

Density Variations Drive Earth's Processes

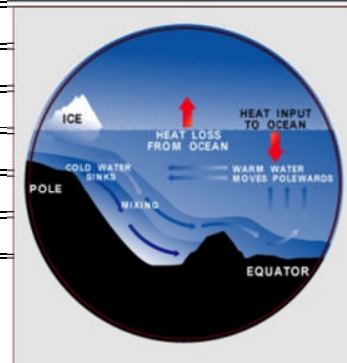
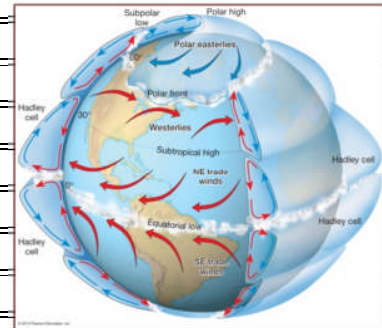
The density of water is 1000kg/m³ at 4C. Other substances are of different densities, some heavier and some lighter than water. To keep things easier, densities are often expressed as "specific gravity", which just means they are expressed as a ratio of the gravity of water. So water, at 1000kg/m³, counts as 1 in specific gravity. The densities in the following chart are given in both styles (ρ is the symbol for density).

Heat (from Earth's interior and from the Sun) drives Earth processes a couple ways: 1) by warming a substance it becomes more mobile (*ductile, plastic, liquid or gaseous*), and 2) unequal heating creates convection currents thus setting in motion a substance. When substances heat unequally their heated region's density changes (*becoming less dense*) thereby driving these portions to rise, in some cases very quickly and other times very very slowly. This drives the geologic processes in Earth's interior, contributes to the currents in the ocean, and drives the movement (*winds & air masses*) in Earth's atmosphere.

NOTE: These can vary!
Please let me know if errors are found!

Material	ρ in kg/m ³ Density	Specific Gravity	Notes
Interstellar medium	10 ⁻²⁵ – 10 ⁻¹⁵	10 ⁻²⁸ – 10 ⁻¹⁸	Assuming 90% H, 10% He; variable T
Helium gas	0.0179	0.0000179	
Air at 30C (sea level)	1.16	0.00116	Warmer air rises!
Air at 20C (sea level)	1.20	0.0012	
Air at 10C (sea level)	1.25	0.00125	Cooler air sinks!
Styrofoam	30 – 120	0.03 – 0.120	
Cork	220 – 260	0.22 – 0.26	
Alcohol (Ethanol)	789	0.789	
Oil	800	0.8	
Potassium	860	0.86	
Sodium	970	0.97	
Ice	916.7	0.9167	
Water (fresh) at 20C	998.2	0.9982	
Water (fresh) at 0C	999.8	0.9998	
Water (fresh) at 4C	1,000	1.0	Side note: Generally, above ↑ items will float in water while below ↓ items will sink.
Water (salt) at 20C	1,026	1.026	Notice that salt water is denser than freshwater.
Water (salt) at 0C	1,027	1.027	Notice, in the case of water, the very coldest is not the densest!
Water (salt) at 4C	1,028	1.028	Cooler water sinks (generally).
Coal (bituminous)	1,280		
Plastics	850 – 1,400	0.850 – 1.4	
Cinders	1,450	1.45	
Coal	1,500	1.5	
Magnesium	1,740	1.74	
Coal (anthracite)	1,600	1.6	

Increasing density
↓



Increasing density
↓

Clay	2,200	2.2	
Silicon	2,330	2.33	
Concrete	2,400	2.4	
Glass	2,600	2.6	
Quartz	2,650	2.65	
Aluminum	2,700	2.7	
Continental crust (granitic)	2,700 – 3,000	2.7 – 3	
Oceanic crust (basaltic)	3,000 – 3,300 Varies by content & temperature	3 – 3.3	Being denser than continental crust, this will always sink when they collide
Diamond	3,500	3.5	
Earth's mantle	3,300 – 5,700 Varies with depth	3.3 – 5.7	Any mantle material that becomes heated will become less dense than the surrounding mantle...and rise!
Titanium	4,540	4.54	
Magnetite	5,000	5	
The Earth (mean density)	5,515.3	5.515	
Zinc	7,000	7	
Chromium	7,200	7.2	
Manganese	7,210 – 7,440	7.21 – 7.44	
Tin	7,310	7.31	
Steel (varies with blend)	7,850	7.85	
Iron	7,870	7.87	
Nickel	8,900	8.9	
Copper	8,920 – 8,960	8.92 – 8.96	
Earth's outer core	9,900 - 12,200	9.9 – 12.2	
Silver	10,500	10.5	
Lead	11,340	11.34	
Earth's inner core	12,600 – 13,000	12.6 – 13	
Mercury	13,546	13.546	
Uranium	18,800	18.8	
Gold	19,320	19.32	
Plutonium	19,840	19.84	
Platinum	21,450	12.45	
The core of the Sun	~150,000	~150	
White dwarf star	1×10^9	1×10^6	
Atomic nuclei	2.3×10^{17}	2.3×10^{14}	
Neutron star	$8.4 \times 10^{16} - 1 \times 10^{18}$	$8.4 \times 10^{13} - 1 \times 10^{15}$	
Black hole	4×10^{17}	4×10^{14}	Mean density inside the Schwarzschild radius of an Earth-mass black hole (theoretical)

