Prepare and Deliver Scientific Presentations

Read Part III, especially chapters 24 and 25 of Schultz book.

- Presentation skill is another important part of communication skills beyond written communication.
- Presentations at conferences can be in an oral or poster format. Chapter 27 of Schultz book focuses on poster presentation.
- Presentations can be given in a variety of scenarios, such as for class projects, at research group meetings, at department and institutional seminars, national and international workshops and conferences, job interviews, project/program report and review meetings, to potential customers, investors, funding program managers, to the general public or K-12 school students.
- Clearly, presentations should be prepared and delivered with the audience in mind, and often specifically tailored to the audience.
- The content of presentations should also be adjusted to the allotted time allowed.
- In this class, we focus more on preparing and giving scientific presentations.

Similarity with paper writing:

- A speaker should be presenting material worth listening to.
- A speaker should also determine who the audience is and how best to reach them.
- The purpose of a talk should clearly frame its content.

Differences between presentations and papers:

- **Presentations must be more focused.** Generally, writing requires the author to elaborate on details and provide all the evidence supporting the conclusions. ***Speaking requires keeping the audience focused,*** which usually entails ***limiting the number and depth of details*** in the presentation.
- **Presentations have more flexibility.** Presentations are more flexible in format than papers, with more ways to emphasize material, either through the speaker's delivery or multimedia content.
- **Presentations are received by a captive audience.** Presentations are delivered to a mostly captive audience in a room at a fixed time and place. The audience members are beholden to the pace of the speaker, and they get a one-time viewing.
- **Presentations involve feedback between the audience and the speaker.** The audience faces the speaker, and their feedback can be received in real time — facial expressions, approving nods, questions, notetaking, yawns, reading e-mail, talking on the phone, and booing — all are indications of the level of audience participation.
- **Presentations can be provocative.** Whereas scientific journal articles are peer reviewed and permanent, speaking is not. Presenters can be more informal, provocative, and controversial.
- **Presentations can contain fresh content.** The content of a talk can be very new and preliminary. They could results obtained from last night's model simulation, or a new idea from this morning. Presentations can be updated for variety, spontaneity, different audiences, or different occasions.

Constructing Effective Presentation

- Plan your presentation through storyboarding/sketches on paper first.
- Each slide should make one point.
- Keep slides simple.
- Do not state the obvious
- Keep the audience focused
- Save the details for the question-and-answer period or the manuscript.
- Close with one well-considered conclusion slide.

Constructing Effective Presentation - continued

- Headlines are often better than titles
- Remove unnecessary words from the slides.
- Are all bullets necessary?
- Find ways to connect with the audience.
- Use meaningful graphics.
- Graphics should be legible to the audience. Should be clearly labeled.
- Favor simple transitions. Avoid too much animation, unless well organized and rehearsed.
- Important processes/ conceptual models can be built via multi-steps in one slide.

Example of Professionally, Extremely Well Prepared Presentations:

An Inconvenient Truth – By Al Gore

https://www.youtube.com/playlist?list=PLZbXA4lyCtqrVL1to0lSWFJRFsOORzwqx

An Inconvenient Truth – Science of Global Warming

https://www.youtube.com/watch?v=NXMarwAusY4

An Inconvenient Truth – Glaciers

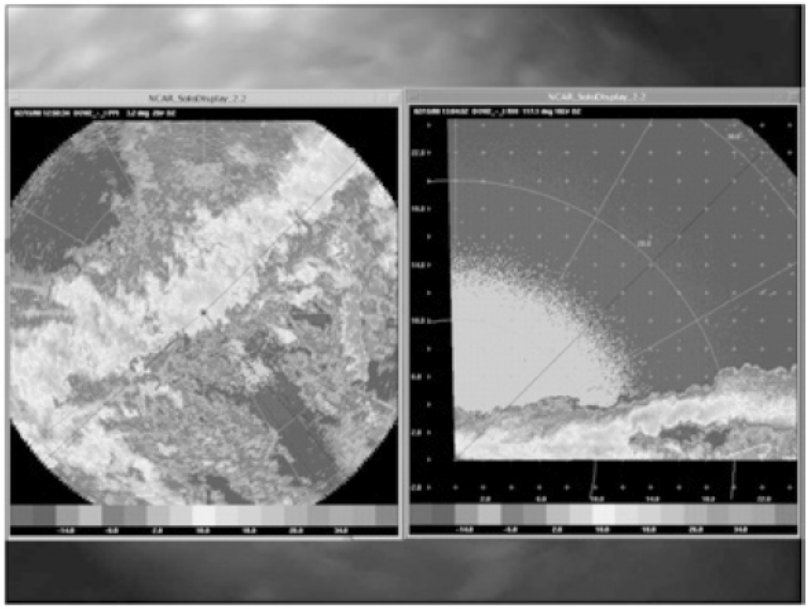
https://www.youtube.com/watch?v=6hFxG-8I0Go&list=PLZbXA4lyCtqrVL1to0lSWFJRFsOORzwqx&index=4

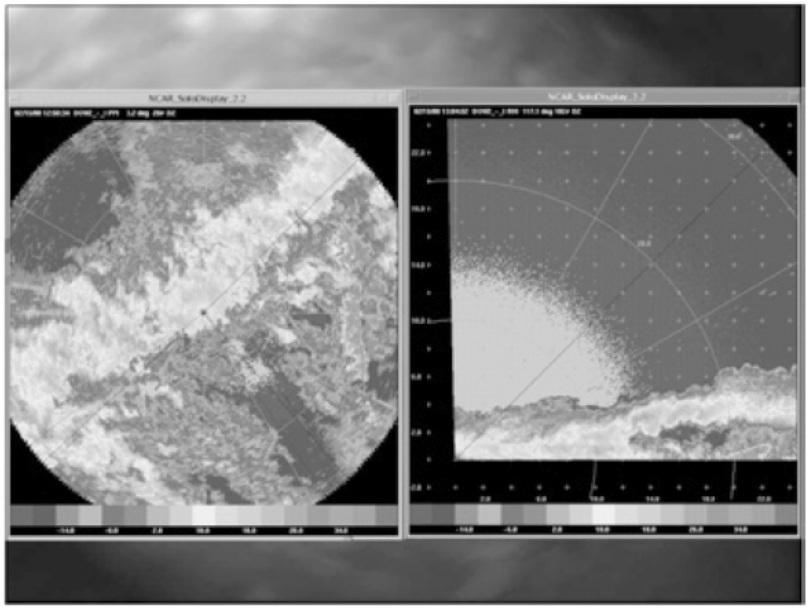
An Inconvenient Truth – Drastic Rise in CO2 Concentration

https://www.youtube.com/watch?v=9tkDK2mZlOo&list=PLZbXA4lyCtqrVL1to0lSWFJRFsOORzwqx&index=5

