Earth Science
Review Booklet

Spring 2012

Instructions to the Students: This booklet contains Regents questions taken from past examinations. They cover the material that you have been working on in your Regents Earth Science classes. There are 50 multiple choice questions in the booklet. It is suggested that you complete ten (10) questions per day. Please make sure to select the choice that you feel best answers the question or completes the statement.

The reference tables that you will need to complete the questions are located at the back of the booklet. Please make sure to complete all questions and if there are any questions that you do not fully understand, make a notation on the question and be sure to ask you teacher for the explanation when you return to school.

The questions and tables in this packet are from the New York State Education Department at http://www.nysedregents.org/EarthScience/. *You can visit this link for additional Regents exams and practice.*

1. Which planet has the least distance between the two foci of its elliptical orbit?

(1) Venus (3) Mars
(2) Earth (4) Jupiter

2. Mt. Marcy often has the coldest nighttime temperatures in New York State because of its

(1) latitude and planetary winds
(2) latitude and elevation
(3) longitude and planetary winds
(4) longitude and elevation

3. During which two geologic time periods did most of the surface bedrock of the Taconic Mountains form?

(1) Cambrian and Ordovician
(2) Silurian and Devonian
(3) Pennsylvanian and Mississippian
(4) Triassic and Jurassic

4 Which event is an example of chemical weathering?

(1) rocks falling off the face of a steep cliff
(2) feldspar in granite being crushed into clay-sized particles
(3) water freezing in cracks in a roadside outcrop
(4) acid rain reacting with limestone bedrock

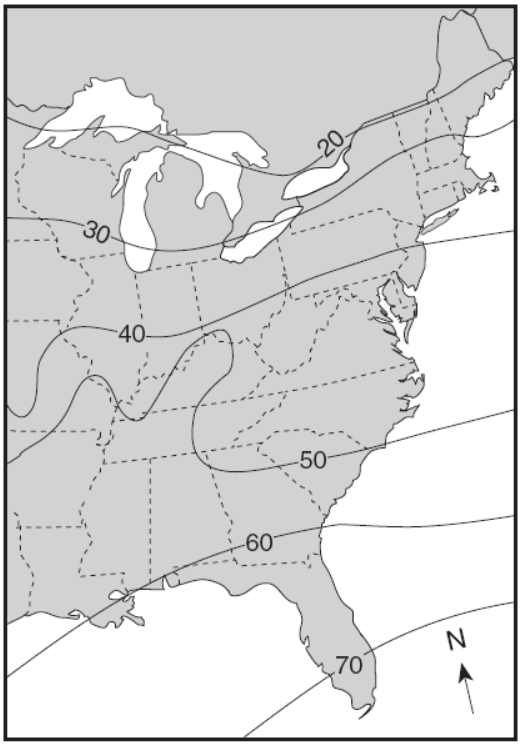
5. The entire area drained by a river and its tributaries is called a

(1) delta (3) valley
(2) watershed (4) floodplain

6. A meandering stream deposits most of its sediments on the

(1) inside of meanders where the stream flows faster
(2) inside of meanders where the stream flows slower
(3) outside of meanders where the stream flows faster
(4) outside of meanders where the stream flows slower

7. The map below shows a weather variable recorded at noon on a certain day. Isolines show values from 20 to 70.



Which atmospheric variable is most likely represented by the isolines on this map?

(1) snowfall in inches
(2) wind speed in knots
(3) barometric pressure in millibars
(4) air temperature in degrees Fahrenheit

8. Which combination of temperature and pressure is inferred to occur within Earth's stiffer mantle?

(1) 3500°C and 0.4 million atmospheres
(2) 3500°C and 2.0 million atmospheres
(3) 5500°C and 0.4 million atmospheres
(4) 5500°C and 2.0 million atmospheres

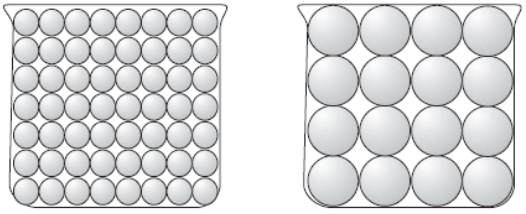
9. Earth's rate of rotation is approximately

(1) 1° per day (3) 180° per day
(2) 15° per day (4) 360° per day

10. Light and other forms of electromagnetic radiation are given off by stars using energy released during

(1) nuclear fusion (3) convection
(2) conduction (4) radioactive decay

11. The diagram below shows two identical containers filled with uniform particles that were sorted by size.



Which characteristic is most likely the same for these particle-filled containers?

(1) infiltration rate (3) capillarity
(2) water retention (4) porosity

12. Which soil conditions normally result in the greatest amount of runoff?

(1) low permeability and gentle slope
(2) low permeability and steep slope
(3) high permeability and gentle slope
(4) high permeability and steep slope

13. Which natural agent of erosion is mainly responsible for the formation of the barrier islands along the southern coast of Long Island, New York?

(1) mass movement (3) prevailing winds
(2) running water (4) ocean waves

14. Which geologic event occurred in New York State at approximately the same time that eurypterids were becoming extinct?

(1) the opening of the Atlantic Ocean
(2) the uplift of the Appalachian Mountains
(3) the formation of the Catskill Delta
(4) the intrusion of the Palisades Sill

15. Which group of elements is listed in increasing order based on the percent by mass in Earth's crust?

(1) aluminum, iron, calcium
(2) aluminum, silicon, magnesium
(3) magnesium, iron, aluminum
(4) magnesium, silicon, calcium

16. As viewed from Earth, most stars appear to move
across the sky each night because

(1) Earth revolves around the Sun
(2) Earth rotates on its axis
(3) stars orbit around Earth
(4) stars revolve around the center of the galaxy

17. One reason *Tetragraptus* is considered a good index fossil is that *Tetragraptus*

(1) existed during a large part of the Paleozoic Era
(2) has no living relatives found on Earth today
(3) existed over a wide geographic area
(4) has been found in New York State

18. What is the dew point temperature when the relative humidity is 30% and the air temperature is 20°C?

(1) –28°C (3) 6°C
(2) 2°C (4) 9°C

19. An igneous rock contains 10 grams of radioactive potassium-40 and a total of 10 grams of its decay products. During which geologic time interval was this rock most likely formed?

(1) Middle Archean
(2) Late Archean
(3) Middle Proterozoic
(4) Late Proterozoic

20. Which statement best describes the age of our solar system and the universe?

(1) The universe is at least twice as old as our solar system.
(2) Our solar system is at least twice as old as the universe.
(3) Our solar system and the universe are estimated to be 5 billion years old.
(4) Our solar system and the universe are estimated to be 10 billion years old.

21. A Foucault pendulum is used to prove that

(1) the Sun rotates on its axis
(2) the Sun revolves around Earth
(3) Earth rotates on its axis
(4) Earth revolves around the Sun

22. Compared to the terrestrial planets, the Jovian planets are

(1) smaller and have lower densities
(2) smaller and have greater densities
(3) larger and have lower densities
(4) larger and have greater densities

23. Which process produces the energy that allows the stars of the universe to radiate visible light?

(1) convection (3) insolation
(2) nuclear fusion (4) radioactive decay

24. A soil sample with a large amount of space between the particles will have a

(1) low permeability rate
(2) low infiltration rate
(3) high porosity
(4) high capillarity

25. The spinning of Earth on its axis causes the apparent rising and setting of the

(1) Sun, only
(2) Sun and the Moon, only
(3) Moon and some stars, only
(4) Sun, the Moon, and some stars

26. On sunny summer days, a breeze often develops that blows from large bodies of water toward nearby landmasses because the

(1) temperature of the air above the landmasses is greater
(2) specific heat of the landmasses is greater
(3) temperatures of the bodies of water are greater
(4) air over the bodies of water becomes heavier with additional water vapor

27. The largest sediment particles that can be transported by a stream traveling at a velocity of 200 centimeters per second are

(1) boulders
(2) cobbles
(3) pebbles
(4) sand

28. What happens to the density and temperature of rock within Earth's interior as depth increases?

(1) density decreases and temperature decreases
(2) density decreases and temperature increases
(3) density increases and temperature increases
(4) density increases and temperature decreases

29. Scientists believe that a large asteroid struck Earth approximately 65 million years ago. It is often theorized that this event contributed to the

(1) end of the last ice age
(2) breaking up of the supercontinent Pangea
(3) evolution of the first birds
(4) extinction of the dinosaurs

30. Which two landscape regions in New York State have the oldest surface bedrock?

(1) Allegheny Plateau and Newark Lowlands
(2) Tug Hill Plateau and Erie-Ontario Lowlands
(3) Taconic Mountains and the Catskills
(4) Adirondack Mountains and Hudson Highlands

31. The planetary wind belts in the troposphere are primarily caused by the

(1) Earth's rotation and unequal heating of Earth's surface
(2) Earth's revolution and unequal heating of Earth's surface
(3) Earth's rotation and Sun's gravitational attraction on Earth's atmosphere
(4) Earth's revolution and Sun's gravitational attraction on Earth's atmosphere

32. When Earth cools, most of the energy transferred from Earth's surface to space is transferred by the process of

(1) conduction (3) refraction
(2) reflection (4) radiation

33. Which type of surface absorbs the greatest amount of electromagnetic energy from the Sun?

(1) smooth, shiny, and light colored
(2) smooth, shiny, and dark colored
(3) rough, dull, and light colored
(4) rough, dull, and dark colored

34. The largest particles that a stream deposits as it enters a pond are 8 centimeters in diameter. The minimum velocity of the stream is approximately

(1) 100 cm/sec (3) 300 cm/sec
(2) 200 cm/sec (4) 400 cm/sec

35. One factor responsible for the strength of gravitational attraction between a planet and the Sun is the

(1) degree of tilt of the planet's axis
(2) distance between the planet and the Sun
(3) planet's period of rotation
(4) amount of insolation given off by the Sun

36. Which planet is located approximately ten times farther from the Sun than Earth is from the Sun?

(1) Mars (3) Saturn
(2) Jupiter (4) Uranus

37. Large craters found on Earth support the hypothesis that impact events have caused

(1) a decrease in the number of earthquakes and an increase in sea level
(2) an increase in solar radiation and a decrease in Earth radiation
(3) the red shift of light from distant stars and the blue shift of light from nearby stars
(4) mass extinctions of life-forms and global climate changes

38. What is the inferred age of our solar system, in millions of years?

(1) 544 (3) 4600
(2) 1300 (4) 10,000

39. The water table usually rises when there is

(1) a decrease in the amount of infiltration
(2) a decrease in the amount of surface area covered by vegetation
(3) an increase in the amount of precipitation
(4) an increase in the slope of the land

40. What causes the Coriolis effect?

(1) Earth's tilt on its axis
(2) the spin of Earth on its axis
(3) the orbital motion of the Moon around Earth
(4) the orbital motion of Earth around the Sun

41. What is the relative humidity when the dry-bulb temperature is 16°C and the wet-bulb temperature is 14°C?

(1) 90%
(2) 80%
(3) 14%
(4) 13%

42. Which weather instrument is used to measure wind speed?

(1) anemometer
(2) wind vane
(3) psychrometer
(4) thermometer

43. The upward movement of air in the atmosphere generally causes the temperature of that air to

(1) decrease and become closer to the dewpoint
(2) decrease and become farther from the dewpoint
(3) increase and become closer to the dewpoint
(4) increase and become farther from the dewpoint

44. Which statement correctly compares seismic *P*-waves with seismic *S*-waves?

(1) *P*-waves travel faster than *S*-waves and pass through Earth's liquid zones.
(2) *P*-waves travel faster than *S*-waves and do not pass through Earth's liquid zones.
(3) *P*-waves travel slower than *S*-waves and pass through Earth's liquid zones.
(4) *P*-waves travel slower than *S*-waves and do not pass through Earth's liquid zones.

