GEOG 215- Climatology

Expectations

Strongly recommended GEOG 214 - Meteorology or GEOG 112 - Earth Systems Science

a *science* course within geography

A lot of terminology

Application of terminology

Attendance in class is essential

Note taking while listening is critical toward obtaining information needed to perform well in the class

Reading the chapters is important

Course structure

3 exams and a number of class assignments
- exams 1 and 2 are worth 125 points
- Final exam is worth 200 points
  semi-comprehensive
  60% new content 40% old content
  exams are curved up to 10% of total pts based on the highest score achieved
- class assignments are worth 50 points total

Total points for course = 500 points

Exam curve

Example 1-

The highest score is 119 out of 125 points. The curve would be 6 points. Thus everyone has 6 points added to their score, making the top score 100% or 125 pts

Example 2-

The highest score is 99 out of 125 points. The curve would be 12.5 points or 10% of 125 possible. Thus everyone gets 12.5 points added to their score, making the top score 89% or 111.5 points

Exam dates are fixed and will not be changed.

They are:

Exam 1- Friday, February 13, 2008 9-10 AM

Exam 2- Wednesday, March 26, 2008 9-10 AM

Final Exam- Wednesday, May 7, 2008 9-11 AM

Legitimate reason to miss an exam (academics, athletics, illness) - you must inform me at least one week ***before*** the scheduled exam to make arrangements for the make up exam. Illness- call me or email. Make ups are at my discretion.

The final exam will not be rescheduled to accommodate travel plans for students wishing to leave for summer break early.

Chapter 1 Climatology
Atmosphere-One of the critical components on our planet:

- **Thermal regulator**- movement of energy from areas with excess (Equatorial) to areas with limited (Polar).

- **Protective shield**- prevents, limits or alters harmful materials from reaching the Earth.

- **Essential for Respiration**- Most Living organisms (plant and animal) require interaction with gases in the atmosphere

Important fields of Study

- **Aerology**- study of the structure and chemical and physical interactions of the various components in the atmosphere.
- **Meteorology**- deals with air mass motion, air mass characteristics such as temperature, moisture and pressure, and weather phenomena such as storms, on a short time scale.
- **Climatology**- the same as with meteorology only over a longer time scale. Both average and extreme conditions

Atmospheric variables

- Air Temperature: units -> C, F, K
- Clouds: type, height (elevation) amount
- Barometric pressure: bars, millibars, mm or in
- Dew Point Temperature: F or C
- Precipitation: kind (rain, snow sleet, etc., and amount inches or cm
- Wind velocity and direction: MPH, Knots, KmPH and N, S, E, W, NW, NE, SE, SW
- Degree of sunshine: qualitative estimate

These constitute the Current or Prevailing Weather conditions

Gas	Parts per million	Percentage of total
Nitrogen (N_2)	780,840	78.1%
Oxygen (O, O_2)	209,460	20.9%
Argon (Ar)	9,340	0.9%
Carbon Dioxide (CO_2)	350	0.035%
Neon (Ne)	18	0.0018%
Helium (He)	5.2	0.00052%
Methane (CH_4)	1.4	0.00014%
Kryton (Kr)	1	0.0001%
Nitrous Oxide (NOx)	0.5	0.00005%
Hydrogen (H_2)	0.5	0.00005%
Xenon (Xe)	0.09	0.000009%
Ozone (O3)	0.07	0.000007%