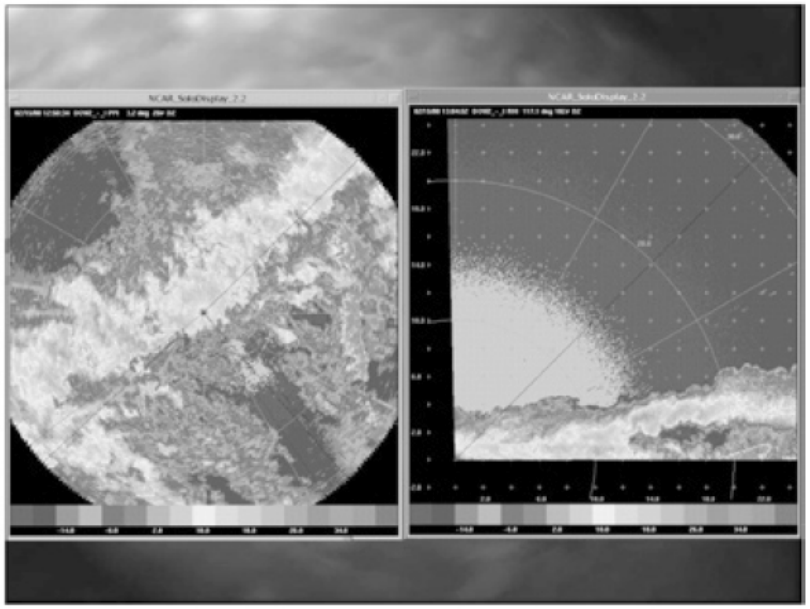
An Inconvenient Truth – U.S. Contribution to Global Warming

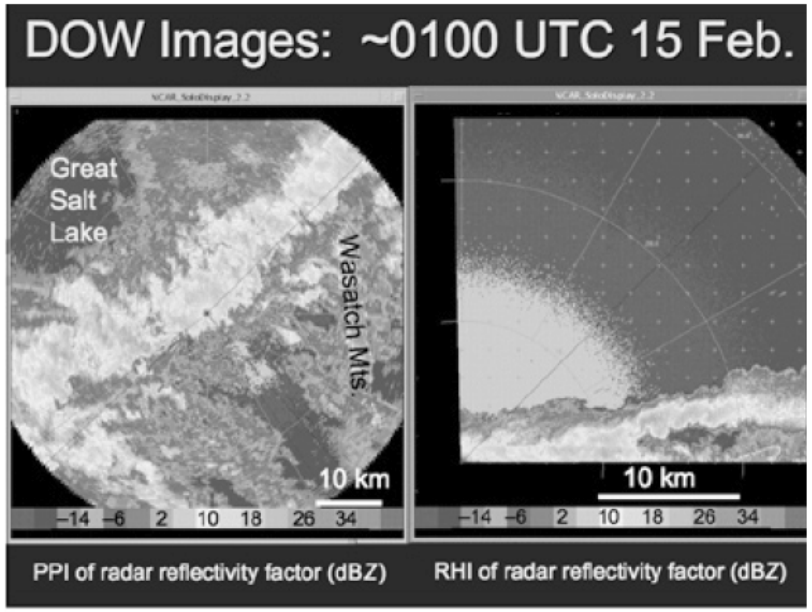
https://www.youtube.com/watch?v=FzQ0GeLVLhk&list=PLZbXA4lyCtqrVL1to0lSWFJRFsOORzwqx&index=6





- The slide is obviously showing radar imagery, but no information about location and time of the images.
- The scales are too small to read.





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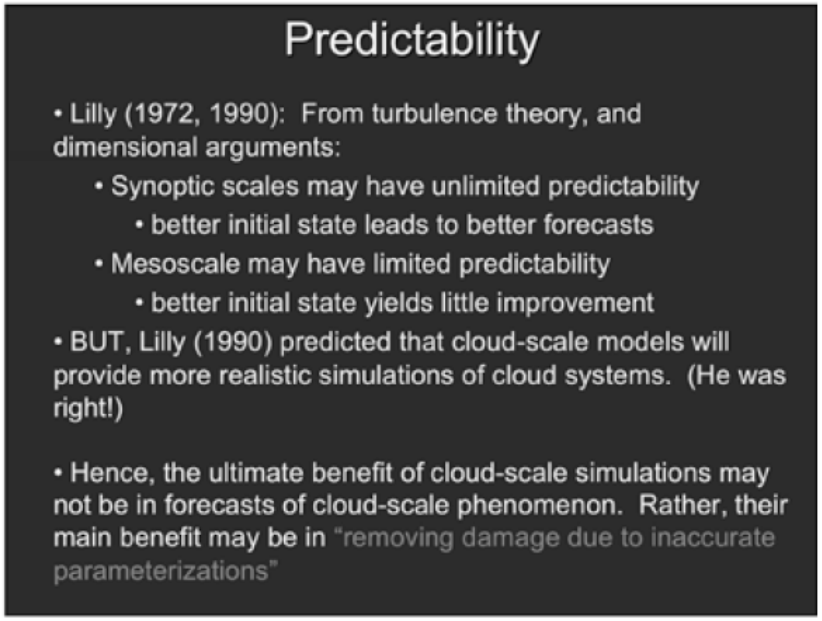
- Annotations now describe the graphs.
- Spatial scales and geographical annotation help identify the location.
- Small scales are covered up, new labels for the color-bar values are added.
- The right image might be further cropped to highlight only the data, not the empty space.