45. A whalebone that originally contained 200 grams of radioactive carbon-14 now contains 25 grams of carbon-14. How many carbon-14 half-lives have passed since this whale was alive?

(1) 1
(2) 2
(3) 3
(4) 4

46. Which geologic event occurred during the same geologic period as the first appearance of modern corals in Earth's oceans?

(1) Grenville Orogeny
(2) Acadian Orogeny
(3) intrusion of the Palisades Sill
(4) formation of the Catskill Delta

47. The Coriolis effect causes winds in New York State to generally curve

(1) to the right of the direction of travel
(2) to the left of the direction of travel
(3) upward away from Earth's surface
(4) downward toward Earth's surface

48. The star *Algol* is estimated to have approximately the same luminosity as the star *Aldebaran* and approximately the same temperature as the star *Rigel*. *Algol* is best classified as a

(1) main sequence star (3) white dwarf star
(2) red giant star (4) red dwarf star

49. The explosion associated with the Big Bang theory and the formation of the universe is inferred to have occurred how many billion years ago?

(1) less than 1 (3) 4.6
(2) 2.5 (4) over 10

50. The altitude of the ozone layer near the South Pole is 20 kilometers above sea level. Which temperature zone of the atmosphere contains this ozone layer?

(1) troposphere (3) mesosphere
(2) stratosphere (4) thermosphere

The University of the State of New York • THE STATE EDUCATION DEPARTMENT • Albany, New York 12234 • www.nysed.gov

Reference Tables for Physical Setting/EARTH SCIENCE

Radioactive Decay Data

RADIOACTIVE ISOTOPE	DISINTEGRATION	HALF-LIFE (years)
Carbon-14	$^{14}C \rightarrow {}^{14}N$	5.7×10^3
Potassium-40	$^{40}K \rightarrow {}^{40}Ar$, $^{40}K \rightarrow {}^{40}Ca$	1.3×10^9
Uranium-238	$^{238}U \rightarrow {}^{206}Pb$	4.5×10^9
Rubidium-87	$^{87}Rb \rightarrow {}^{87}Sr$	4.9×10^{10}

Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (Joules/gram • °C)
Liquid water	4.18
Solid water (ice)	2.11
Water vapor	2.00
Dry air	1.01
Basalt	0.84
Granite	0.79
Iron	0.45
Copper	0.38
Lead	0.13

Equations

$$\text{Eccentricity} = \frac{\text{distance between foci}}{\text{length of major axis}}$$

$$\text{Gradient} = \frac{\text{change in field value}}{\text{distance}}$$

$$\text{Rate of change} = \frac{\text{change in value}}{\text{time}}$$

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Properties of Water

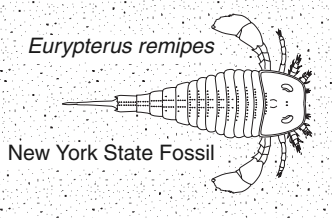
Heat energy gained during melting	334 J/g
Heat energy released during freezing	334 J/g
Heat energy gained during vaporization	2260 J/g
Heat energy released during condensation	2260 J/g
Density at 3.98°C	1.0 g/mL

Average Chemical Composition of Earth's Crust, Hydrosphere, and Troposphere

ELEMENT (symbol)	CRUST		HYDROSPHERE	TROPOSPHERE
	Percent by mass	Percent by volume	Percent by volume	Percent by volume
Oxygen (O)	46.10	94.04	33.0	21.0
Silicon (Si)	28.20	0.88		
Aluminum (Al)	8.23	0.48		
Iron (Fe)	5.63	0.49		
Calcium (Ca)	4.15	1.18		
Sodium (Na)	2.36	1.11		
Magnesium (Mg)	2.33	0.33		
Potassium (K)	2.09	1.42		
Nitrogen (N)				78.0
Hydrogen (H)			66.0	
Other	0.91	0.07	1.0	1.0

2011 EDITION

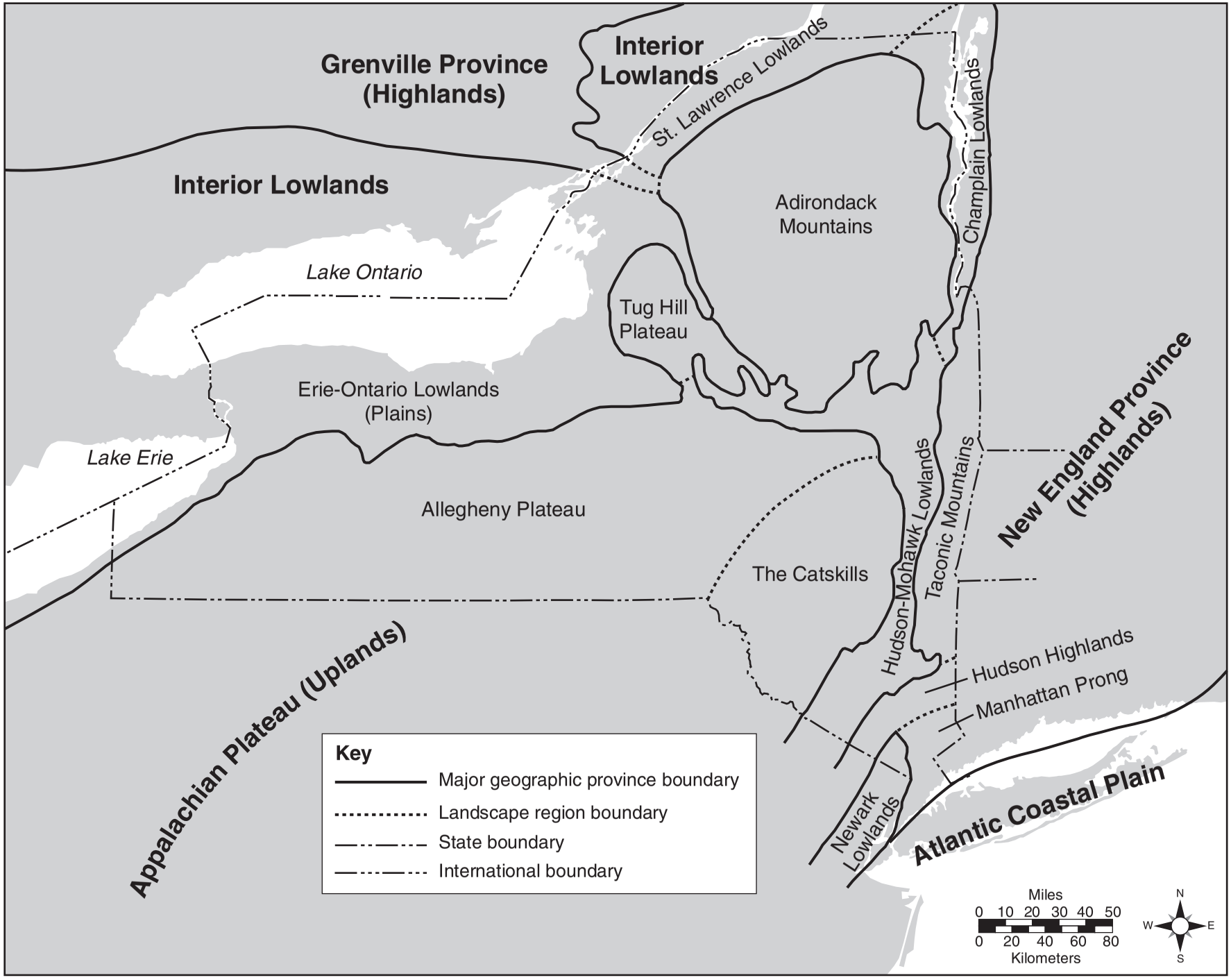
This edition of the Earth Science Reference Tables should be used in the classroom beginning in the 2011–12 school year. The first examination for which these tables will be used is the January 2012 Regents Examination in Physical Setting/Earth Science.