Constant gases

relative proportions of these gases remains the vertically to around 80 km

many of these are present in small amounts

Most important abundant constant gases are

Nitrogen- relatively inactive

Oxygen - very active

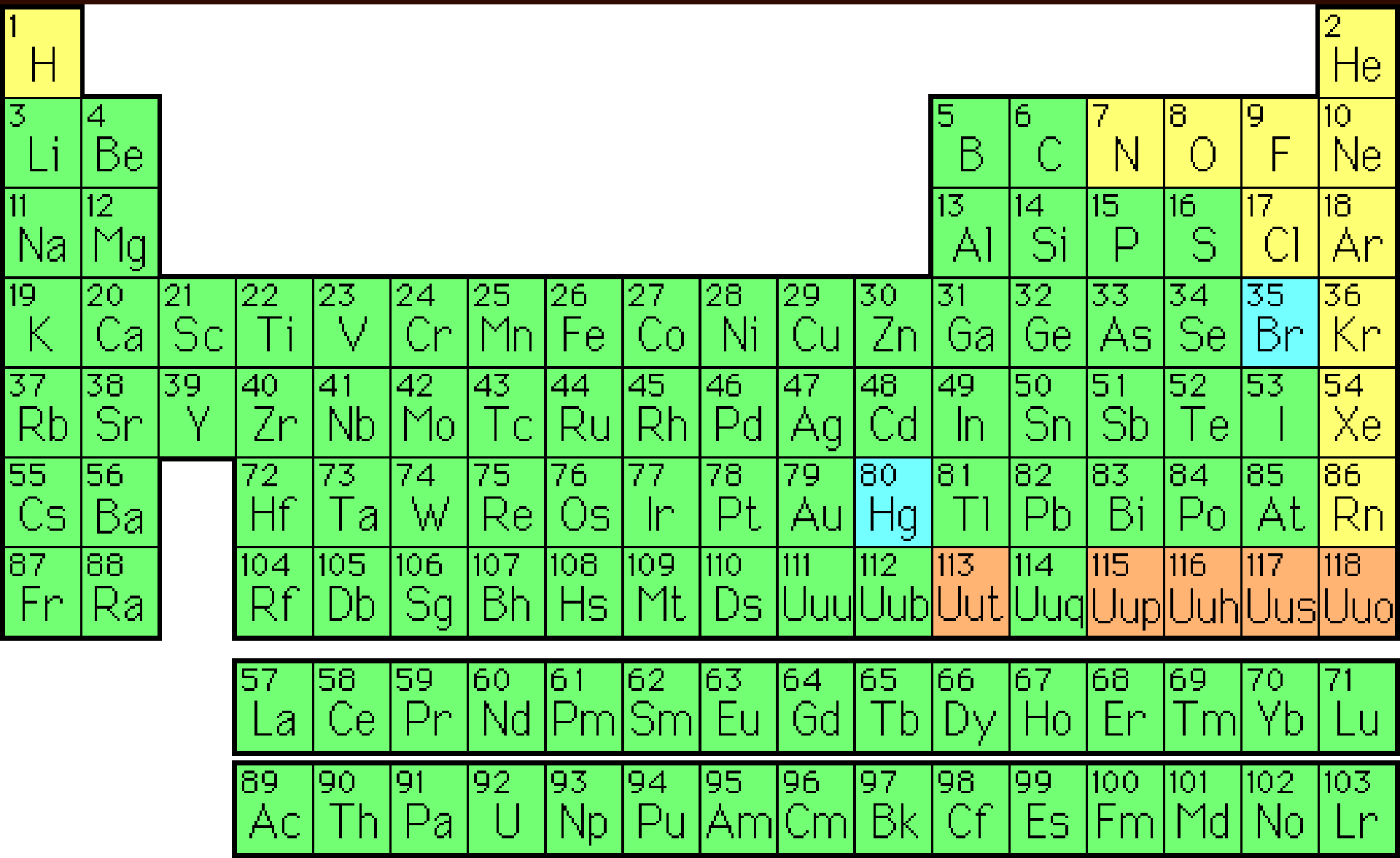
Argon - very inactive

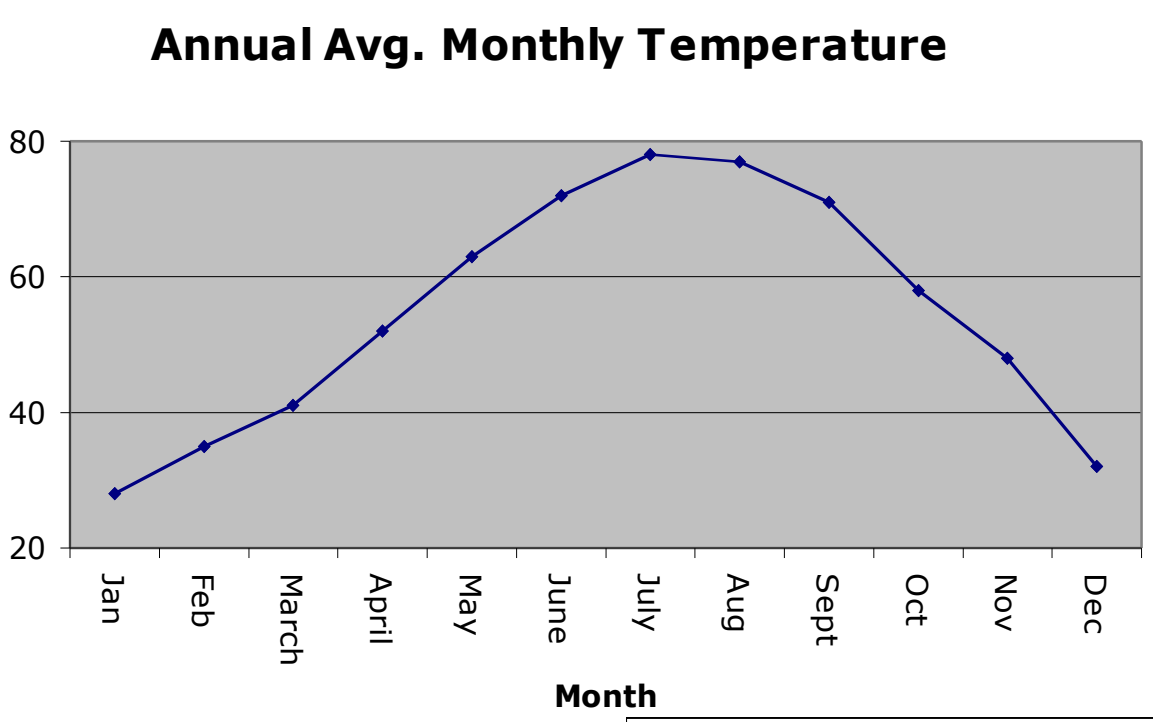
Variable gases