Predictability

- Lilly (1972, 1990): From turbulence theory, and dimensional arguments:
  - Synoptic scales may have unlimited predictability
    - better initial state leads to better forecasts
  - Mesoscale may have limited predictability
    - better initial state yields little improvement
- BUT, Lilly (1990) predicted that cloud-scale models will provide more realistic simulations of cloud systems. (He was right!)

- Hence, the ultimate benefit of cloud-scale simulations may not be in forecasts of cloud-scale phenomenon. Rather, their main benefit may be in "removing damage due to inaccurate parameterizations"



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- The title of the slide doesn't really say anything.

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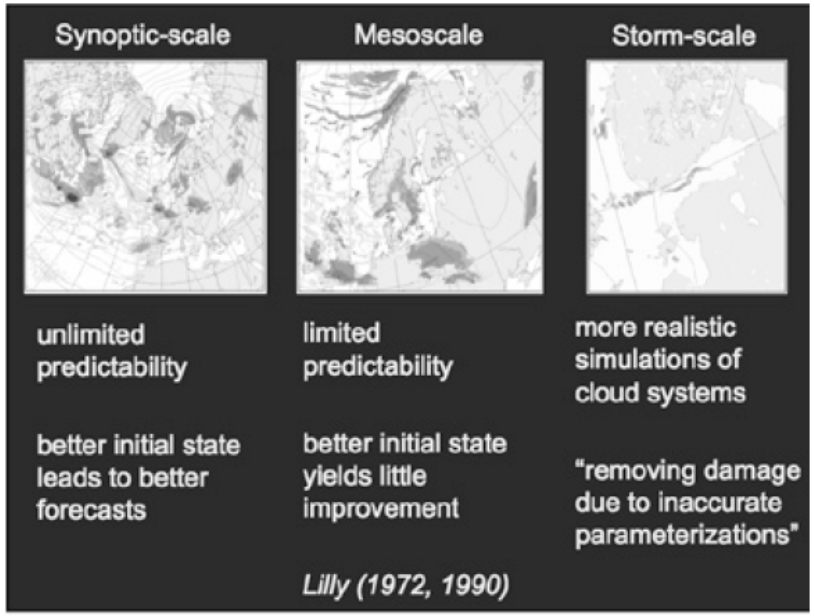

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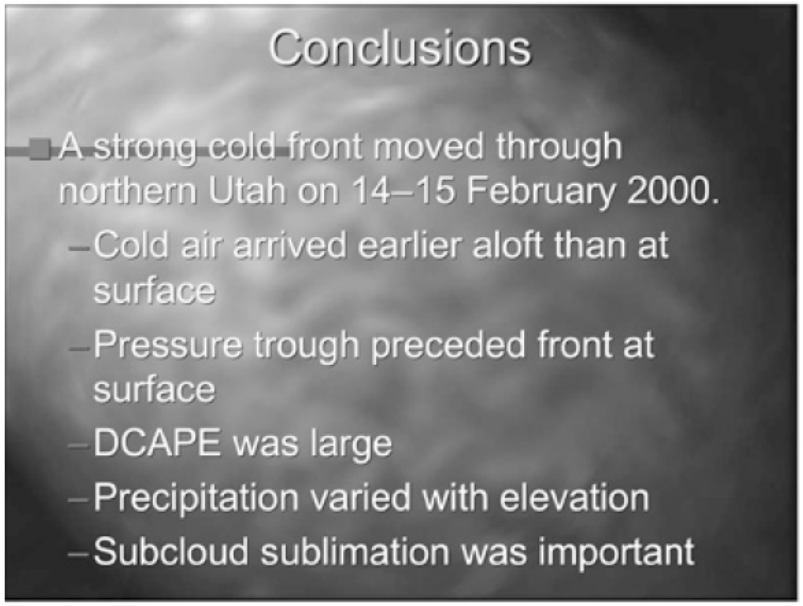
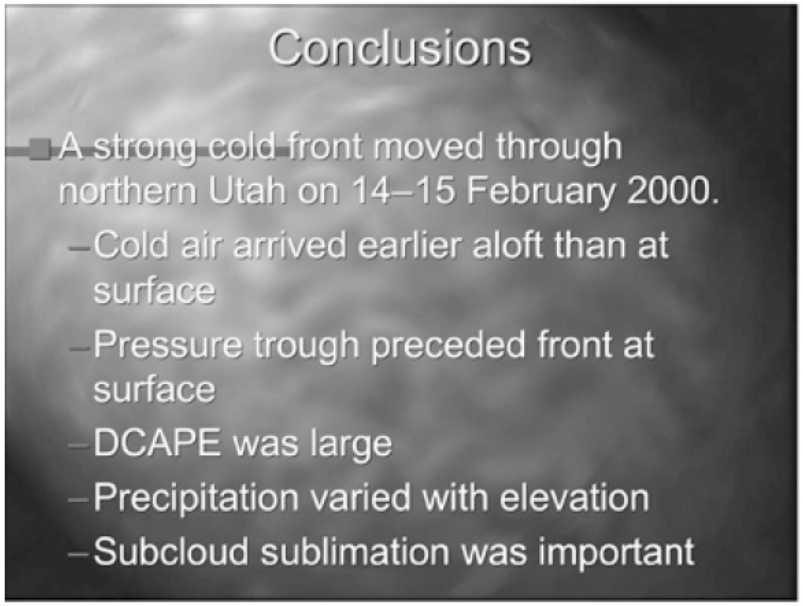
- Graphics and better organization provide a framework to see the differences in predictability described by Lilly.