Eurypterus remipes

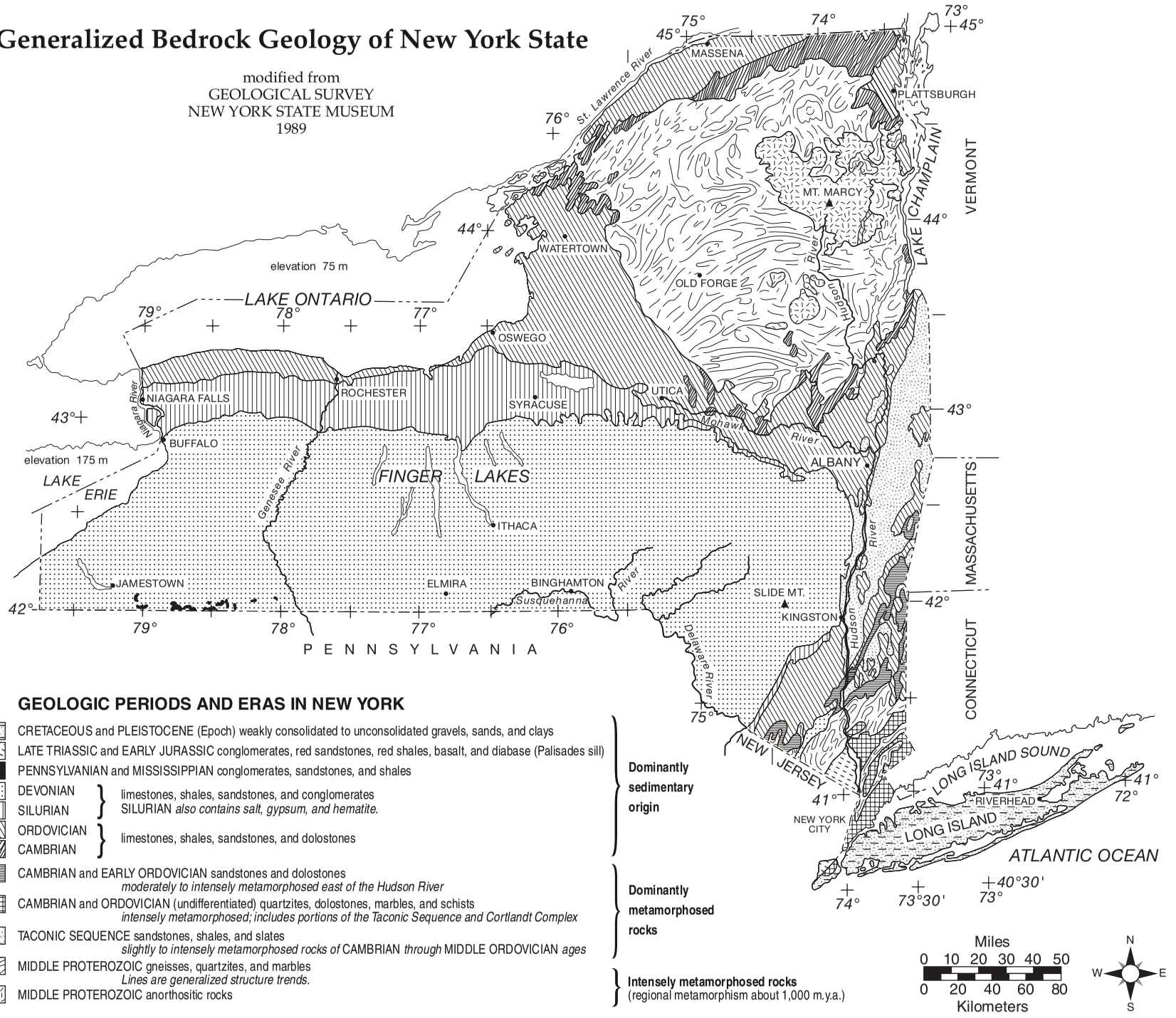
New York State Fossil

Generalized Landscape Regions of New York State



Generalized Bedrock Geology of New York State

modified from
GEOLOGICAL SURVEY
NEW YORK STATE MUSEUM
1989



GEOLOGIC PERIODS AND ERAS IN NEW YORK

Dominantly sedimentary origin

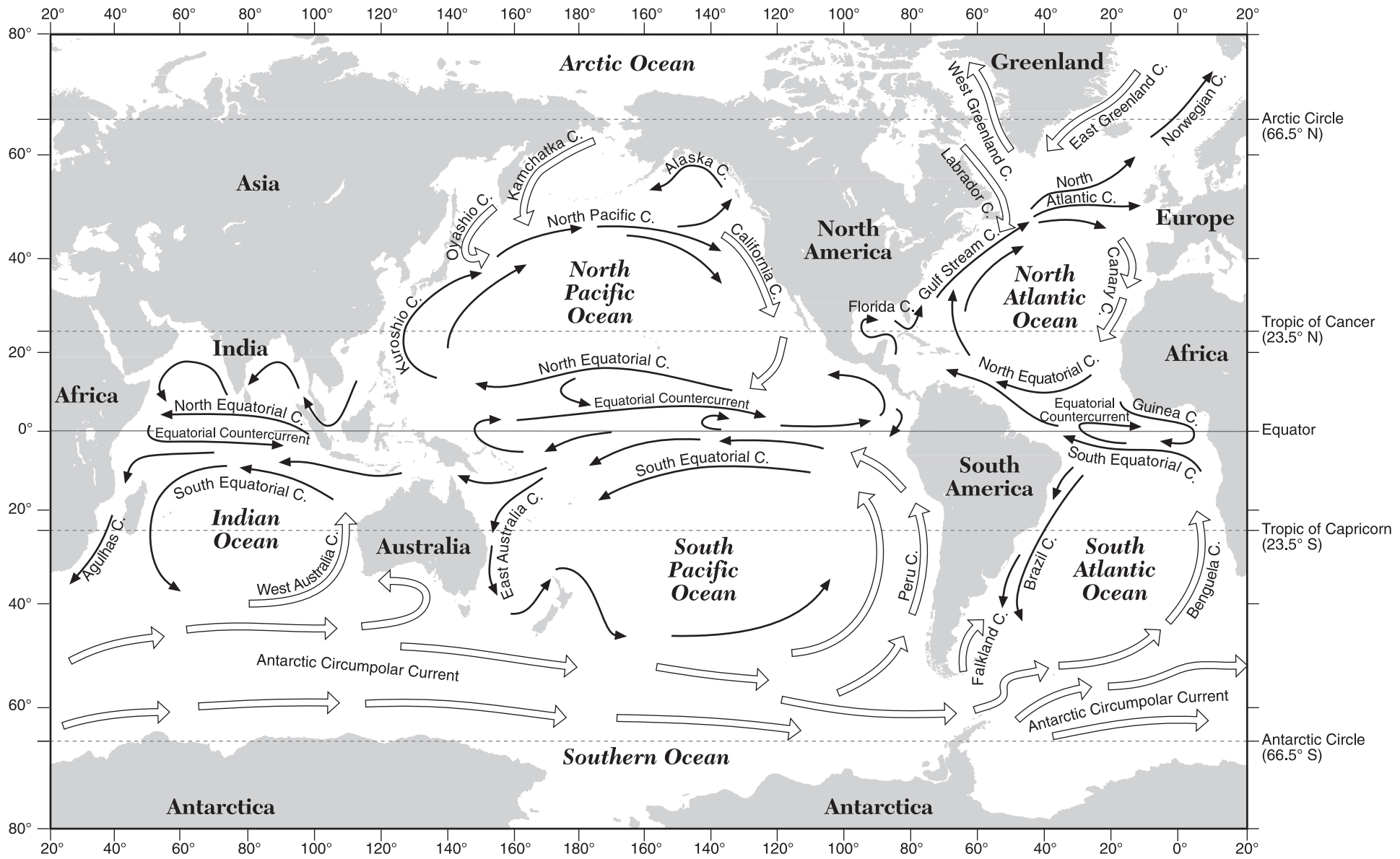
- CRETACEOUS and PLEISTOCENE (Epoch) weakly consolidated to unconsolidated gravels, sands, and clays
- LATE TRIASSIC and EARLY JURASSIC conglomerates, red sandstones, red shales, basalt, and diabase (Palisades sill)
- PENNSYLVANIAN and MISSISSIPPIAN conglomerates, sandstones, and shales
- DEVONIAN, SILURIAN — limestones, shales, sandstones, and conglomerates; SILURIAN *also contains salt, gypsum, and hematite.*
- ORDOVICIAN, CAMBRIAN — limestones, shales, sandstones, and dolostones

Dominantly metamorphosed rocks

- CAMBRIAN and EARLY ORDOVICIAN sandstones and dolostones
  moderately to intensely metamorphosed east of the Hudson River
- CAMBRIAN and ORDOVICIAN (undifferentiated) quartzites, dolostones, marbles, and schists
  intensely metamorphosed; includes portions of the Taconic Sequence and Cortlandt Complex
- TACONIC SEQUENCE sandstones, shales, and slates
  slightly to intensely metamorphosed rocks of CAMBRIAN *through* MIDDLE ORDOVICIAN *ages*
- MIDDLE PROTEROZOIC gneisses, quartzites, and marbles
  Lines are generalized structure trends.
- MIDDLE PROTEROZOIC anorthositic rocks

Intensely metamorphosed rocks
(regional metamorphism about 1,000 m.y.a.)

Surface Ocean Currents

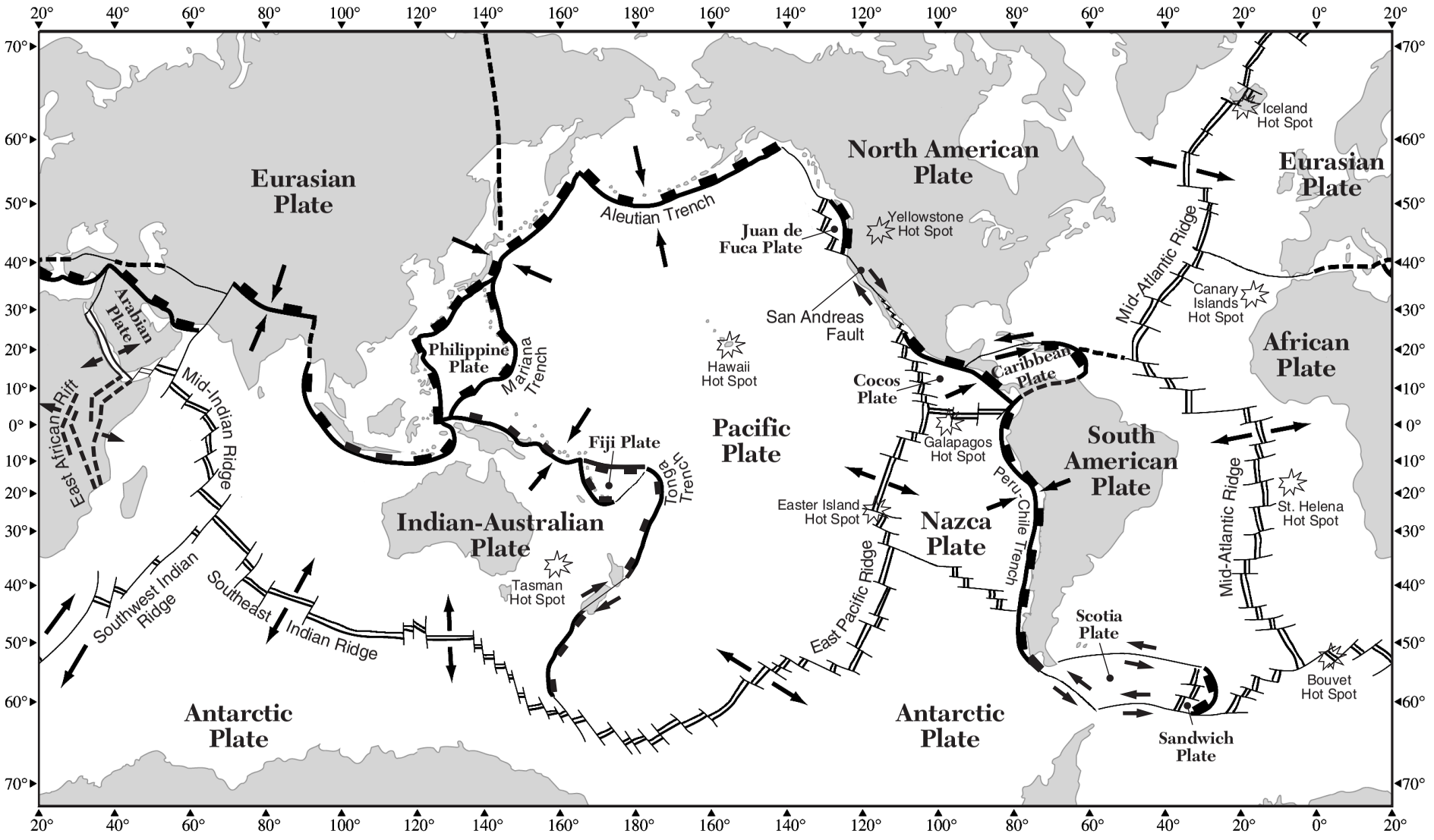


NOTE: Not all surface ocean currents are shown.

