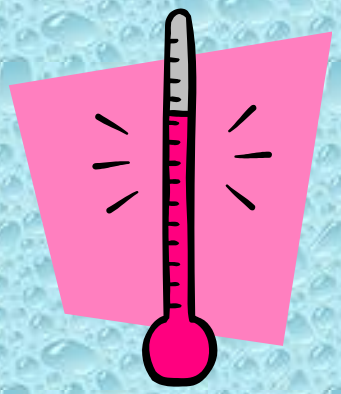
What does the Meteorologist Really Mean???



What is temperature?

- ✓ Temperature is the measurement of how **fast or slow** molecules are **moving**.
- ✓ When molecules move faster, the temperature **increases**.
- ✓ Measured with a thermometer.
- ✓ Is measured in **°F, °C, or K.**

Wind

- **What is wind**?

- A measurement of how fast the air is blowing and in what direction

- Found by using an anemometer

- Measured in mph

THE WIND

- Air moving from an area of high pressure to an area of low pressure.

➢ Warm air is less dense

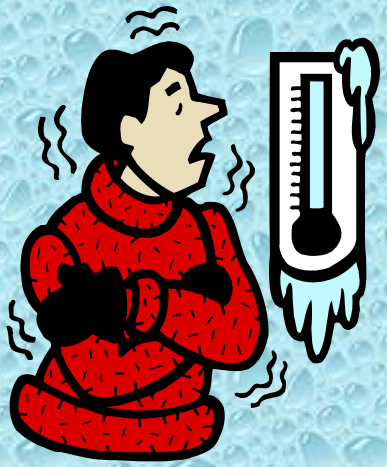
➢ Cool air is more dense

➢ Cool air sinks and forces warm, less dense air upward.

➢ Density differences are due to unequal heating and cooling of Earth's surface, which form areas of high and low pressure.

What does Wind Chill Mean?

- How the cold actually feels to the human body



- Measured with a wind-chill index, which estimates heat lost from human skin in the presence of cold air and winds

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

What is Air Pressure?

- Air Pressure - **The force that air particles exert as they are pulled toward Earth.**

- As you move DOWN through the layers of the atmosphere, air pressure **increases**

- Why?????