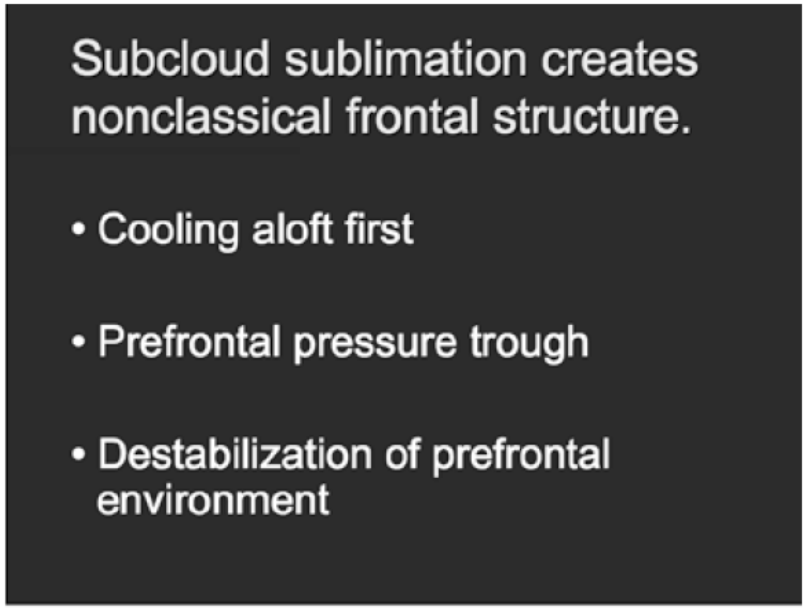
Conclusions

- A strong cold front moved through northern Utah on 14–15 February 2000.
  - Cold air arrived earlier aloft than at surface
  - Pressure trough preceded front at surface
  - DCAPE was large
  - Precipitation varied with elevation
  - Subcloud sublimation was important



- These "conclusions" are not really conclusions at all, just a list of observations of the cold front.
- A busy background distracts from text.
- Because the five bulleted points give the impression of equal weight, the most important conclusion of the research ("Subcloud sublimation was important") is underemphasized.





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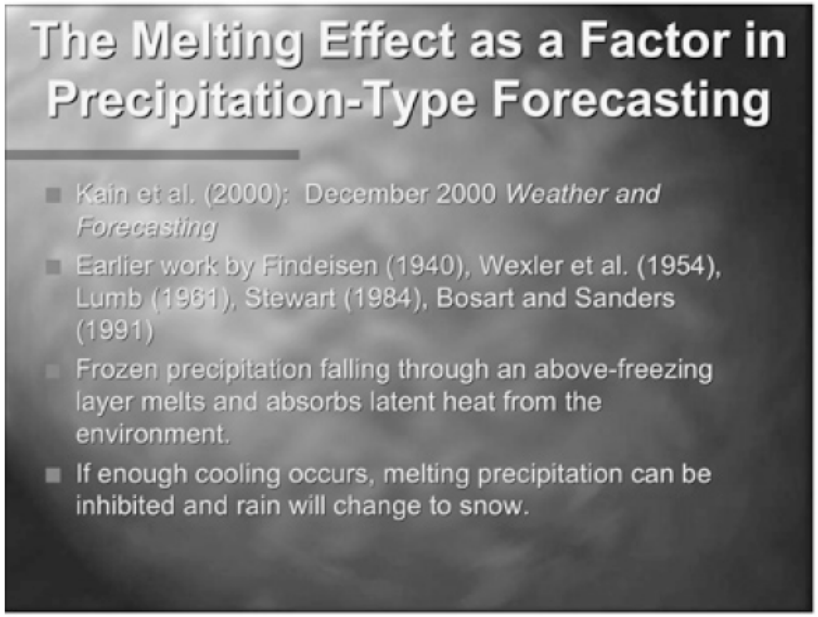
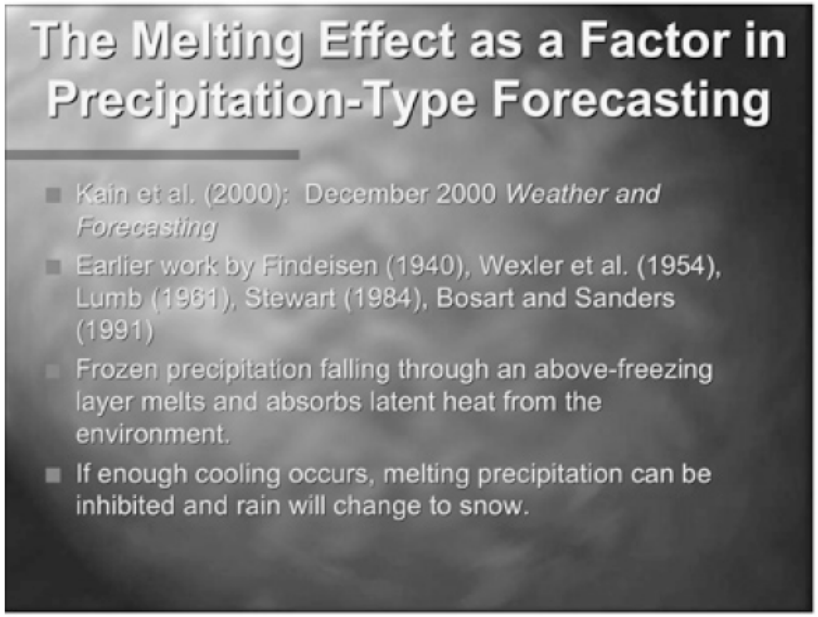
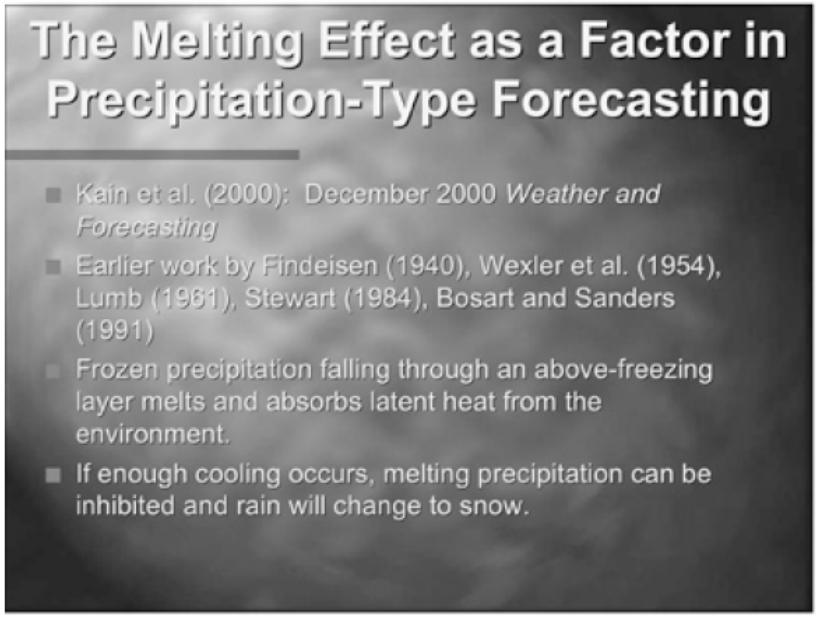
- The title for this conclusion slide is a headline
- All the bulleted observations support that conclusion.