Key

- Warm currents
- Cool currents

Tectonic Plates

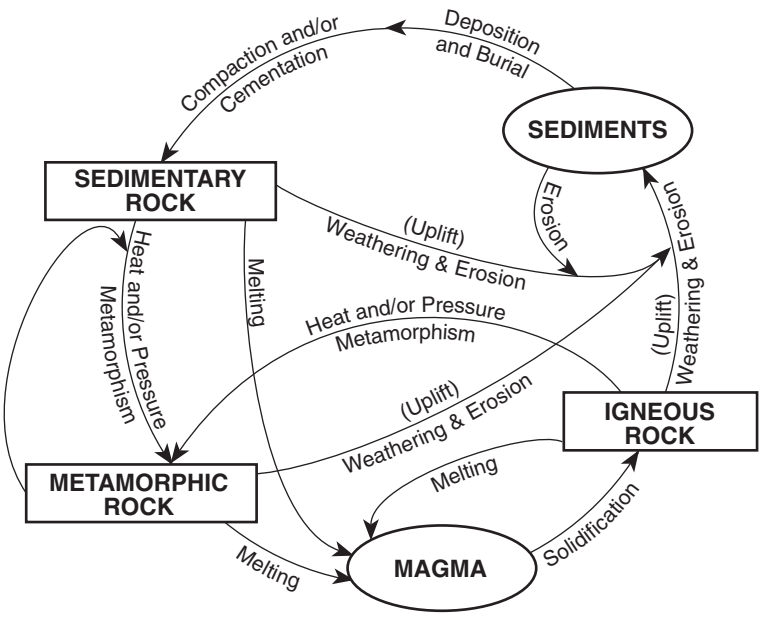


Key

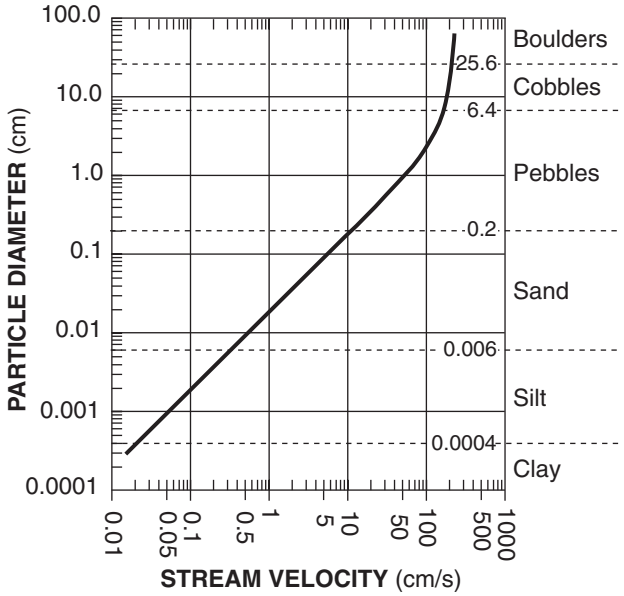
- Relative motion at plate boundary
- Transform plate boundary (transform fault)
- Divergent plate boundary (usually broken by transform faults along mid-ocean ridges)
- overriding plate / subducting plate — Convergent plate boundary (subduction zone)
- Complex or uncertain plate boundary
- Mantle hot spot

NOTE: Not all mantle hot spots, plates, and boundaries are shown.

Rock Cycle in Earth's Crust



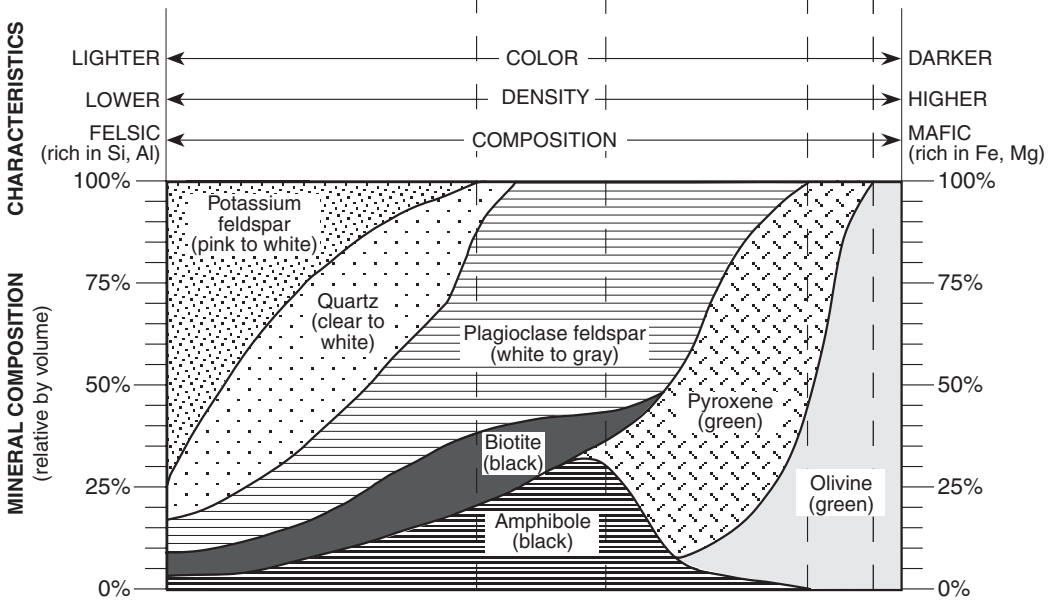
Relationship of Transported Particle Size to Water Velocity



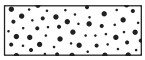
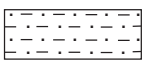
This generalized graph shows the water velocity needed to maintain, but not start, movement. Variations occur due to differences in particle density and shape.

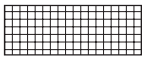
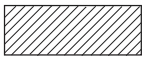
Scheme for Igneous Rock Identification

IGNEOUS ROCKS	ENVIRONMENT OF FORMATION	Light-colored	Medium-colored	Dark-colored	Very dark	CRYSTAL SIZE	TEXTURE	
	EXTRUSIVE (Volcanic)	**Obsidian** (usually appears black)		**Basaltic glass**		non-crystalline	Glassy	Non-vesicular
		Pumice		**Scoria**				Vesicular (gas pockets)
		Vesicular rhyolite	**Vesicular andesite**	**Vesicular basalt**		less than 1 mm	Fine	
		Rhyolite	**Andesite**	**Basalt**				Non-vesicular
	INTRUSIVE (Plutonic)	**Granite**	**Diorite**	**Diabase** / **Gabbro**	**Peridotite** / **Dunite**	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very coarse	

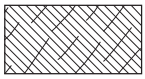
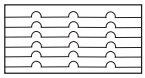
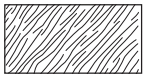
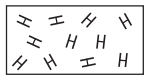


Scheme for Sedimentary Rock Identification

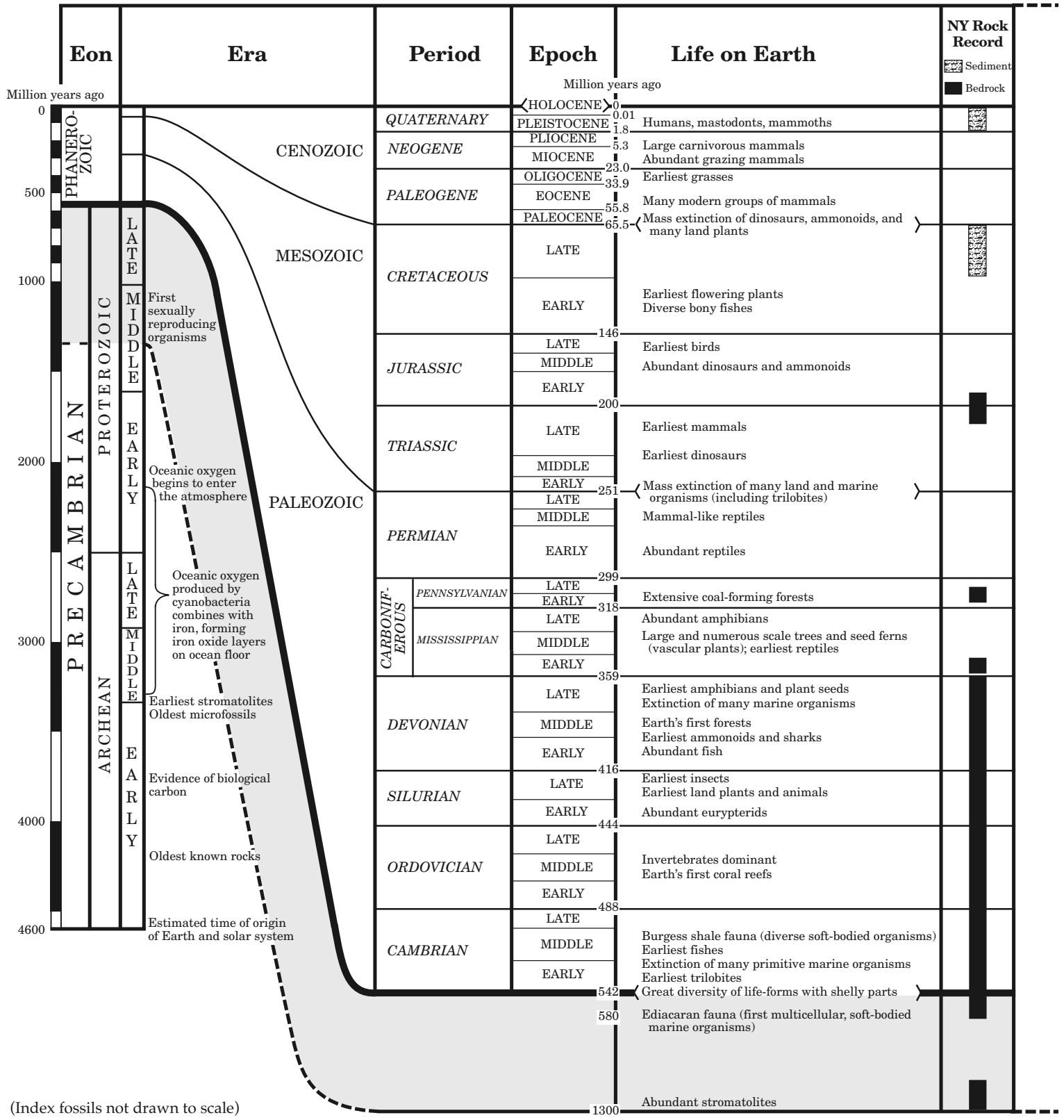
INORGANIC LAND-DERIVED SEDIMENTARY ROCKS					
TEXTURE	**GRAIN SIZE**	**COMPOSITION**	**COMMENTS**	**ROCK NAME**	**MAP SYMBOL**
Clastic (fragmental)	Pebbles, cobbles, and/or boulders embedded in sand, silt, and/or clay	Mostly quartz, feldspar, and clay minerals; may contain fragments of other rocks and minerals	Rounded fragments	**Conglomerate**	
			Angular fragments	**Breccia**	
	Sand (0.006 to 0.2 cm)		Fine to coarse	**Sandstone**	
	Silt (0.0004 to 0.006 cm)		Very fine grain	**Siltstone**	
	Clay (less than 0.0004 cm)		Compact; may split easily	**Shale**	

