

APPENDIX 2. USEFUL VALUES

Molecular mass of dry air, $m_a = 28.966$

Molecular mass of water, $m_w = 18.016$

Universal gas constant, $R = 8.31436 \text{ J mol}^{-1} \text{ K}^{-1}$

Gas constant for dry air, $R_a = R/m_a = 287.04 \text{ J kg}^{-1} \text{ K}^{-1}$

Gas constant for water vapor, $R_v = R/m_w = 461.50 \text{ J kg}^{-1} \text{ K}^{-1}$

Molecular weight ratio $\varepsilon \equiv m_w/m_a = R_a/R_v = 0.62197$

Stefan's constant $\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$

Acceleration due to gravity, $g (\text{m s}^{-2})$ as a function of latitude φ and height $z (\text{m})$

$$g = (9.78032 + 0.005172 \sin^2 \varphi - 0.00006 \sin^2 2\varphi)(1 + z/a)^{-2}$$

Mean surface value, $\bar{g} = \int_0^{\pi/2} g \cos \varphi d\varphi = 9.7976$

Radius of sphere having the same volume as the Earth, $a = 6371 \text{ km}$ (equatorial radius = 6378 km, polar radius = 6357 km)

Rotation rate of earth, $\Omega = 7.292 \times 10^{-5} \text{ s}^{-1}$

Mass of earth = $5.977 \times 10^{24} \text{ kg}$

Mass of atmosphere = $5.3 \times 10^{18} \text{ kg}$

Mass of ocean = $1400 \times 10^{18} \text{ kg}$

Mass of ground water = $15.3 \times 10^{18} \text{ kg}$

Mass of ice caps and glaciers = $43.4 \times 10^{18} \text{ kg}$

Mass of water in lakes and rivers = $0.1267 \times 10^{18} \text{ kg}$

Mass of water vapor in atmosphere = $0.0155 \times 10^{18} \text{ kg}$

Area of earth = $5.10 \times 10^{14} \text{ m}^2$

Area of ocean = $3.61 \times 10^{14} \text{ m}^2$

Area of land = $1.49 \times 10^{14} \text{ m}^2$

Area of ice sheets and glaciers = $1.62 \times 10^{13} \text{ m}^2$

Area of sea ice = $1.9 \times 10^{13} \text{ m}^2$ in March and $2.9 \times 10^{13} \text{ m}^2$ in September (averaged between 1979 and 1987)