The concentrations vary throughout time and space

e.g., Ozone, CO_2, Water Vapor

Periodic table of elements
Yellow squares are gases




Annual Avg. Monthly Temperature
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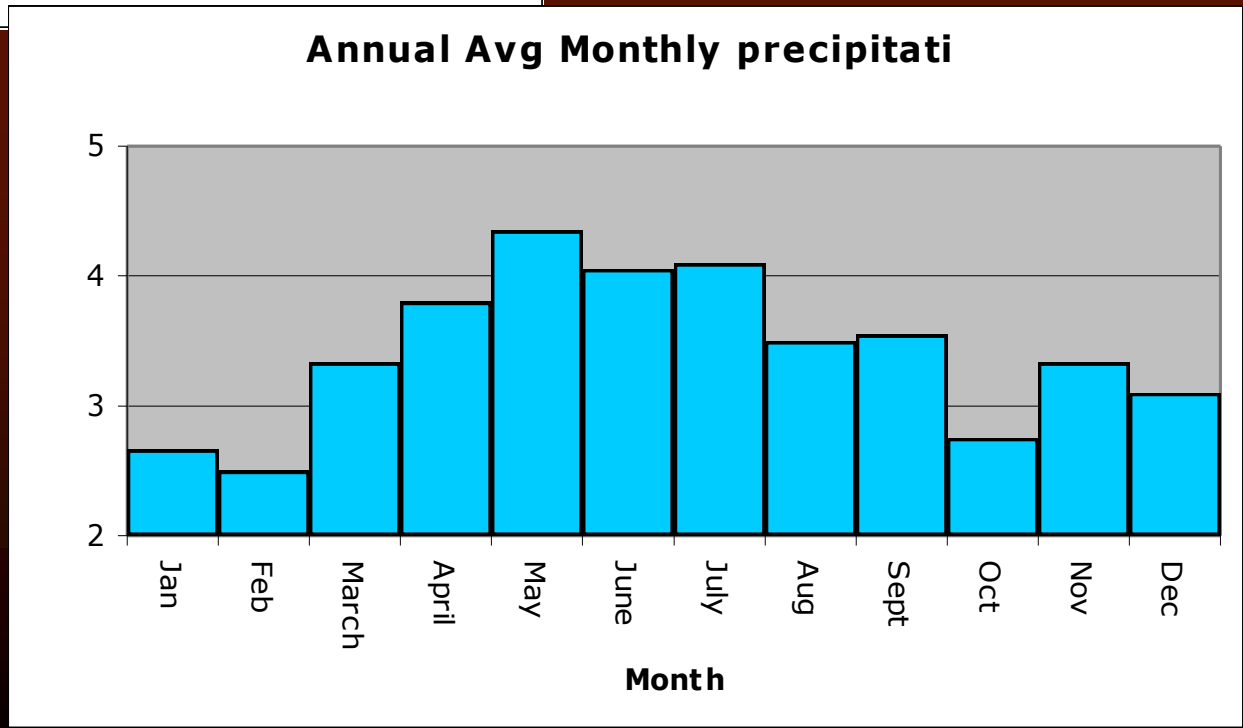
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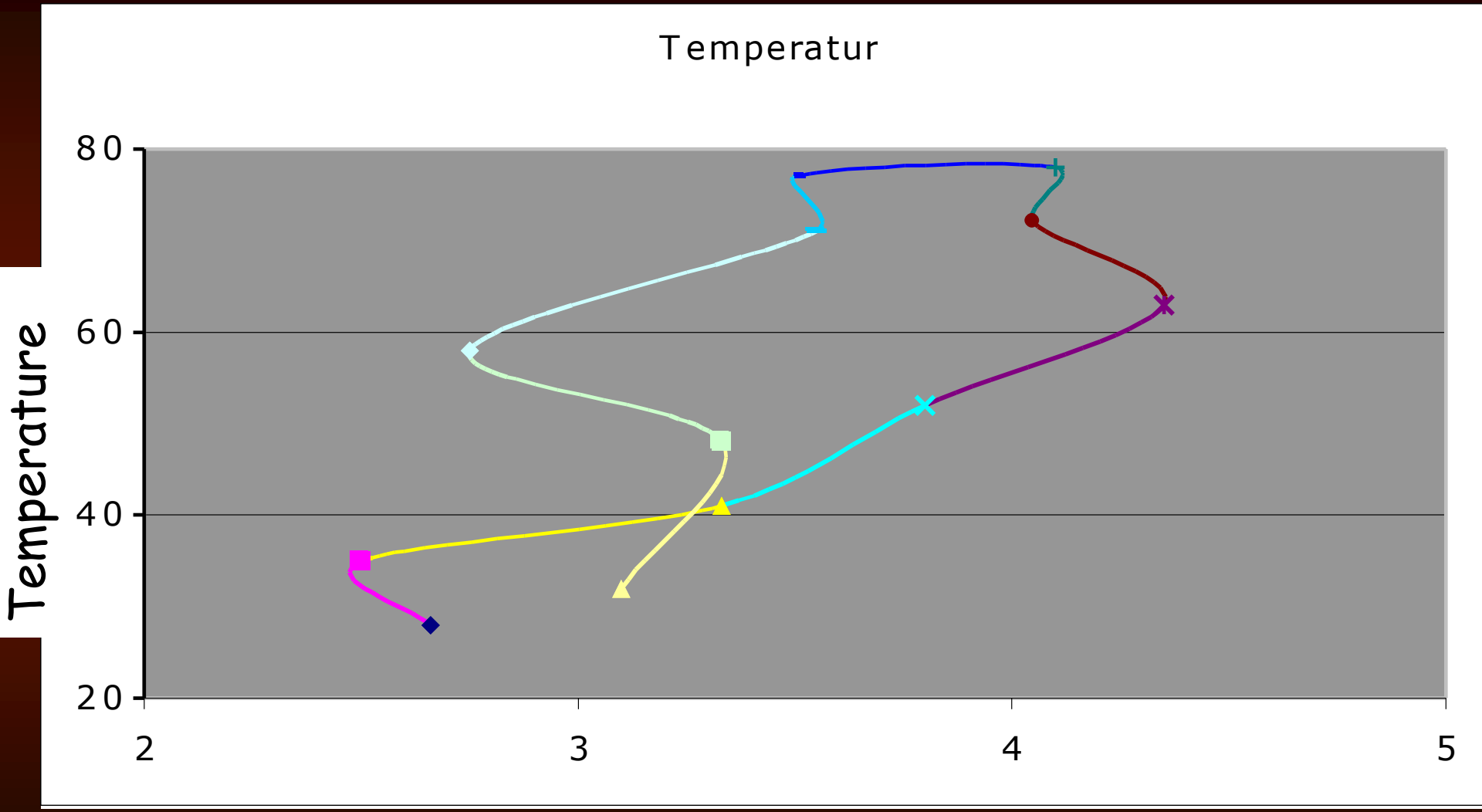
Climogram



