

Natural Disasters

Lecture 35

Topic 1: Ice Storms & Blizzards

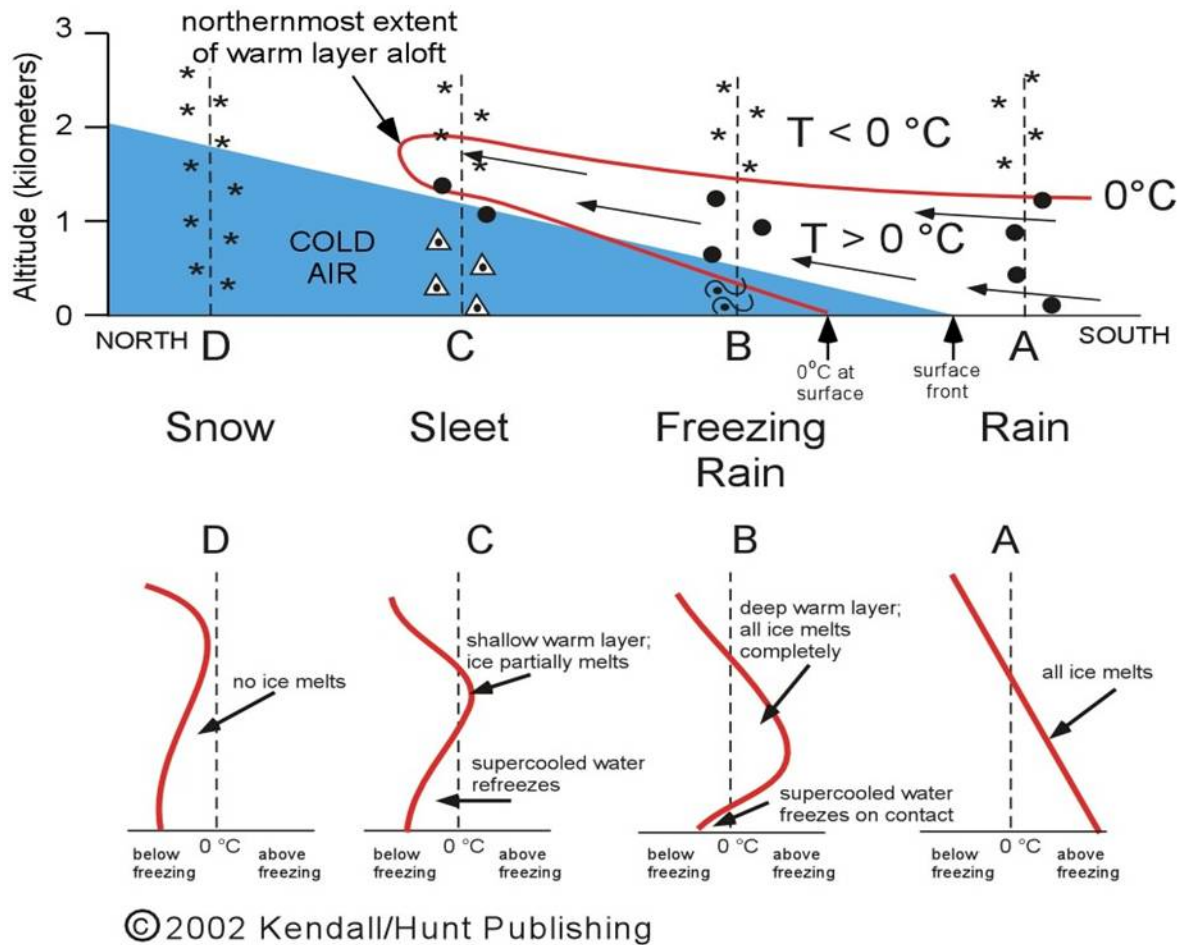
Text Source Today:
Ch. 11 (p. 294-298)

Topic 1: Ice Storms & Blizzards

- Water exist can exist in three phases in the atmosphere: gas, liquid, and solid. What is often referred to as "**winter weather**" is solely dependent on the precipitation particle **being or becoming solid** as it **lands at the surface**.
- Temperature at which pure ice melts: **32 °F (0 °C)**
- Temperature at which pure water freezes: **-40 °F (-40 °C)**
- ◆ This is possible because water can become **supercooled** before it **freezes**. To **freeze** at a temperature **above -40 °C**, **ice nuclei** must be present which roughly approximate the lattice structure of **ice**. **Ice nuclei** are fairly **rare** in the atmosphere, and are more effective for **lower temperatures**.



- There are three types of "winter" precipitation -- **snow, sleet, and freezing rain**. The determination of which type of precipitation will fall is determined by the **temperature profile** of the layers of air **above** the surface.



♦♦ **Snow (D)** falls when the temperature of the column of air aloft is **below freezing throughout**.

♦♦ **Sleet (C)** falls when solid precipitation melts in a **shallow layer of warm air** aloft, but then refreezes in a **relatively deep cold layer** above the ground.