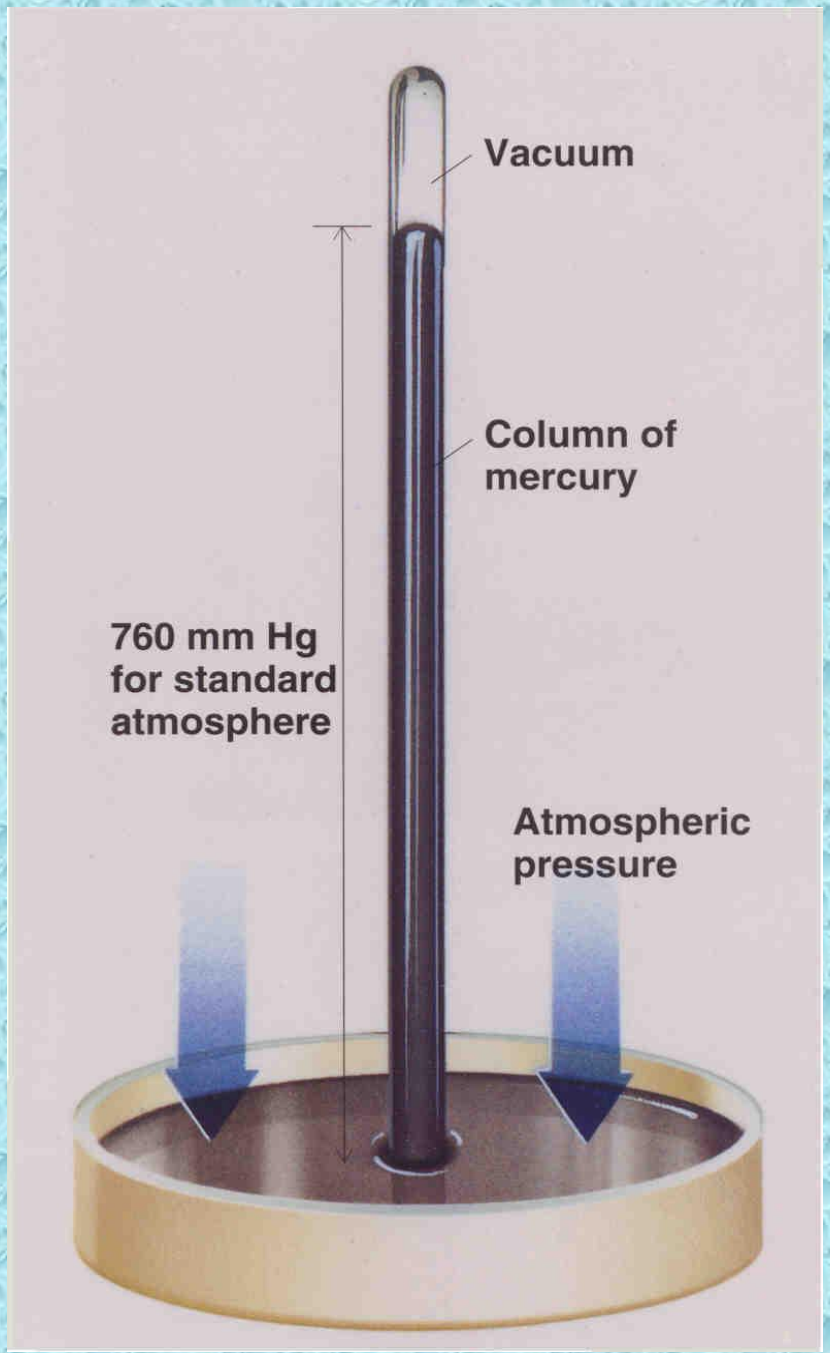
- **Because more pressure is exerted by the air particles above them.**

- This causes **wind** as air moves from areas of high pressure to **low** pressure.

To measure the Air Pressure, use a ….

Barometer!

Measured as millimeters of Mercury or mmHg for short;



Humidity and Relative Humidity?

- FACT: All air has some **water vapor** in it.
- Humidity= **the amount of water vapor in the air.**
- Relative Humidity= the **ratio** of water **vapor** in a volume of **air** relative to how much water vapor that volume of air is **capable of holding.**

Relative humidity (R.H.) cont.

- R.H. is measured using a Psychrometer and is expressed as a **percent %**

  - if air is holding **as much** water vapor as it can, R.H. = **100%**

  - if air is holding **1/2 as much** water vapor it can, R.H. = **50%**

- R.H. varies with **temperature** (warm air holds **more** moisture than cool)
- R.H. affects development of **clouds** and ultimately **precipitation.**

DEW POINT

WHAT IS "DEW POINT"

- ✓ The Temperature to which air must be cooled to reach saturation.

WHAT IS "SATURATION"?

- ✓ The point at which air holds as much water vapor as it possibly can
- ✓ Must occur before the water vapor will condense

- ✓ If over night temps are cool enough "dew" will form on grass and leaves

WHAT IS "CONDENSATION"

- ✓ Matter changing state from gas to liquid

THE PROCESS OF CLOUD FORMATION:

1. **Warm, moist air rises, expands and cools in a convection current**

2. **Air reaches its dew point and the water vapor condenses around the condensation nuclei**

   CONDENSATION NUCLEI are small particles for the water vapor to condense onto and cling to
   EX: dust, smoke, SPM