Inches of Precipitation per month

Gas Laws

Boyles' first law: $P_oV_o = P_1V_1 = K$

Pressure = P; Volume=V; Constant= K

O= time 1; 1= time 2

an increase in pressure results in a decrease in volume and vice versa

Boyles' second law: $P/D = K$

D= Density

As pressure increases so does the density of the gas

Gay-Lussac's Law

Relates Temperature (t) and volume (V_x) with pressure constant

$V_t = V_o(1+t/273)$ where Vt is a volume at temperature t in (C) and Vo is the volume at temperature 0 C.

Charles' law

Relationship between Pressure and Temperature when Volume is constant

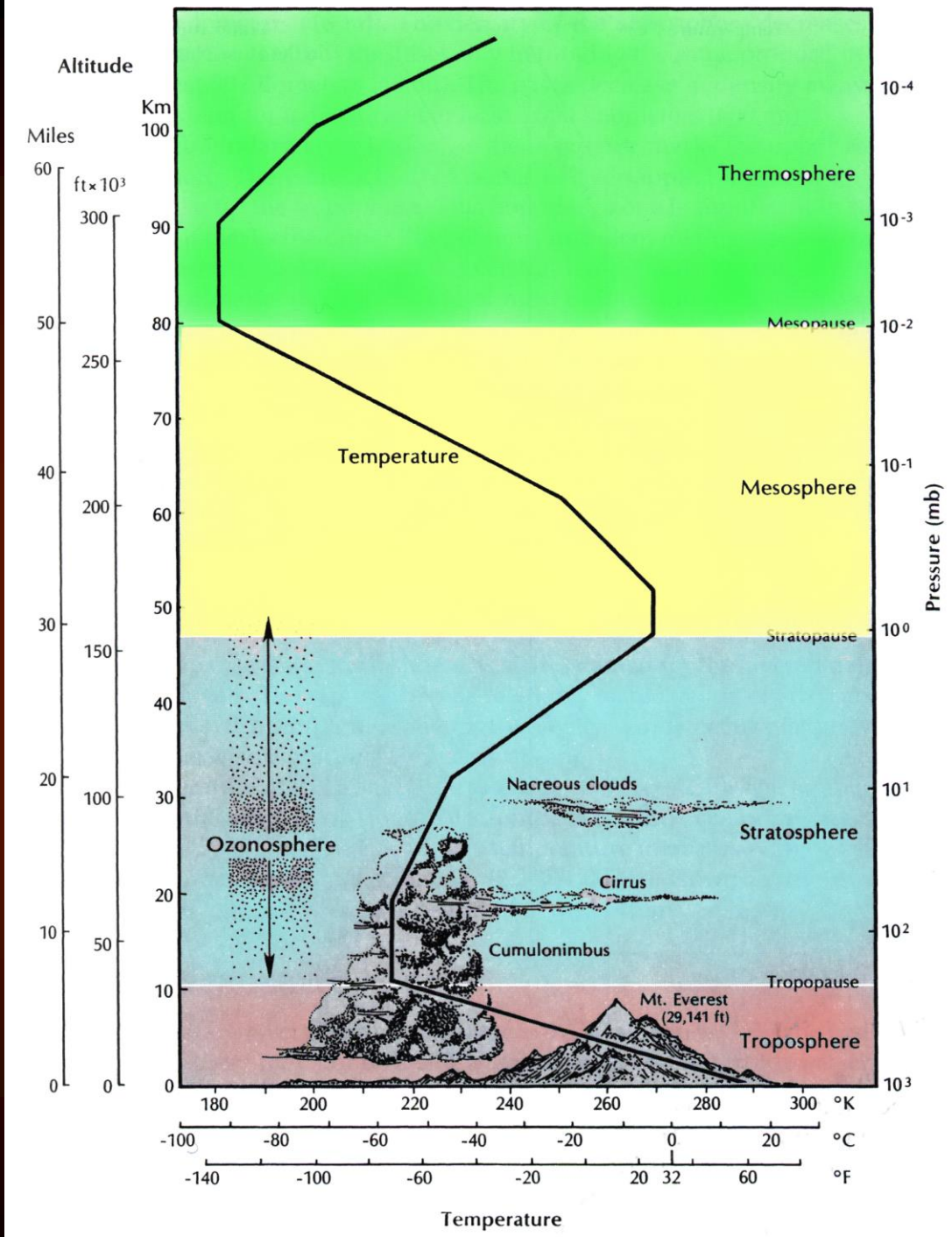
$P_t = P_o (1+ t /273)$

Pt is a pressure at temperature t in (C) and Po is the pressure at temperature 0 C.

Structure:

Atmosphere has discrete zones each with specific characteristics

Atmosphere is base loaded- most stuff is present in higher amounts in the lower zones