CHEMICALLY AND/OR ORGANICALLY FORMED SEDIMENTARY ROCKS					
TEXTURE	**GRAIN SIZE**	**COMPOSITION**	**COMMENTS**	**ROCK NAME**	**MAP SYMBOL**
Crystalline	Fine to coarse crystals	Halite	Crystals from chemical precipitates and evaporites	**Rock salt**	
		Gypsum		**Rock gypsum**	
		Dolomite		**Dolostone**	
Crystalline or bioclastic	Microscopic to very coarse	Calcite	Precipitates of biologic origin or cemented shell fragments	**Limestone**	
Bioclastic		Carbon	Compacted plant remains	**Bituminous coal**	

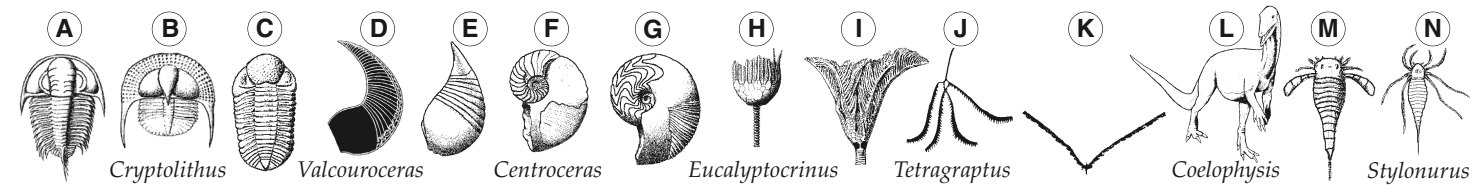
Scheme for Metamorphic Rock Identification

TEXTURE		GRAIN SIZE	COMPOSITION	TYPE OF METAMORPHISM	COMMENTS	ROCK NAME	MAP SYMBOL
FOLIATED	MINERAL ALIGNMENT	Fine	MICA, QUARTZ, FELDSPAR, AMPHIBOLE, GARNET, PYROXENE	Regional (Heat and pressure increases)	Low-grade metamorphism of shale	**Slate**	
		Fine to medium			Foliation surfaces shiny from microscopic mica crystals	**Phyllite**	
					Platy mica crystals visible from metamorphism of clay or feldspars	**Schist**	
	BAND-ING	Medium to coarse			High-grade metamorphism; mineral types segregated into bands	**Gneiss**	
NONFOLIATED		Fine	Carbon	Regional	Metamorphism of bituminous coal	**Anthracite coal**	
		Fine	Various minerals	Contact (heat)	Various rocks changed by heat from nearby magma/lava	**Hornfels**	
		Fine to coarse	Quartz	Regional or contact	Metamorphism of quartz sandstone	**Quartzite**	
			Calcite and/or dolomite		Metamorphism of limestone or dolostone	**Marble**	
		Coarse	Various minerals		Pebbles may be distorted or stretched	**Metaconglomerate**	

GEOLOGIC HISTORY



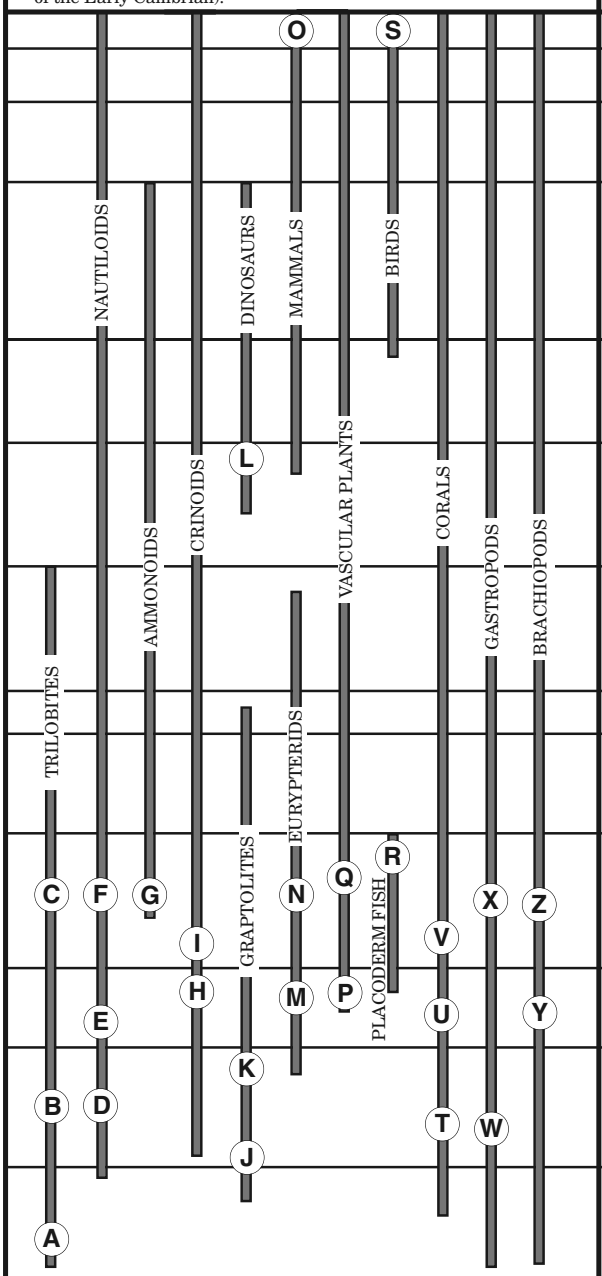
(Index fossils not drawn to scale)



OF NEW YORK STATE

Time Distribution of Fossils
(including important fossils of New York)

The center of each lettered circle indicates the approximate time of existence of a specific index fossil (e.g. Fossil (A) lived at the end of the Early Cambrian).



Important Geologic Events in New York

Advance and retreat of last continental ice

Sands and clays underlying Long Island and Staten Island deposited on margin of Atlantic Ocean

Dome-like uplift of Adirondack region begins

Initial opening of Atlantic Ocean
North America and Africa separate

⟨ Intrusion of Palisades sill ⟩

Pangaea begins to break up

Alleghenian orogeny caused by collision of North America and Africa along transform margin, forming Pangaea

Catskill delta forms
Erosion of Acadian Mountains

Acadian orogeny caused by collision of North America and Avalon and closing of remaining part of Iapetus Ocean

Salt and gypsum deposited in evaporite basins

Erosion of Taconic Mountains; Queenston delta forms

Taconian orogeny caused by closing of western part of Iapetus Ocean and collision between North America and volcanic island arc

Widespread deposition over most of New York along edge of Iapetus Ocean

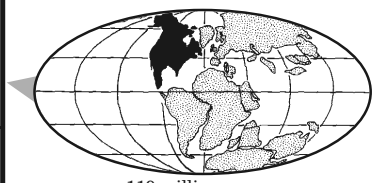
Rifting and initial opening of Iapetus Ocean

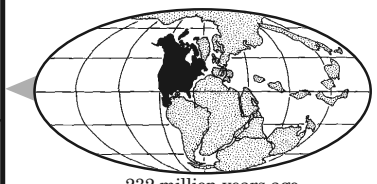
Erosion of Grenville Mountains

Grenville orogeny: metamorphism of bedrock now exposed in the Adirondacks and Hudson Highlands

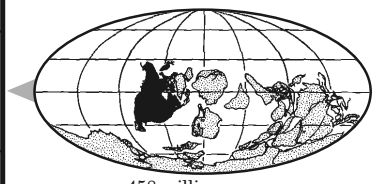
Inferred Positions of Earth's Landmasses