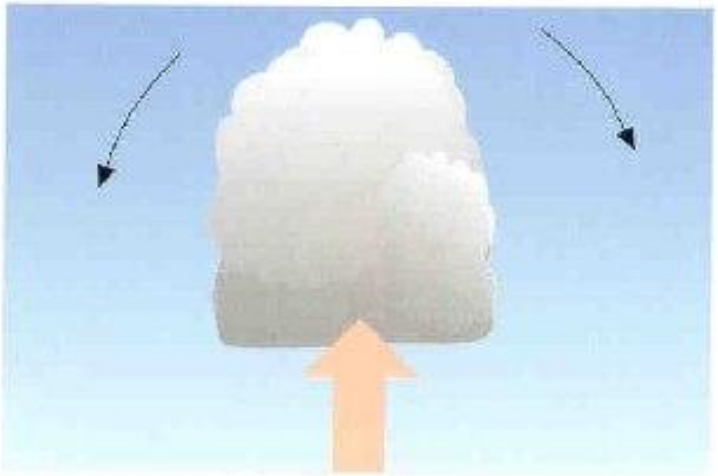
3. **When millions of these droplets collect, a cloud forms!**

Other Methods of Cloud Formation

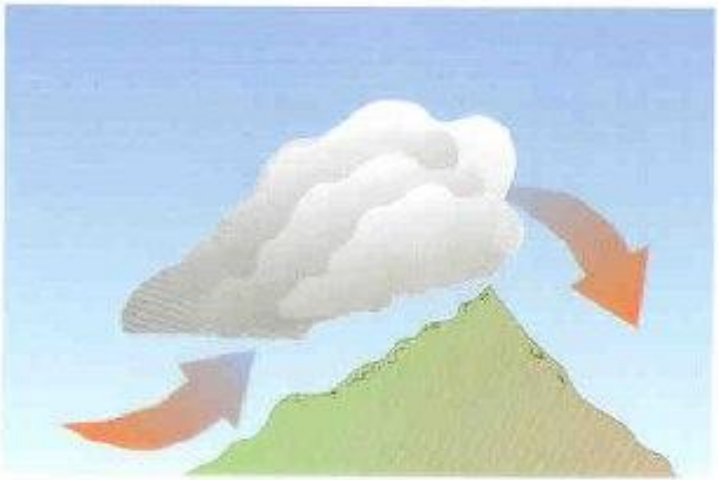
- Orographic lifting – when wind encounters a mountain and the air has no place to go but up.

- Collision of air masses of different temperatures

Methods of cloud formation

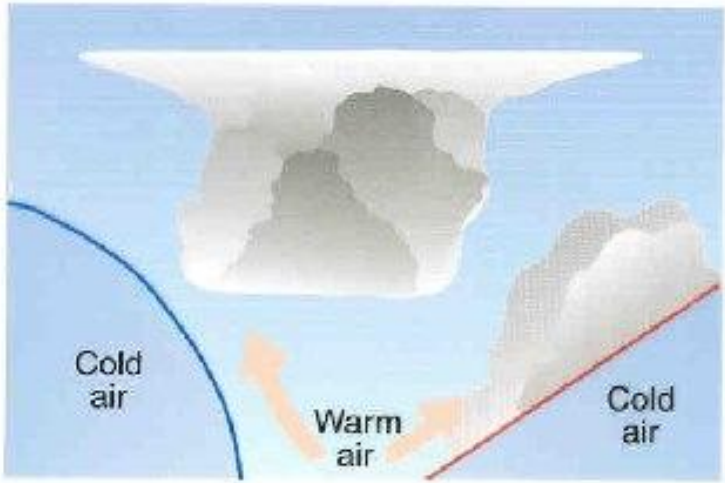


5 km
Convection
(a)



150 km
Topography
(b)

500 km
Convergence of air
(c)



1500 km
Lifting along weather fronts
(d)

PRECIPITATION

- **As more and more water droplets condense what happens?**

  The condensation droplets become larger and larger

- **What happens when the droplets get too big?**

  They fall to the Earth as precipitation

- **What determines if rain, snow, or hail will fall?**

  Temperature