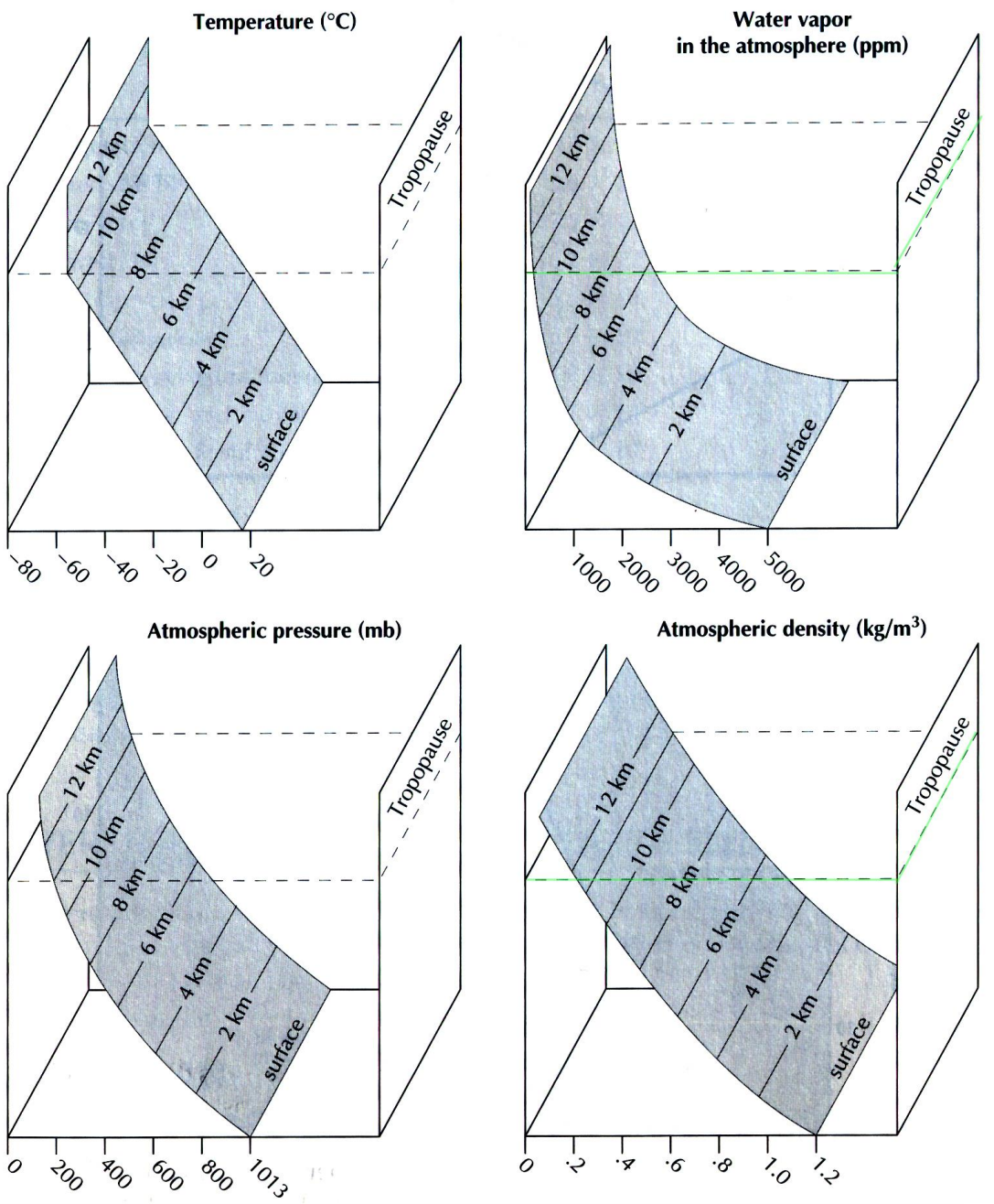


Figure 1.4
Vertical distribution of temperature, water vapor, pressure, and density in the lowest 14 km of the atmosphere.

Troposhpere/Tropopause

The lowermost part of the atmosphere

Most turbulent

vertical and horizontal air motion

Variable height

Poles: 9-12 Km Equator: 16-18 km ***Think WHY?***

Most moisture here

thus most cloud cover in this layer

Area of active weather

This is the area with most meteorological phenomena

Separated from over lying layer by a zone of overlapping zones called the Tropopause

can be seen as towering clouds encounter this boundary and get sheared off in the next layer

□□□□□□□□□□□□□□□ punching through the Tropopause into the Stratosphere□

Stratosphere /Stratopause

Stable dry and little vertical motion

Lowermost region in Stratosphere has high velocity horizontal winds

- jetstreams are located here

Temperature remains constant throughout most of the stratosphere

- still cold though!!!

Ozone layer (ozonosphere) resides primarily in this zone

Separated from overlying layer by the Stratopause

- overlapping zones create this boundary
- mostly determined by temperature change

[illegible]

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Mesosphere

- Decreasing temperature with altitude
- the mesosphere is part of a thicker layer or zone called the ionosphere

Ionosphere

- created by the Sun's incoming radiative energy
- the radiation strips electrons from atoms
- ions interact with other ions incoming and encountered in the atmosphere
- creates some interesting phenomena
  - Aurora Borealis (Northern and Southern Lights)
  - interference with electrical systems on Earth

□□□B□□□□□□□□(northern hemisphere) □□□□□□□□A□□□□□□□A□□□□□□□□□ (southern hemisphere)

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Above the Mesosphere exists several zones with discrete elemental compositions

The lowermost part (up to 120 km) of these zones is called the ***Thermosphere***

Otherwise they are referred to by their gaseous composition

e.g., Nitrogen, Oxygen, Helium, and Hydrogen