The Melting Effect as a Factor in Precipitation-Type Forecasting
Kain et al. (2000): December 2000 Weather and Forecasting
Earlier work by Findeisen (1940), Wexler et al. (1954), Lumb (1961), Stewart (1984), Bosart and Sanders (1991)
Frozen precipitation falling through an above-freezing layer melts and absorbs latent heat from the environment.
If enough cooling occurs, melting precipitation can be inhibited and rain will change to snow.



- The background is too busy, making the text difficult to read.
- "2000" is repeated twice.
- The list of references seems unnecessary.



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- The physical process becomes the headline, followed by a photo illustrating the consequences of rain changing to snow.
- The citation remains to emphasize the article upon which the talk is based.

Of course, use color for the figures and text.

How to prepare successful presentations?

FOCUS YOUR MESSAGE

- Because presentation time is limited, focusing message becomes essential. Most details have to be omitted in the talk.
- What one or two things do you want your audience to remember? A rule of thumb is that five minutes are generally required to deliver one point of substance.
- Having decided on the key points, build the talk around them.
- Scrutinize the necessity of every slide. Does it add to the content of the talk?

KNOW WHY YOU ARE GIVING THE TALK

Clearly define the goals of your talk first

- Why are you giving this talk? What is the topic?
- Are you trying to persuade forecasters to adopt your methods?
- Or, were you looking for your laboratory to pay for your trip to this Hawaiian conference?
- What is the reason for the talk? You may want to inform, persuade, confront, inspire, educate, or some combination of these.
- Different types of talks require different approaches. Whatever the purpose, speak to the occasion.
- If you were invited to train forecasters, make sure you give them usable information to be better forecasters.
- For meetings, find out more about your position in the schedule. If you have been invited to give a presentation and are opening the session, your remarks can be more introductory and forward-looking, with a tip of the hat to the people that follow you. If you are the last speaker in a series, try wrapping up the comments and building connections among the various speakers that preceded you. You may even wish to contact the other speakers before the meeting to ensure that everyone's messages are complementary rather than redundant.

ADDRESS YOUR AUDIENCE

- Ask yourself, “What does this audience want from me? And, why is it important?” Then, figure out how to connect with them.
- Respect your audience. Do not show contempt or disregard for them by not understanding their needs. They took the time listen to you, so make sure their time was well spent.
- Remember that you are trying to impress them.
- As with papers, your audience will determine your presentation style and content.
    - If you are presenting to an audience of nonspecialists, you need to alter the standard scientific presentation you would give to your colleagues or peers.
    - What background information do you need to present?
    - What jargon do you need to define or eliminate?
    - Do not overshoot or undershoot your audience.
- Example: At NSSL, we would have the occasional visit from an administrator from NOAA headquarters who would tell us about all the great NOAA initiatives that were going on, often things that we already knew were happening because they were our projects. In another situation, we had a speaker come to the lab and give a presentation about climate change, talking to us as if we were high-school students.
- If you do not know your audience, do your best to find out from the conference organizer or the sponsor of your visit before you arrive. If you suspect that the audience might have a strong negative reaction to your presentation, avoid biasing them against your material too early in the talk. Present noncontroversial material early, then systematically reveal the discrepancies with the current thinking until they have no choice but to agree with your overwhelming evidence.

DELIVER THE CONTENT AT THE RIGHT SPEED

- The human brain can only process a limited amount of information within a given amount of time. The rate of information transmission has to be carefully managed.
- The volume and rate of information that the audience brain channel can support is a function of
    - the education level of the audience,
    - the level of material being presented,
    - the content and quality of the presentation and presenter,
    - how fast the presenter speaks and displays information, and
    - how distracted the audience is.
- Furthermore, your audience will be applying filters related to their own backgrounds, experiences, and values. Some of your messages may be understood quite clearly, others may not be. Incorporating that knowledge into the design of your presentations will ensure more reliability in transmitting information.

CREATE A SYNERGY BETWEEN YOUR WORDS AND YOUR VISUALS

- The mind processes information through all the senses. To take maximum advantage of the brain's processing capability, the speech and slides need to complement each other rather than contradict each other or be redundant.
- The brain cannot process information when it arrives both written and verbally at the same time, resulting in the following failures:

    - Slides with too much text spread the audience's attention between reading and listening, so that they do neither well.
    - If the text is read verbatim off the slide, then the speaker is redundant because the audience can read the slides faster than they can be said aloud.
    - Having few connections (or even inconsistencies) between the speaker's words and the material on the slides confuses the audience, reducing comprehension.

- Thus, the spoken word and the visual cues on the slides must be synchronized.
- The best approach is to favor relevant photos and graphics over text on the slides, do not read the slides verbatim, and speak articulately about the material on the slide.

UNDERSTAND THE DISTRACTIONS TO YOUR AUDIENCE

- Your goals as a speaker are to connect with the audience, hold their attention on your topic, and help them remember it.
- How effectively you can do that is determined by the presentation quality, the presenter quality, and the audience quality.
- You can imagine that the best presentation given by the most energetic lecturer would still fail to connect if the audience were distracted, uninterested, or asleep.
- Although some of the factors that lessen the audience's ability to pay attention may be out of your control, others are entirely within your control.
- As you speak, watch your audience. Get a sense of everyone in the room, not just a few individuals. Some people will fall asleep no matter what, so do not judge your performance too harshly based on them. Does your audience seem attentive? Do they look confused? As the speaker, you must take control.
- Back up and reiterate your point using a different approach. Ask a question of the audience to wake them up, to get them to actively participate in your presentation, and to get feedback on how well your message is being received.