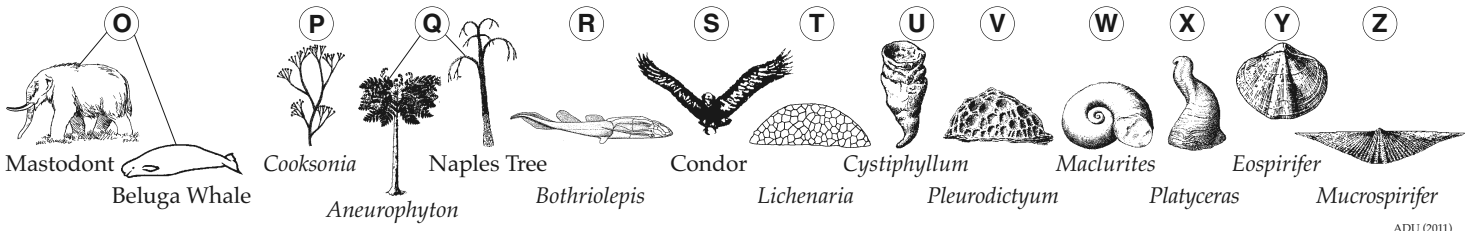

59 million years ago


119 million years ago


232 million years ago

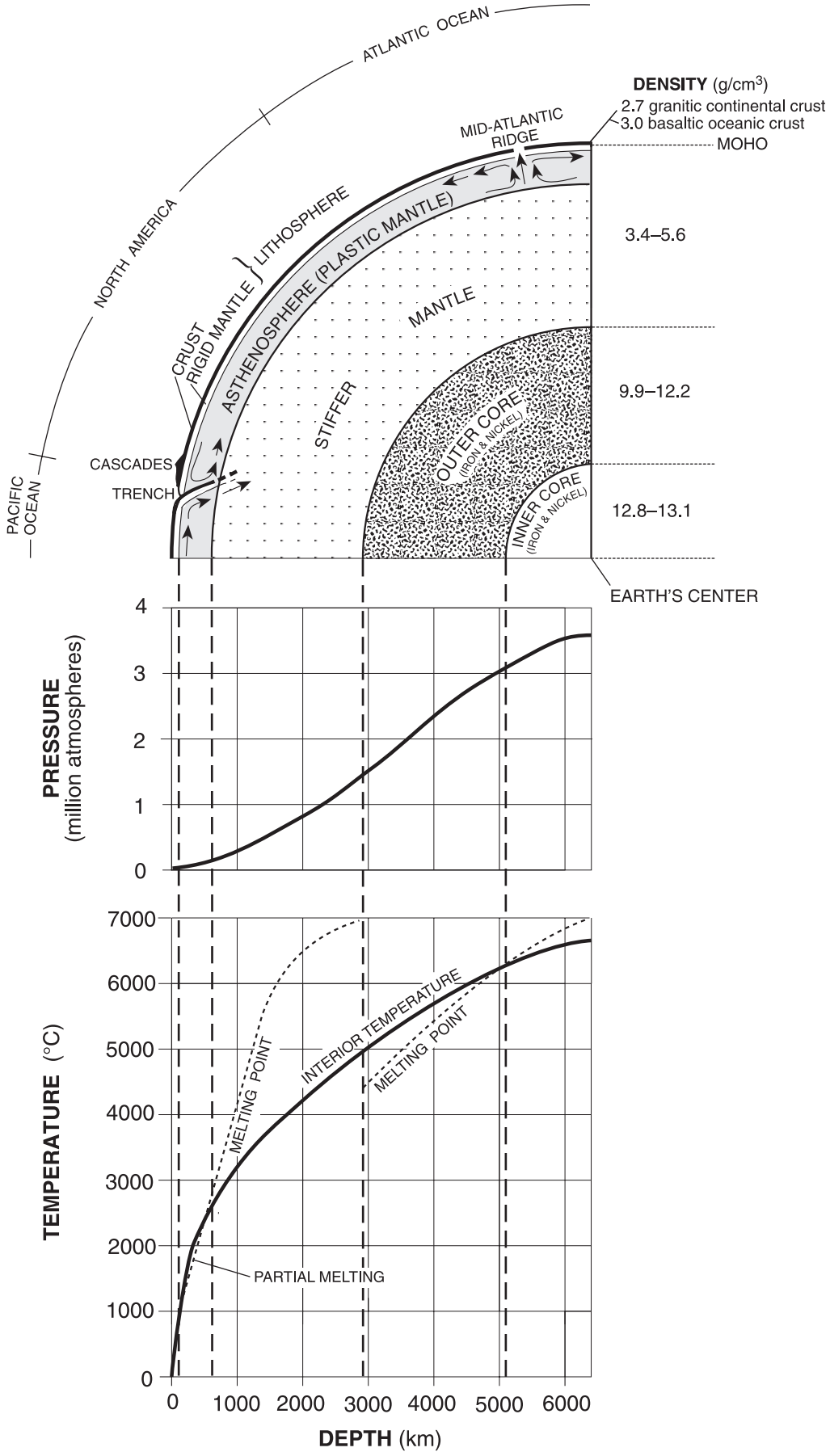

359 million years ago


458 million years ago

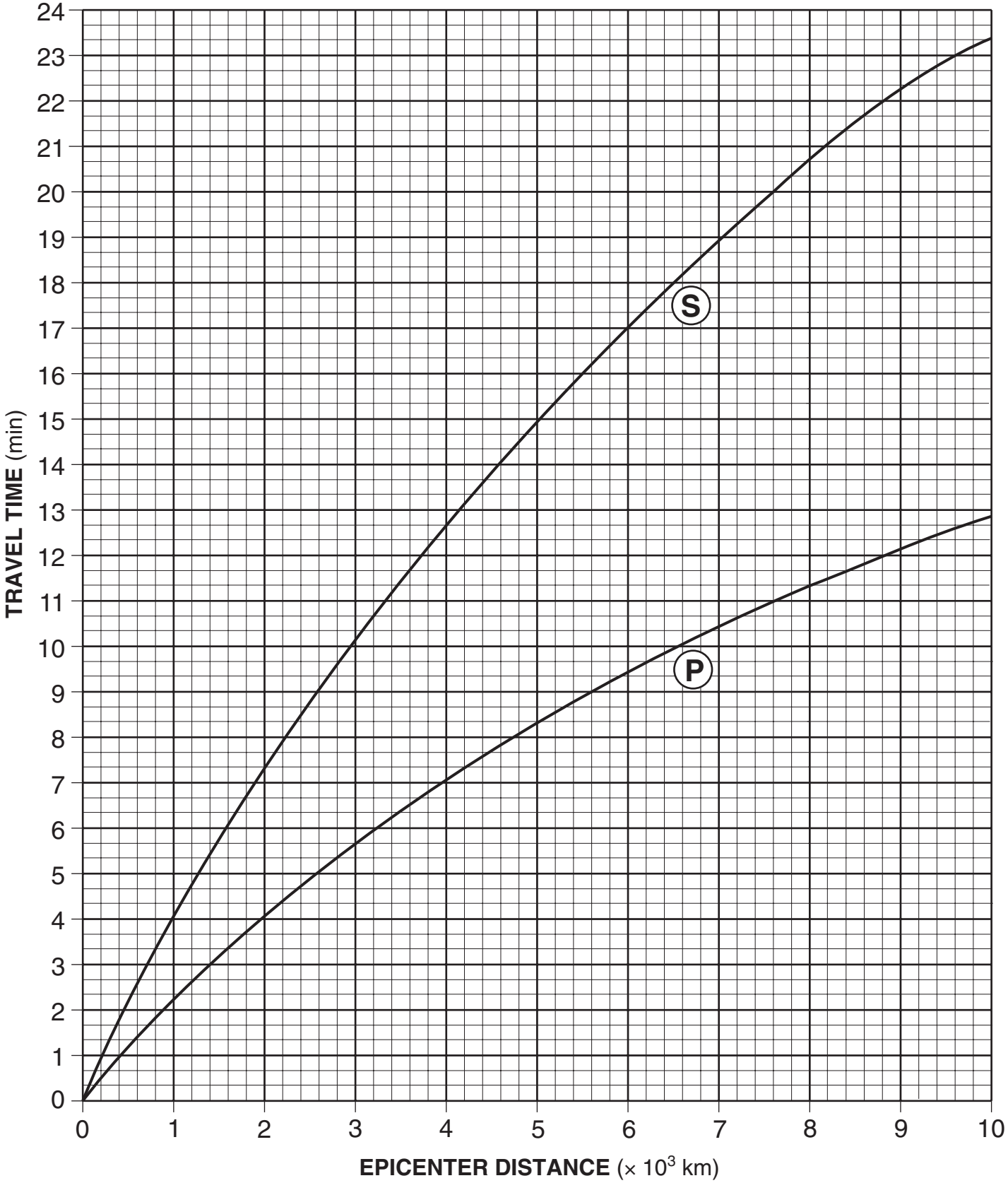


ADU (2011)

Inferred Properties of Earth's Interior



Earthquake P-Wave and S-Wave Travel Time



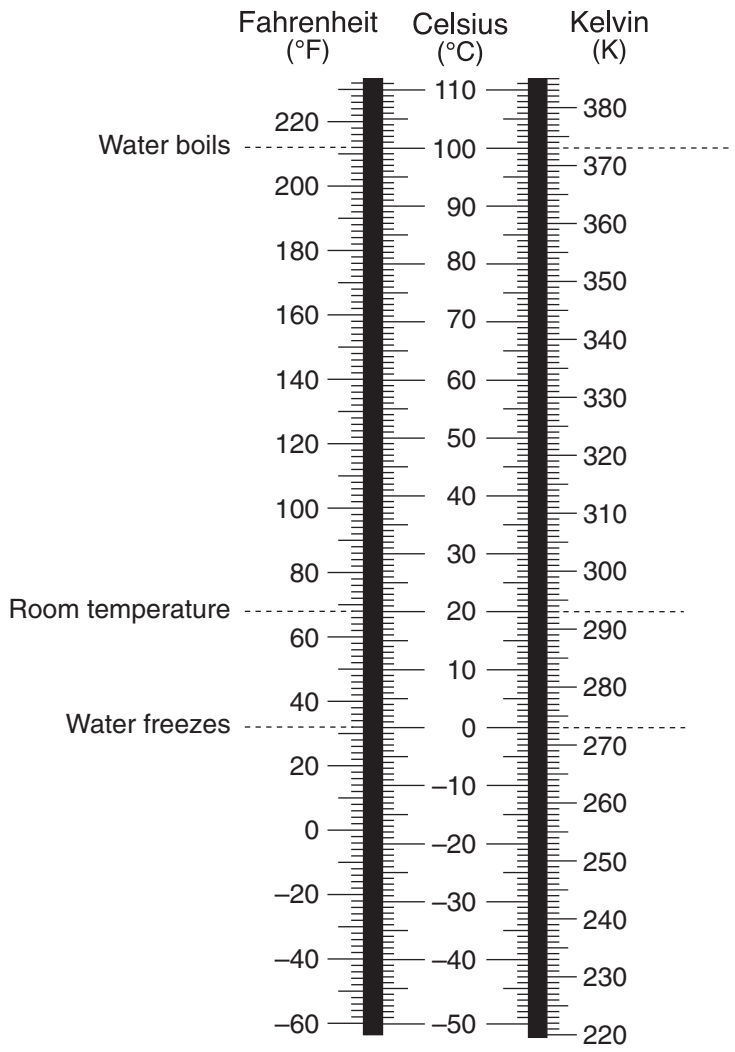
Dewpoint (°C)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
–20	–20	–33														
–18	–18	–28														
–16	–16	–24														
–14	–14	–21	–36													
–12	–12	–18	–28													
–10	–10	–14	–22													
–8	–8	–12	–18	–29												
–6	–6	–10	–14	–22												
–4	–4	–7	–12	–17	–29											
–2	–2	–5	–8	–13	–20											
0	0	–3	–6	–9	–15	–24										
2	2	–1	–3	–6	–11	–17										
4	4	1	–1	–4	–7	–11	–19									
6	6	4	1	–1	–4	–7	–13	–21								
8	8	6	3	1	–2	–5	–9	–14								
10	10	8	6	4	1	–2	–5	–9	–14	–28						
12	12	10	8	6	4	1	–2	–5	–9	–16						
14	14	12	11	9	6	4	1	–2	–5	–10	–17					
16	16	14	13	11	9	7	4	1	–1	–6	–10	–17				
18	18	16	15	13	11	9	7	4	2	–2	–5	–10	–19			
20	20	19	17	15	14	12	10	7	4	2	–2	–5	–10	–19		
22	22	21	19	17	16	14	12	10	8	5	3	–1	–5	–10	–19	
24	24	23	21	20	18	16	14	12	10	8	6	2	–1	–5	–10	–18
26	26	25	23	22	20	18	17	15	13	11	9	6	3	0	–4	–9
28	28	27	25	24	22	21	19	17	16	14	11	9	7	4	1	–3
30	30	29	27	26	24	23	21	19	18	16	14	12	10	8	5	1

