Fun stuff for beginning

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Assume you know

- mean value of atmospheric pressure
  $\bar{p} = 1013.25\,\mathrm{hPa}$
- mean radius of the earth
  $R = 6.371 \cdot 10^6\,\mathrm{m}$
- mean gravity (we need to make wrong but justified assumption that this value is not changing with height)
  $\bar{g} = 9.81\,\mathrm{m\,s^{-2}}$

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$$m_{atm} = \frac{\bar{p} \cdot 4\pi R^2}{g}$$

Another approach

Assume you know

- barometric height scale (we could treat whole atmosphere as homogenous layer of that height)
  $H = 8 \cdot 10^3\,\mathrm{m}$
- mean radius of the earth
  $R = 6.371 \cdot 10^6\,\mathrm{m}$
- mean density of atmosphere
  $\rho_{atm} = 1.3\,\mathrm{kg\,m^{-3}}$

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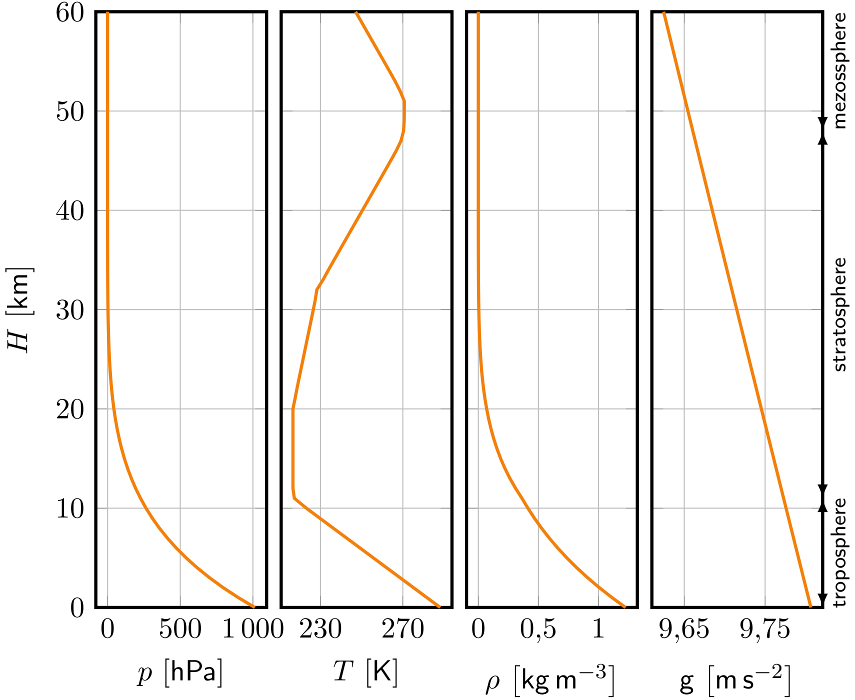
Barometric formula

$$\mathsf{d}p = -\rho g \, \mathsf{d}h$$

$$pV = RT \quad \text{Clapeyron formula}$$

$$p = p_0 e^{-\frac{\rho_0 g}{p_0} h}$$



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50
40
30
20
10
0
H [km]
0
500
1 000
p [hPa]
230
270
T [K]
0
0,5
1
ρ [kg m^{-3}]
9,65
9,75
g [m s^{-2}]
mezossphere
stratosphere
troposphere