ADDRESS EVERYONE WITHIN A DIVERSE AUDIENCE

- Most speakers must balance two competing effects. While oral presentations require a focused message, most audiences usually have a diverse background.
- The speaker must therefore balance a lot of detail (narrow, but deep) with a wide perspective of the research (broad, but shallow).
- This lack of consideration of the depth and breadth of the presentation plagues many conference presenters who focus, for example, on describing intricacies of the data collection methods or the simulations. Unfortunately, these details may appeal to only a few people in the audience, while the majority of the audience is bored, left unappreciating the potentially interesting reasons for the study or the implications to the larger research community.
- Communicating with your audience in these situations will require you to broaden your material, to make it more interesting to more people. Do not worry about speaking too long at a general level for the specialists. Most people probably would rather spend their time in a well-presented but general talk than a poorly presented but specific talk.
- Broadening is not your only possible strategy when speaking to a heterogeneous audience. Speak to their diversity throughout the talk.
- Start out by discussing the topic in a way that everyone can understand. As the talk progresses, dive down to depths at various points, reaching more specialized portions of the audience. At the end of a topic and especially at the end of the talk, come back out to the big picture. Connect what was just learned back to the whole audience, so even nontechnical audience members know the implications of what just happened, even if they did not understand the specifics. Repeat this cycle for as many times as you need to.

- The vertical axis of Fig. 24.1 could also represent different disciplines. For example, in a talk about the societal impacts of flash flooding, you may be speaking to an audience of meteorologists, hydrologists, and social scientists.
- As your presentation follows the curve of Fig. 24.1, touch upon topics that relate most closely to the meteorologists, then the hydrologists, then the social scientists. Such a cycle does not need to be repeated or be in a specific order, but by making at least some portions of your talk relevant to each segment of your audience, you can deliver a talk that your whole audience will appreciate.

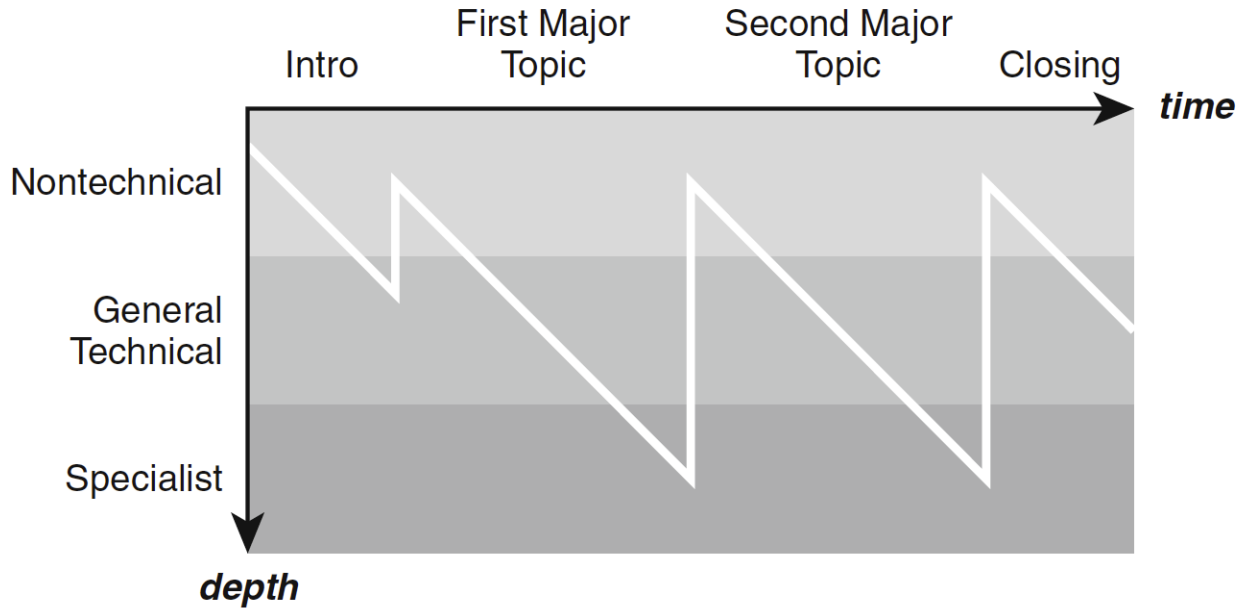

Fig. 24.1 Timeline showing the presenter reaching multiple audiences by beginning at the surface of a topic for nontechnical audience members, diving into a subject for the specialists, and then surfacing to gather the entire audience again. (Caption and figure adapted from Fig. 2-3 in Alley 2003.)

Structure of Effective Presentations

STORYBOARD YOUR PRESENTATION

- Storyboard comes from the film industry and is the planning by which the scenes of a movie are illustrated on separate sheets of paper and arranged to display the entire shooting sequence.
- Before composing a presentation, try to sketch out the storyboard on paper. Avoid being bogged down by technical detailed of the presentation software from the beggining.
- Storyboarding forces you to focus on the theme and content of your presentation rather than on the style and visuals.
- Create the storyboard with explicit drawings of each slide.
- Focus on the message, the content, and the order of the slides to tell the story.
- Details such as the specific graphics, background color, and style can be refined later.
- Simply put, storyboards do not require a lot of detail on each slide because they should mimic the final presentation—simple and relevant.

STARTING TO CONSTRUCT YOUR PRESENTATION

- After the storyboard is complete, open up your slideware and start creating on the computer.
- Start with your storyboard and write notes for what you want to say about each slide.
- Each slide should have one important point, and that one point should be made extremely clear by the slide. If no discernible point exists for the slide, delete it from your presentation.
- Do not put the obvious on your slide. An example would be to say that hail is an important forecasting problem at a severe storms conference. Instead, provide statistics, the number of events, the economic losses, or other facts that demonstrate to the audience why it is an important forecast problem.

First few slides

- Title slide presents the title of the talk, author, coauthors, and affiliations. Usually on display while the speaker is introduced. Usually not be on display for very long.
- Nest should be the "Outline of my talk" slide. Simple outline showing the presentation structure is usually a waste of time.
- Better to present the motivation, purpose, or goals of the presentation. Or present some shocking evidence that contradicts traditional thinking to attract attention.
- Slide in Fig. 25.1b motivate the question of how strong cold fronts occurred in Utah. By challenging the belief that such fronts might not be caused by the advection of Arctic air through the western United States, to get the audience thinking.
- Except for a review presentation like the ones you will be giving, avoid presenting a full literature synthesis Discuss only most relevant literature in a focused way. Avoid "paper X did this, paper Y did that."

