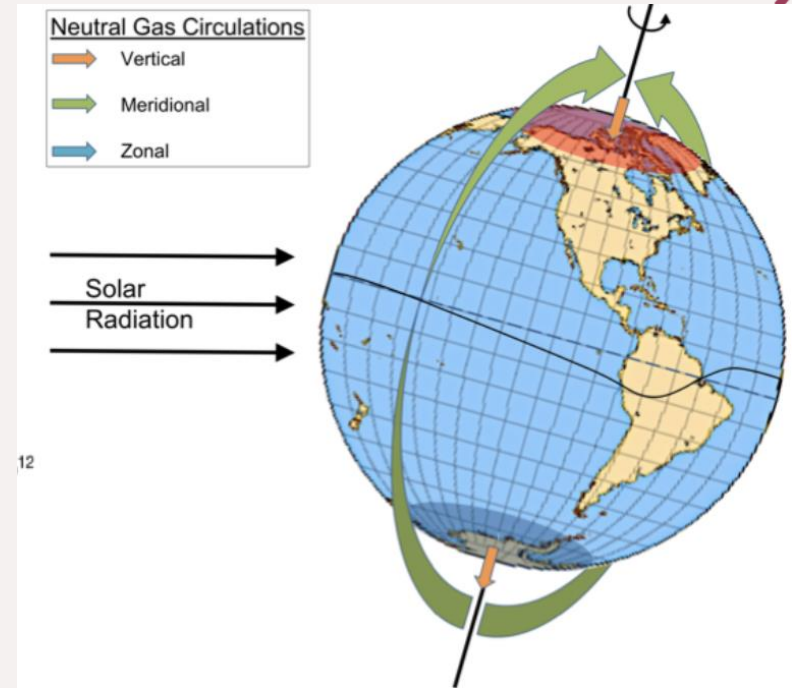
- **Besides data visualization, you can create figures for illustrations**

- **Explain an algorithm**

Scattering Model [Brian Harding, 2016 CEDAR]



- **Explain a mechanism**



Adiabatic heating/cooling regions in the upper thermosphere, as interpreted from helium concentrations.

[Hannah Holt, 2018 CEDAR]

Winter helium bulge is a consequence of large scale, divergent, meridional circulations that produce bulk vertical motion.

Work on your poster

- **Tables**

- Simple but illustrative
- Caption the table clearly
- Put the points you want to convey through the table near the table



- **Table can be used to summarize simulations**

Simulation summary: Grid: 5° LON x 5° LAT; $F_{10.7}=150$; Sep Equinox

Run	Large-scale fields	Small-scale Evar	Small-scale PP var	Output
1	YES	NO	NO	Fig 4a
2	YES	YES	NO	Fig 4b
3	YES	YES	YES	Fig 4c

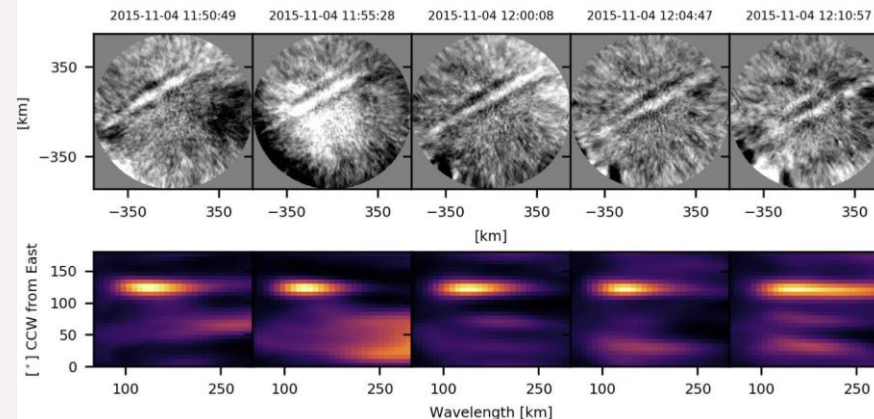
*Evar: Electric field variability *PP var: Particle precipitation variability

[Qingyu Zhu, 2018 CEDAR]

- **Tables can be used to summarize results**

For each of the dates, the top row in each figure show 5 temporally filtered frames from the event. The bottom row shows the energy surface output from the directional filtering step for each frame. The actual wave measurements are provided in the rightmost tables.