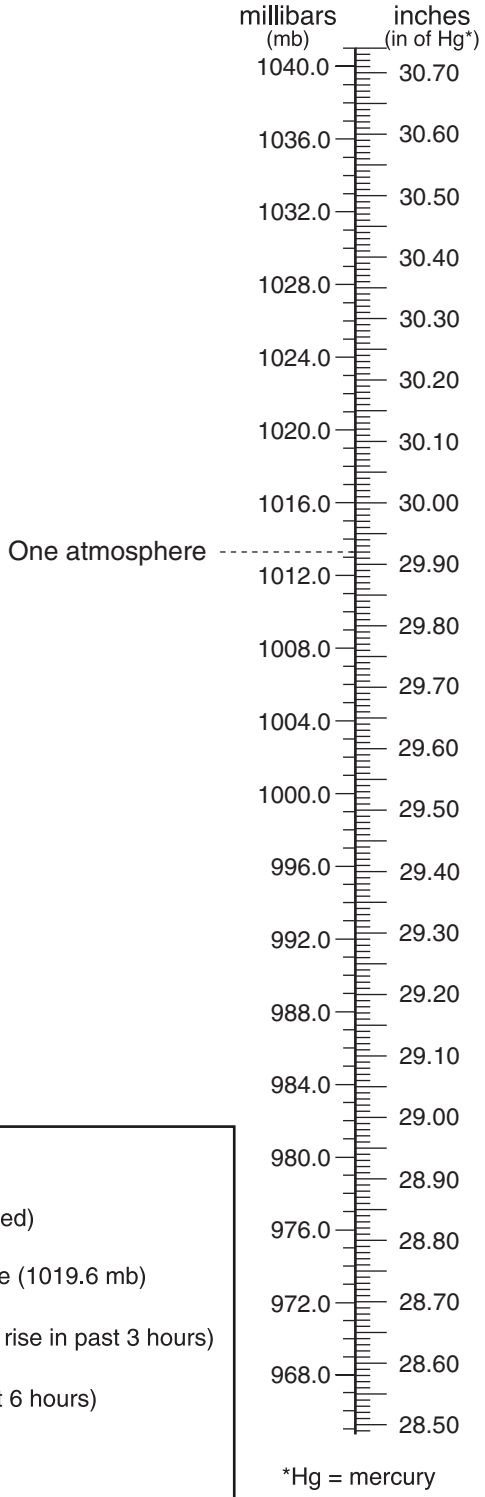
Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
–20	100	28														
–18	100	40														
–16	100	48														
–14	100	55	11													
–12	100	61	23													
–10	100	66	33													
–8	100	71	41	13												
–6	100	73	48	20												
–4	100	77	54	32	11											
–2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

Temperature



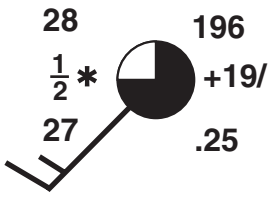
Pressure



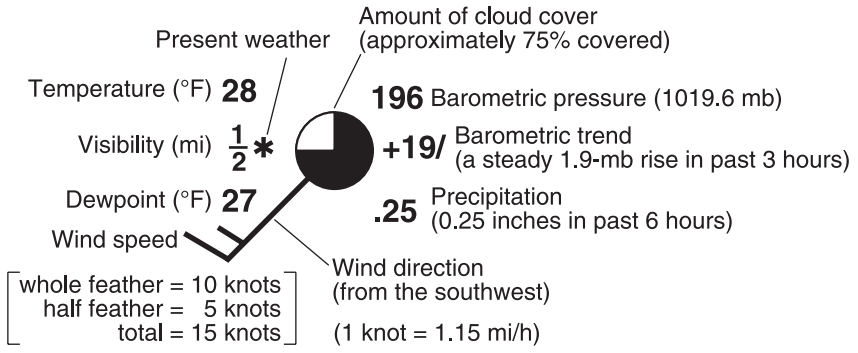
*Hg = mercury

Key to Weather Map Symbols

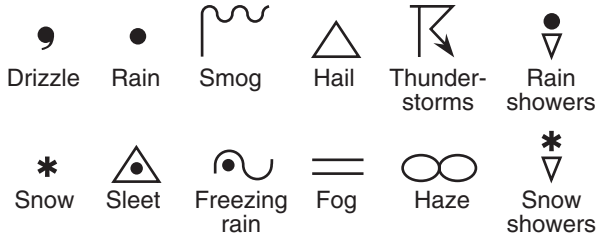
Station Model



Station Model Explanation



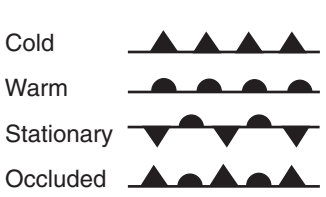
Present Weather



Air Masses

cA	continental arctic
cP	continental polar
cT	continental tropical
mT	maritime tropical
mP	maritime polar

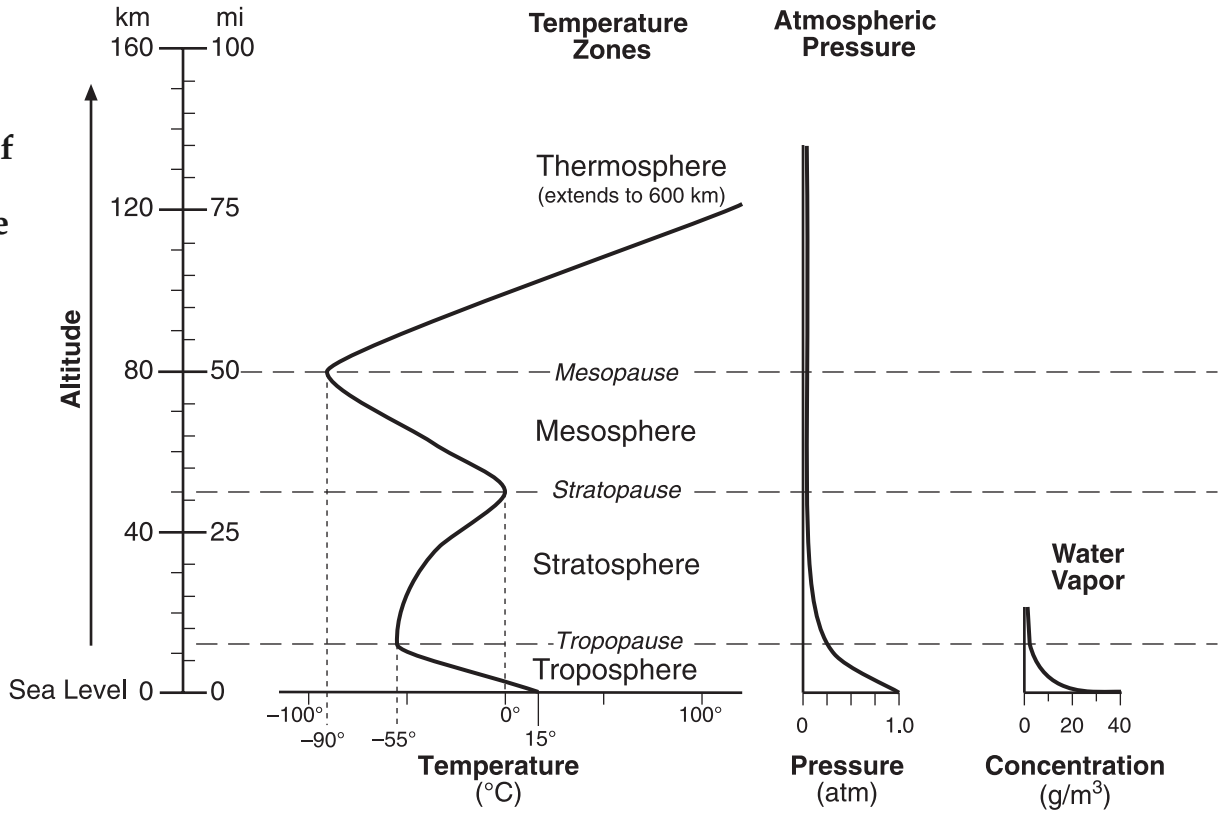
Fronts



Hurricane

Tornado

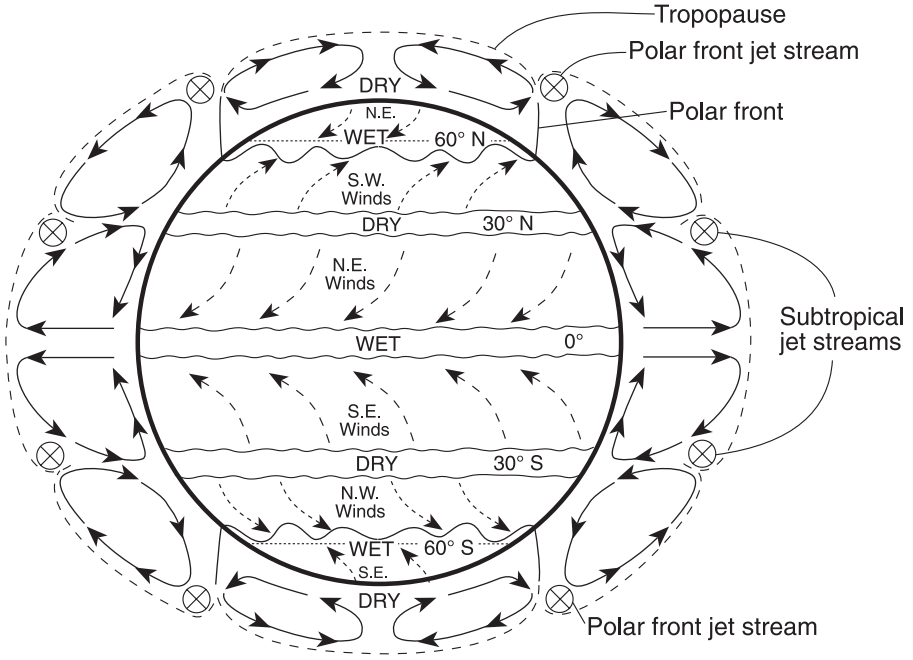
Selected Properties of Earth's Atmosphere



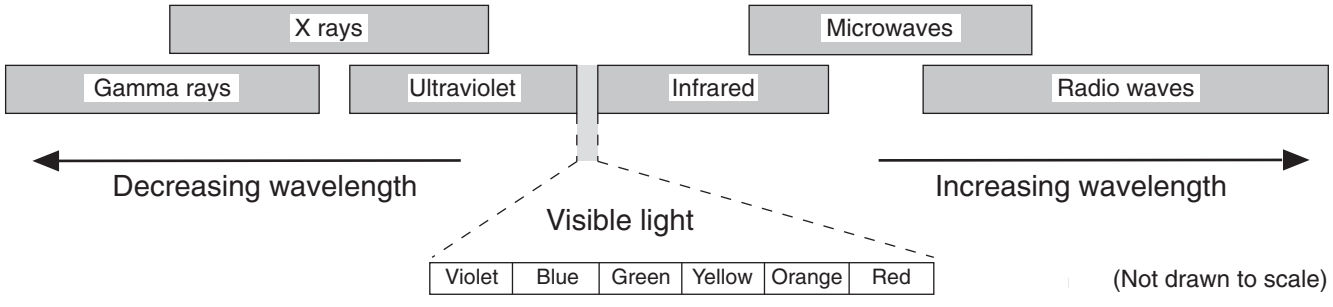
Planetary Wind and Moisture Belts in the Troposphere

The drawing on the right shows the locations of the belts near the time of an equinox. The locations shift somewhat with the changing latitude of the Sun's vertical ray. In the Northern Hemisphere, the belts shift northward in the summer and southward in the winter.