Last few slides

- Your last slide should be one well-considered and briefly worded conclusion slide.
- Do not make extremely general statements that are obvious to anyone paying at least some attention during your talk ("The model was capable of reproducing the Madden–Julian Oscillation.").
- Select real results that summarize your talk in a few key points, which should already have been done during the storyboarding.
- Although all slides should be simple, concise, and clear, the conclusion slide is especially important to emphasize the take-home message to the audience.
- A different style, but still quite an effective approach, to the conclusion slide is to present a conceptual model or graphical schematic.
- Fig. 25.2 tied results together with simple schematics or figures that were repeated from the talk.
- Because the conclusion slide contains the summary of your presentation, leave it on display for as long as possible to allow the audience to fully absorb the message.
- Avoid presenting more after the conclusion slide.
- Do not close with a "Questions?" slide, "Thank you" slide, or the list of references from your talk.

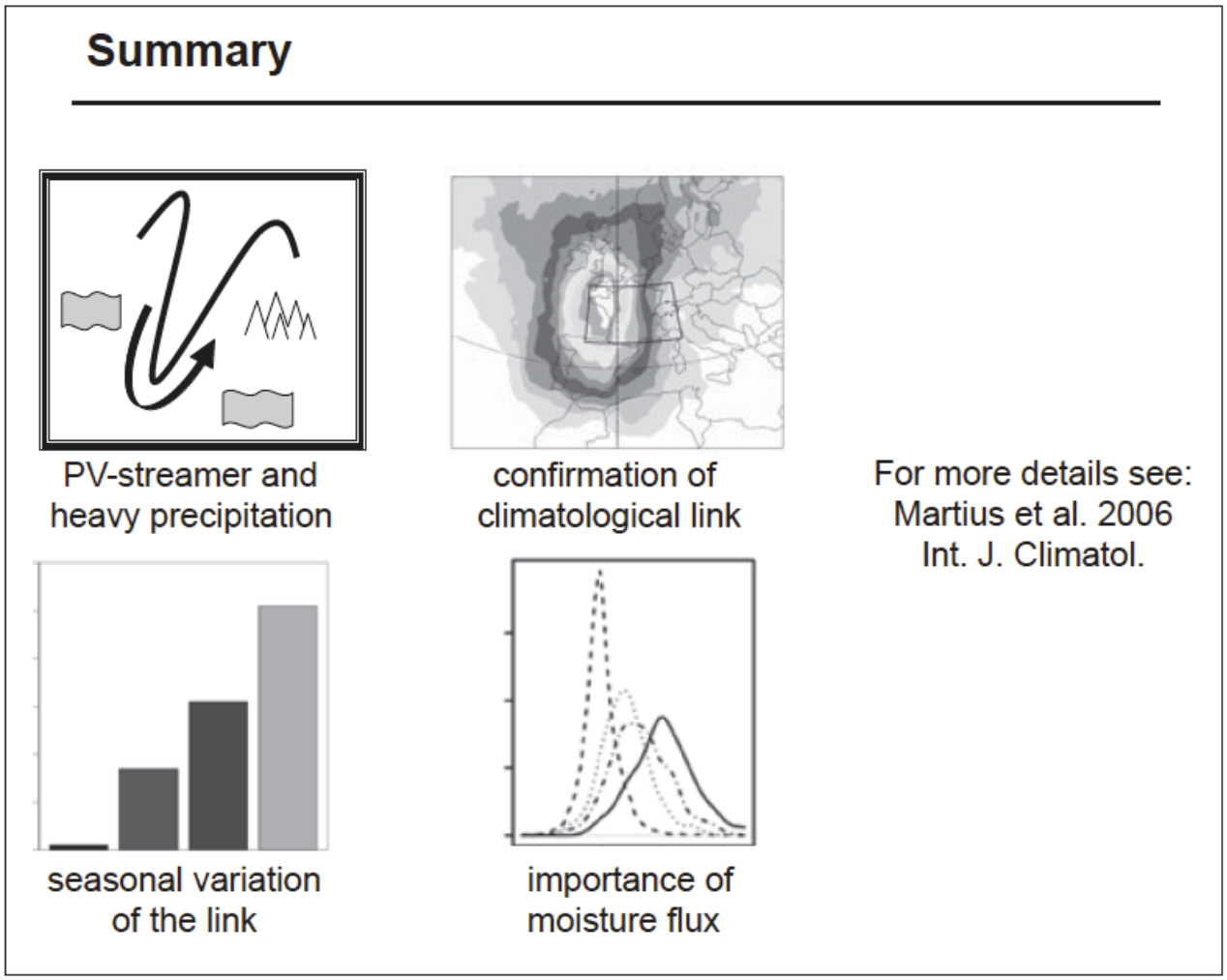

Fig. 25.2 An effective schematic conclusion slide from "A climatological analysis of the link between breaking synoptic-scale Rossby waves and heavy precipitation events in the Alps." (Figure courtesy of Olivia Martius.)

DESIGN ATTRACTIVE SLIDES

- Well-constructed and attractive slides convey professionalism and credibility, whereas poorly designed or sloppy slides convey the opposite.
- Maintaining a consistent look to your slides (e.g., background, font, color, transition between slides) indicates that the slides are part of a consistent message from the speaker to the audience.
- Although small logos of your affiliation on the title and conclusion slides may be appropriate, such graphics on every slide are visually distracting.
- Avoid standard backgrounds packaged with your presentation software— most are overused or poor quality. Avoid photos as backgrounds.
- All components of the presentation should be clearly visible from the back of the room.
- Use light colors on simple dark backgrounds. Dark green, blue, or purple with white and yellow letters are an effective combination.
- Light-colored backgrounds, especially white, are not ideal for the following reasons:
    - Red lasers (especially if the laser light is weak) may not show up well on white backgrounds.
    - Slides with white backgrounds lose contrast if the room is not dark enough.
    - Color to the slides is refreshing and not as tiring on viewers during long presentations.
- Graphs, however, are generally more legible with dark colors on white backgrounds.
- Do not use yellows, light greens, or light blues on a white background. These colors simply do not show up when projected.