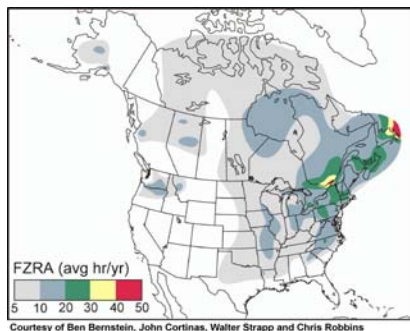
♦♦ **Freezing Rain (B)** falls when solid precipitation melts in a **deep warm layer** above a **sub-freezing surface**. The liquid precipitation **freezes at the surface on impact**.

♦♦ **Rain (A)** falls when there is a deep layer of air near the surface that is **above freezing**.

- **Sleet** tends to pose less of a problem or hazard to humans than **freezing rain** because it **doesn't stick to anything and accumulates like snow**.

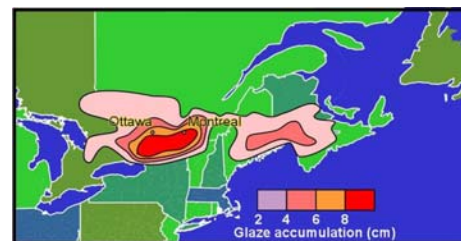
- ◆ The difference between **hail** and sleet? **Hail** is formed by an ice particle growing in the updraft of a thunderstorm, which then falls and stays frozen throughout. Snow melts and refreezes into sleet (ice pellets), and is **rarely** associated with thunderstorms.

- **Ice storms** require ice accumulation of at least **0.25"** or **structural damage** due to icing, and are almost always caused by **freezing rain**. **Ice storms** affect power, transportation, emergency services, and a whole lot more.



- ◆ In North America, ice storms most frequently strike the **northeast U.S. and southeast Canada**. This is primarily due to the availability of **(relatively) warm, moist air** over the Atlantic, which creates the necessary **temperature profile**.

- ◆ **Quebec, 5-10 January 1998:** The worst **ice storm** in **North American history**, with over **3" (8 cm)** of ice accumulation in regions near **Montreal**. Power in some places was out for weeks, **56** people were killed, and nearly **\$5 billion** in damages were sustained because of the event.



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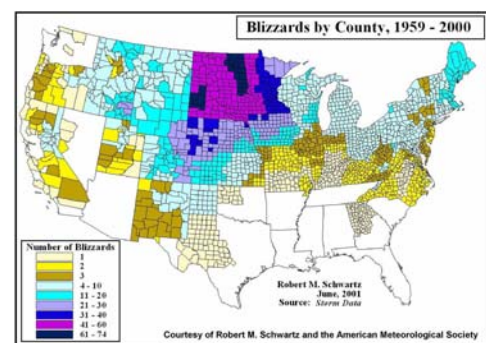
♦ The best mitigation for an ice storm is generally **common sense**. Make sure to have sources of **heat, food, and shelter** available, and try to limit travel as much as possible. Communication often fails after severe ice storms, so **patience, prudence, and preparedness** are extremely important.

♦ **Blizzards** occur when strong winds cause **falling or blowing snow to obscure visibility** to dangerous levels. **Blizzard warnings** are issued when snow in **winds >30 knots** lower **visibility to less than ¼ of a mile** for at least **three hours**. **Blizzard** conditions can lead to especially large snowdrifts!



♦ The "blizzard recipe": cold, wind, and snow. Snow **does not** have to be falling to have a blizzard!

● The north-central U.S. and south-central Canada are at the greatest risk for blizzards, due to their location **just north of a preferred storm track** in a region which gets **both snow and high winds**. There is a secondary max in the Northeast and Rockies.



♦ **Blizzard safety:** staying out of the elements is essential. Many people die in blizzards very close to shelter because **whiteout conditions** become too disorienting, and people get lost.

- **Hypothermia and frostbite** are especially problematic!

♦♦ If in a trapped vehicle, stay there and use a prepared **emergency kit**. We've posted a PDF file detailing a good [winter weather car kit](#) on the class website. Again, being smart is the best way to avoid unnecessary danger!

♦ **NYC and the Northeast, 11-14 March 1888:** A massive snowstorm (40-50" of snow; Albany **48"**) which shut down NYC and debilitated most of the surrounding region. Sustained winds over 45 mph created snowdrifts over 50 feet high!

♦ **"Storm of the Century", 12-13 March 1993:** Another strong snowstorm which affected the entire East Coast, with tornadoes in Florida, flooding in the deep south and record to near-record snowfalls from the Northeast down to GA, AL & north-FL. In total, nearly 270 people were killed in this event, and 3 million homes were left without power. The storm's central pressure and storm surge would place this storm as a **Category 3** on the Saffir-Simpson scale!

♦ **Chicago, 26-27 January 1967 and 13-14 January 1979:** Two of the top five snowstorms in Chicago history (23.0"/1st and 18.8"/4th overall, respectively). Another time where weather ended up affecting **politics**.



♦ Know the meanings of **National Weather Service** warnings, watches, and advisories ([check link](#) on class web page).