4 November 2015



Measurements	
Wavelength	164 (± 44) km
Orientation	297 (± 2) °
Period	13.9 (± 2.2) min
Phase Speed	194 (± 24) m/s

[Matthew Grawe, 2017 CEDAR]

Work on your poster

- **Text**
 - Might be good to use **Sans Serif** fonts
 - **Bold** or non-bold
 - Choose the color and font size carefully (>32 pt)
 - Print your poster on a letter paper and see whether you can see the text well
 - Avoid typos

Before finalizing your poster

- **Check:** Is your poster easy to follow in the absence of presenter?
 - Are all the necessary parts included?
 - Is the frame neat enough?
 - Is the font/font size/font weight/color of the text proper?
 - Is the text concise and informative?
 - Are the visuals informative and easy understood?
- **Revision makes perfect!**



Present your poster

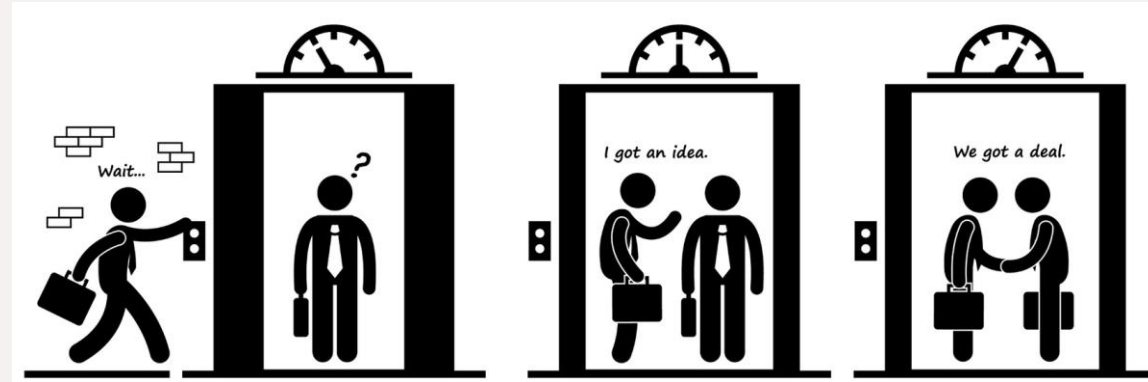
- **Preparation:**

- Prepare for a 10 min presentation (without interruption)

- Prepare for a 3 min presentation

- Scripts could be helpful

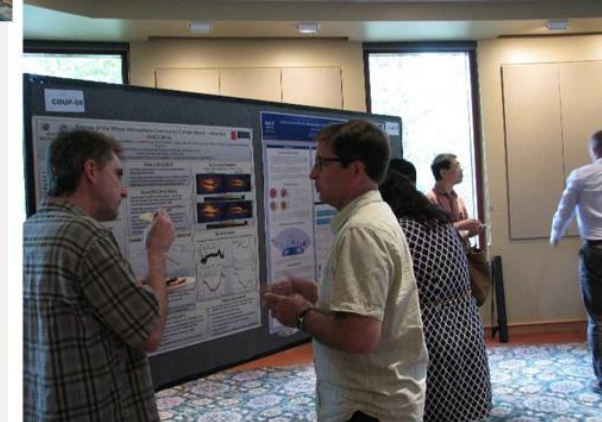
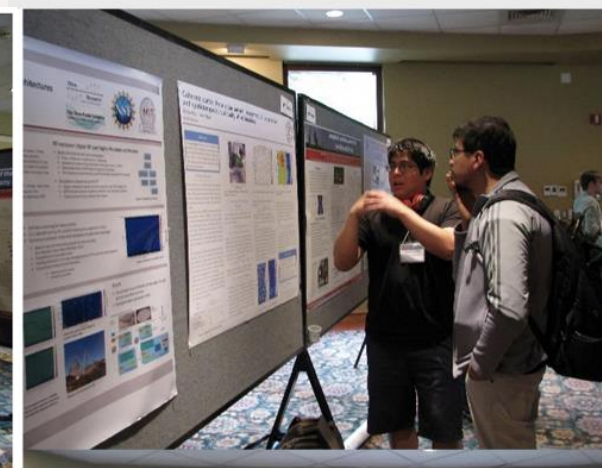
- **Practice makes perfect**



Present your poster

- **Presentation:**

- Be extrovert
- Refer to your poster
- Have the supplement materials ready
- Be nice to your audiences
 - Make your delivery more accessible
 - Pause for a while when they are looking at the figures



How to make a NICE poster presentation



Neat

(Visually appealing)

Informative

(Have all important information [e.g., Motivations, methods, points of each figure and conclusions])

Concise

(Short and sweet)

Engaging

(Create a good story and deliver it in an efficient way)

Thanks!



More materials

- **Past CEDAR posters:**

<https://cedarscience.org/past-workshops>

- **Melissa Marshall: Powerful Posters: Tips & Tricks**

<https://projection.zoom.us/rec/play/wiQSJFtUp6EVQr2M-cf0AhNqfoYxQAWYoLS-S7ZW2IJ2cVgcMuTb4GLsxy5pZ4aYtEaCsEHf0IR-Hil5.tZvC0pTT2IkO5jLL>

- **New York University: How to Create a Research Poster**

<https://guides.nyu.edu/posters>

- **UC Davis: Creating Effective Academic Posters**

<https://urc.ucdavis.edu/creating-effective-academic-posters>

- **Marcia McNutt (2015), It starts with a poster. *Science*, 347 (6226)**

<https://www.science.org/doi/10.1126/science.aab0014>

- **More and more ...**