HEADLINES ARE BETTER THAN TITLES

- Short titles indicating the content of the slides are most often used.
- Instead, a headline summarizing the slide or conveys the most important information is better, like titles of newspaper articles.
    - E.g., rather than “Results,” the headline might read “Zonal wind variations, not heating, cause Kelvin wave amplification.”
- Other points to consider about headlines:
- The headline forces you to define the main point of slide.
- A sentence headline orients the audience and speaker to the topic of the slide.
- Headline titles convey meaningful messages and reduce the number of words on the slide.
- The audience can always read sentence headlines that they might not have heard.
- A sentence headline shows a perspective on a topic that a title phrase generally cannot.
- The sentence headline should begin in the upper-left corner of the slide, be 28–40-point font, be left justified rather than centered, be absolutely no longer than two lines, be colored differently than the rest of the text on the slide, and be written in active voice.

Some examples of potential headlines.

Table 25.1 Examples of headline titles for electronic presentations

Microwave precipitation algorithms underestimate rain rates in shallow convection.
Eddy energies scale with the mean available potential energy.
Our parameterization is not sensitive to the sea-salt flux from the ocean surface.
The daytime convective boundary layer decreases the wave drag.

DELETE UNNECESSARY WORDS

- Most slides are cluttered by too many words and fonts are too small.
- Consider your audience and purpose of talk when deciding on the amount of text on slides.
- For nontechnical audiences, favor fewer words than for more specialized audiences.
- Resist the temptation to place too many words on the slide as a crutch for yourself.
- Instead, remember what you want to say by using handwritten note cards or the speaker notes function in many slideware packages, or, best yet, through repeated rehearsals.

When the language used is not native to the audience or speaker, more words can be helpful.

Use of bullets

- Bullets are not necessarily the best way to organize slides. Bullets at the same level imply that all items are of equal value.
- Keep bullet lists short, generally under four items, as the audience cannot remember much more.
- Leave empty space to prevent adjacent lines from blurring into each other.
- Aim to keep each bulleted item or headline on a single line, or at most on two lines.
- Make items in the list parallel. Use well-constructed phrases rather than sentences, and skip nonessential punctuation. List items in a sensible order (e.g., chronologic, by importance).

Use of equations

- Equations slow down the pace of the talk and make presentation more difficult to understand.
- Presenting equations, especially derivations, usually requires too much time and demands too much patience of the audience.
- Present your ideas in words or graphics, wherever possible.
- When equations are definitely needed, define the variables and use annotations to explain the physical interpretation of the equation.

However, detailed derivation of equations should be given in class room settings.

Style of text

- AVOID LONG STRINGS OF CAPITAL LETTERS. THEY ARE MORE DIFFICULT TO READ THAN LOWERCASE LETTERS, AND THEY TAKE UP MORE SPACE.
- Use left justify only, not both left and right justify.
- To create emphasis, words can be accentuated with color, italics, or upper case.
- Fonts should be 18-point font or larger.

INCLUDE RELEVANT AND CLEAR GRAPHICS

- Some people advocate that each slide should have one image or graphic (see more of such on social science or popular science presentations)
- Graphics are more visually stimulating than words, such graphics can amplify your point and potentially increase audience retention.
- But, do not embed a photo simply because it was a pretty picture or you felt that one was required.
- Make sure included photos are related to the content of the slides or cause confusion.
- Presentation graphics many need to be simpler than paper graphics.
- Axis titles, axis value labels, and other such items need to be readable.
- Put as much descriptive (caption like) material on the slide as possible. Save you time in explaining the details.
- Audience can read faster than you speak, and most in a scientific audience know how to interpret a graph.
- Uncommon style of graphic need explanations.
- Annotated graphics also have the benefit of reminding the audience about details on the slides.
- Acknowledge the source of graphics you use, even if in small fonts.

INCLUDE RELEVANT AND CLEAR GRAPHICS – continued

- Photos of real people help the audience relate to the topic on an emotional level.
- For example, which conveys more emotion: a map of the rainfall distribution for a flash flood in Missouri or a photo of a flood victim with her head in her hands?
- Be creative when presenting your graphics.
    - For example, to compare two graphs, rather than have them side by side, could you blend the two of them by fades back and forth?
- Make a boring flowchart more interesting by having photos or other graphics pop up as you describe the different elements.
- Embedded animations and movies can enhance a presentation and pique the audience's interest.
- Finally, avoid clutter on the slides. Graphic designers recommend no more than seven items on a slide (e.g., headline, three bullet points, main graphic, two annotations).
- Less-cluttered slides have a more powerful impact, so use empty space to keep the items on the slide well placed.

USE EFFECTIVE TRANSITIONS

- Revealing information piece by piece can keep the audience focused, especially when presenting the whole slide might give away the punchline.
- Slideware also allows for each bulleted item to appear sequentially.
- However,
    - Clicking takes time, as most speakers will pause during the click.
    - Lots of clicks means that you are tied to the computer if not using a remote control, inhibiting you from walking around during your talk.
    - If you need to reverse direction to reshow a slide, you will need to wait for all your sequential items to play out in reverse.
- On the other hand, complicated graphics can be presented much more effectively by building the graphic piece by piece.
- Use transitions to walk your audience through complicated slides using arrows, lines, pictures, and animations.
- Complex graphics should build step by step.
    - For example, a conceptual model of a squall line can be built like this. The first slide shows the cloud outline, used to explain the setting. Next adds precipitation. Next adds the cold pool. Next adds airflow arrows. Next adds convective cells, bright band, etc., until the model is complete. By this time, the model is busy but not inaccessible. It takes no more time than explaining a single very complex figure.

One of the most common devices that speakers use to add variety to their presentation is the transition between slides. Most transitions are too slow, so use a quick transition (“appear”), unless there is a specific reason for choosing a different transition (“dissolve,” “flash,” etc.).

Delivering Compelling Oral Presentations

REHEARSE TO REDUCE ANXIETY

PREPARE BEFORE THE PRESENTATION

DELIVER A STRONG OPENING

KEEP THE MOMENTUM GOING

FINISH STRONG

HAVE A COMPELLING DELIVERY

MAINTAIN EYE CONTACT

WATCH THE TIME!

QUESTIONS AND ANSWERS

Read Chapter 26 of Schultz Book