(Not drawn to scale)



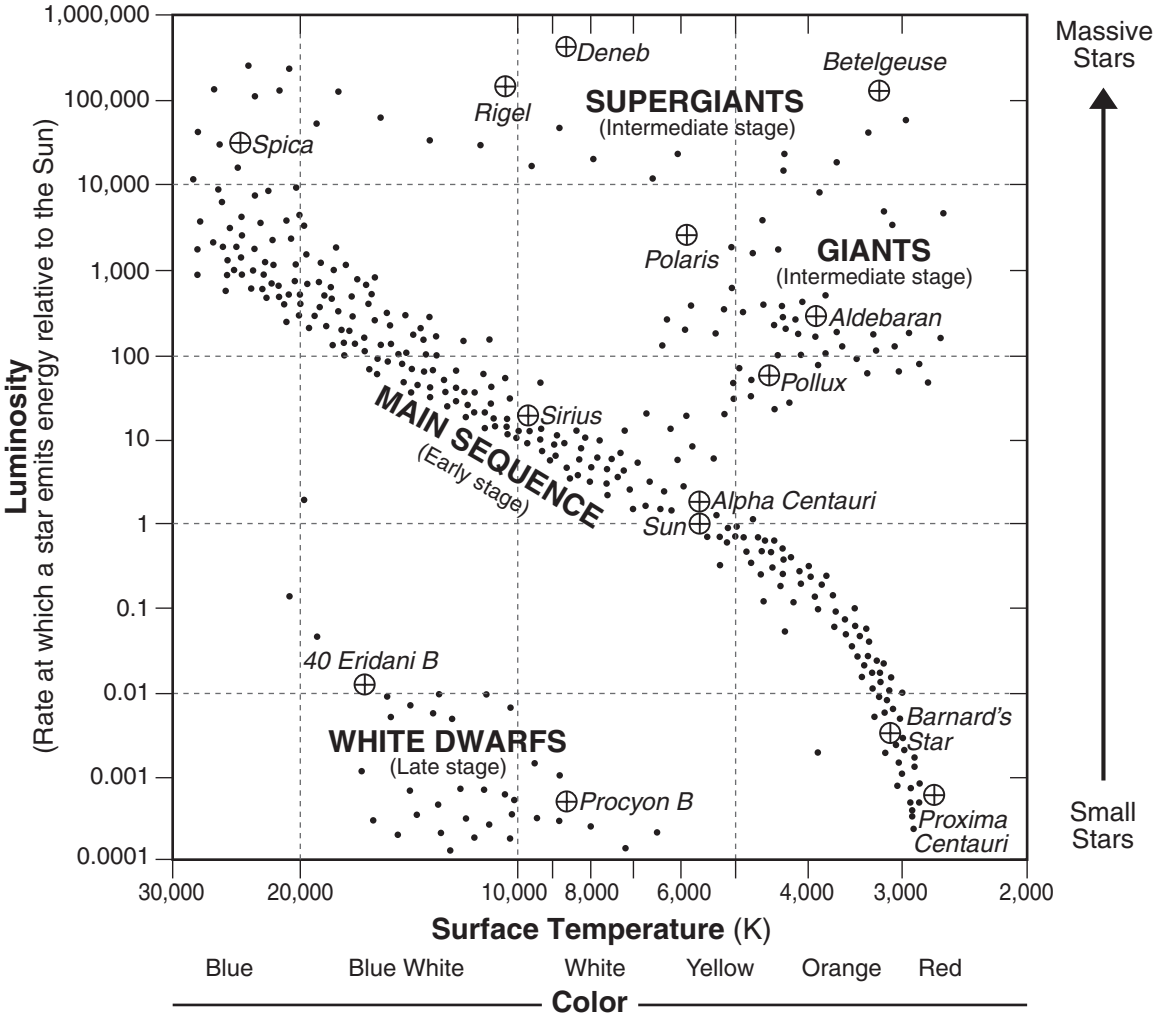
Electromagnetic Spectrum



(Not drawn to scale)

Characteristics of Stars

(Name in italics refers to star represented by a ⊕.)
(Stages indicate the general sequence of star development.)



Solar System Data

Celestial Object	Mean Distance from Sun (million km)	Period of Revolution (d=days) (y=years)	Period of Rotation at Equator	Eccentricity of Orbit	Equatorial Diameter (km)	Mass (Earth = 1)	Density (g/cm^3)
SUN	—	—	27 d	—	1,392,000	333,000.00	1.4
MERCURY	57.9	88 d	59 d	0.206	4,879	0.06	5.4
VENUS	108.2	224.7 d	243 d	0.007	12,104	0.82	5.2
EARTH	149.6	365.26 d	23 h 56 min 4 s	0.017	12,756	1.00	5.5
MARS	227.9	687 d	24 h 37 min 23 s	0.093	6,794	0.11	3.9
JUPITER	778.4	11.9 y	9 h 50 min 30 s	0.048	142,984	317.83	1.3
SATURN	1,426.7	29.5 y	10 h 14 min	0.054	120,536	95.16	0.7
URANUS	2,871.0	84.0 y	17 h 14 min	0.047	51,118	14.54	1.3
NEPTUNE	4,498.3	164.8 y	16 h	0.009	49,528	17.15	1.8
EARTH'S MOON	149.6 (0.386 from Earth)	27.3 d	27.3 d	0.055	3,476	0.01	3.3

Properties of Common Minerals

LUSTER	HARDNESS	CLEAVAGE	FRACTURE	COMMON COLORS	DISTINGUISHING CHARACTERISTICS	USE(S)	COMPOSITION*	MINERAL NAME
Metallic luster	1–2	✔		silver to gray	black streak, greasy feel	pencil lead, lubricants	C	**Graphite**
	2.5	✔		metallic silver	gray-black streak, cubic cleavage, density = 7.6 g/cm^3	ore of lead, batteries	PbS	**Galena**
	5.5–6.5		✔	black to silver	black streak, magnetic	ore of iron, steel	Fe_3O_4	**Magnetite**
	6.5		✔	brassy yellow	green-black streak, (fool's gold)	ore of sulfur	FeS_2	**Pyrite**
Either	5.5 – 6.5 or 1		✔	metallic silver or earthy red	red-brown streak	ore of iron, jewelry	Fe_2O_3	**Hematite**
Nonmetallic luster	1	✔		white to green	greasy feel	ceramics, paper	$Mg_3Si_4O_{10}(OH)_2$	**Talc**
	2		✔	yellow to amber	white-yellow streak	sulfuric acid	S	**Sulfur**
	2	✔		white to pink or gray	easily scratched by fingernail	plaster of paris, drywall	$CaSO_4 \cdot 2H_2O$	**Selenite gypsum**
	2–2.5	✔		colorless to yellow	flexible in thin sheets	paint, roofing	$KAl_3Si_3O_{10}(OH)_2$	**Muscovite mica**
	2.5	✔		colorless to white	cubic cleavage, salty taste	food additive, melts ice	NaCl	**Halite**
	2.5–3	✔		black to dark brown	flexible in thin sheets	construction materials	$K(Mg,Fe)_3AlSi_3O_{10}(OH)_2$	**Biotite mica**
	3	✔		colorless or variable	bubbles with acid, rhombohedral cleavage	cement, lime	$CaCO_3$	**Calcite**
	3.5	✔		colorless or variable	bubbles with acid when powdered	building stones	$CaMg(CO_3)_2$	**Dolomite**
	4	✔		colorless or variable	cleaves in 4 directions	hydrofluoric acid	CaF_2	**Fluorite**
	5–6	✔		black to dark green	cleaves in 2 directions at 90°	mineral collections, jewelry	$(Ca,Na)\ (Mg,Fe,Al)\ (Si,Al)_2O_6$	**Pyroxene** (commonly augite)
	5.5	✔		black to dark green	cleaves at 56° and 124°	mineral collections, jewelry	$CaNa(Mg,Fe)_4\ (Al,Fe,Ti)_3Si_6O_{22}(O,OH)_2$	**Amphibole** (commonly hornblende)
	6	✔		white to pink	cleaves in 2 directions at 90°	ceramics, glass	$KAlSi_3O_8$	**Potassium feldspar** (commonly orthoclase)
	6	✔		white to gray	cleaves in 2 directions, striations visible	ceramics, glass	$(Na,Ca)AlSi_3O_8$	**Plagioclase feldspar**
	6.5		✔	green to gray or brown	commonly light green and granular	furnace bricks, jewelry	$(Fe,Mg)_2SiO_4$	**Olivine**
	7		✔	colorless or variable	glassy luster, may form hexagonal crystals	glass, jewelry, electronics	SiO_2	**Quartz**
	6.5–7.5		✔	dark red to green	often seen as red glassy grains in NYS metamorphic rocks	jewelry (NYS gem), abrasives	$Fe_3Al_2Si_3O_{12}$	**Garnet**

*Chemical symbols:

Al = aluminum	Cl = chlorine	H = hydrogen	Na = sodium	S = sulfur
C = carbon	F = fluorine	K = potassium	O = oxygen	Si = silicon
Ca = calcium	Fe = iron	Mg = magnesium	Pb = lead	Ti = titanium

✔ = dominant form of breakage

Earth Science
Review Booklet (2012)
Answers

[1] 1	[26] 1
[2] 2	[27] 2
[3] 1	[28] 3
[4] 4	[29] 4
[5] 2	[30] 4
[6] 2	[31] 1
[7] 4	[32] 4
[8] 1	[33] 4
[9] 4	[34] 2
[10] 1	[35] 2
[11] 4	[36] 3
[12] 2	[37] 4
[13] 4	[38] 3
[14] 3	[39] 3
[15] 3	[40] 2
[16] 2	[41] 2
[17] 3	[42] 1
[18] 2	[43] 1
[19] 3	[44] 1
[20] 1	[45] 3
[21] 3	[46] 3
[22] 3	[47] 1
[23] 2	[48] 1
[24] 3	[49] 4
[25] 4	[50] 2