

# US Standard Atmosphere 1976

## ▼ Introduction

Standard atmospheric models describe how the properties of air change with altitude. The properties reflect conditions typically expected at that altitude, and do not vary with current climatic conditions. The results are typically used for flight studies, rocketry and ballistics.

This application implements the US Standard Atmosphere model for the lower atmosphere, published by the US Committee on Extension to the Standard Atmosphere (COESA) in 1976.

The model gives the pressure, temperature, density and viscosity of air as a function of geopotential altitude, and is valid from a geopotential altitude of 0 m to 84852 m.

Reference: [US Standard Atmosphere 1976](#)

## ▼ Procedure



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## ▼ Examples and Plots

Here we extract the properties of air at a geopotential altitude of 3000 m

```
> Atmosphere(3000 * Unit(m), all)
```

$$268.6500 \text{ K}, 70108.52215 \text{ Pa}, 0.9091219586 \frac{\text{kg}}{\text{m}^3}, 328.5779005 \frac{\text{m}}{\text{s}}, 0.00001693718731 \text{ Pas} \quad (3.1)$$

Compare with the properties of air at a geometric altitude of 3000 m

```
> Atmosphere(3000 * Unit(m), all, altitudeType = geometric)
```

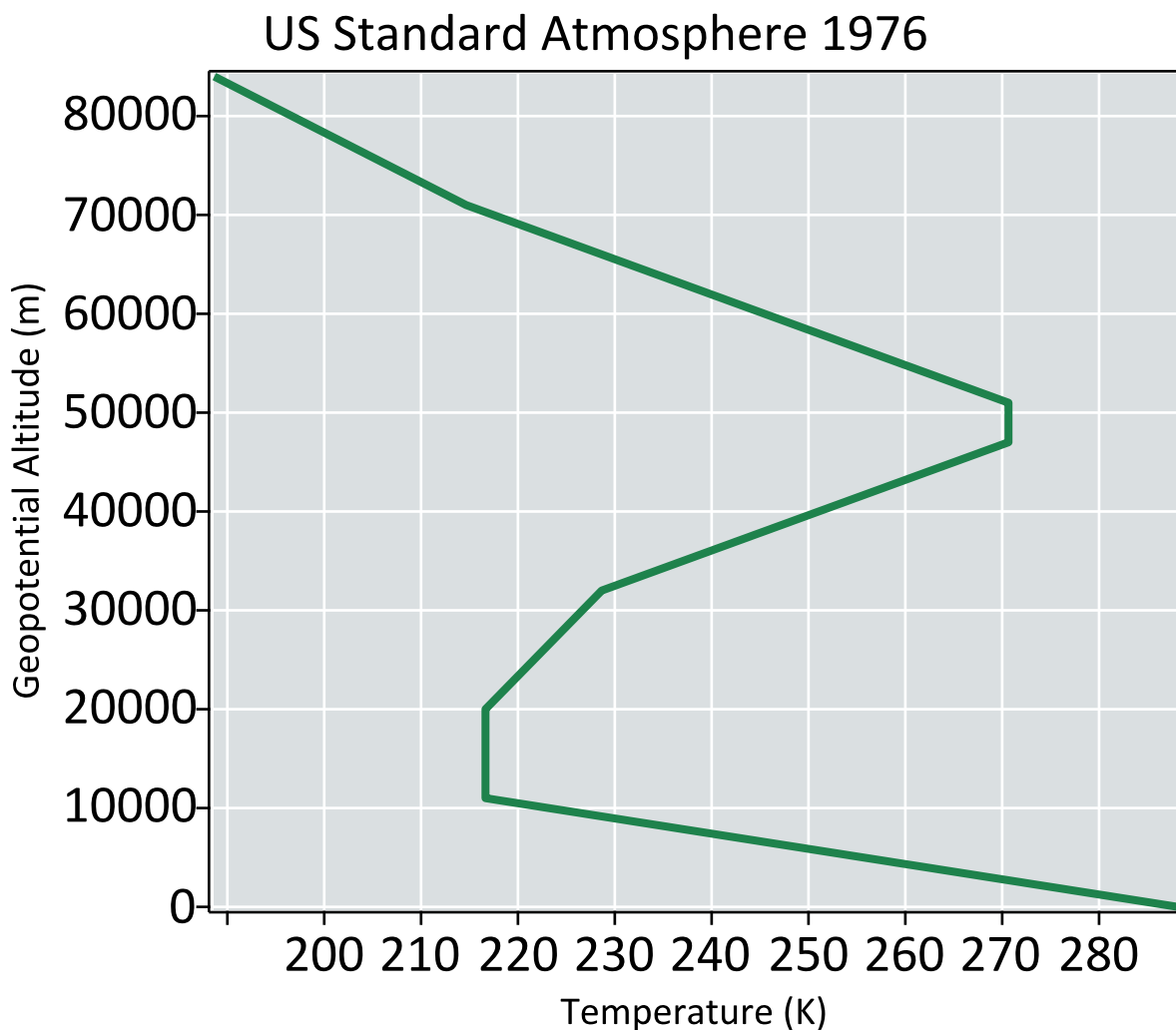
$$268.6591984 \text{ K}, 70121.13970 \text{ Pa}, 0.9092544424 \frac{\text{kg}}{\text{m}^3}, 328.5835256 \frac{\text{m}}{\text{s}}, \quad (3.2)$$

$$0.00001693764616 \text{ Pas}$$

We now plot the temperature, pressure, speed of sound and viscosity of air as a function of

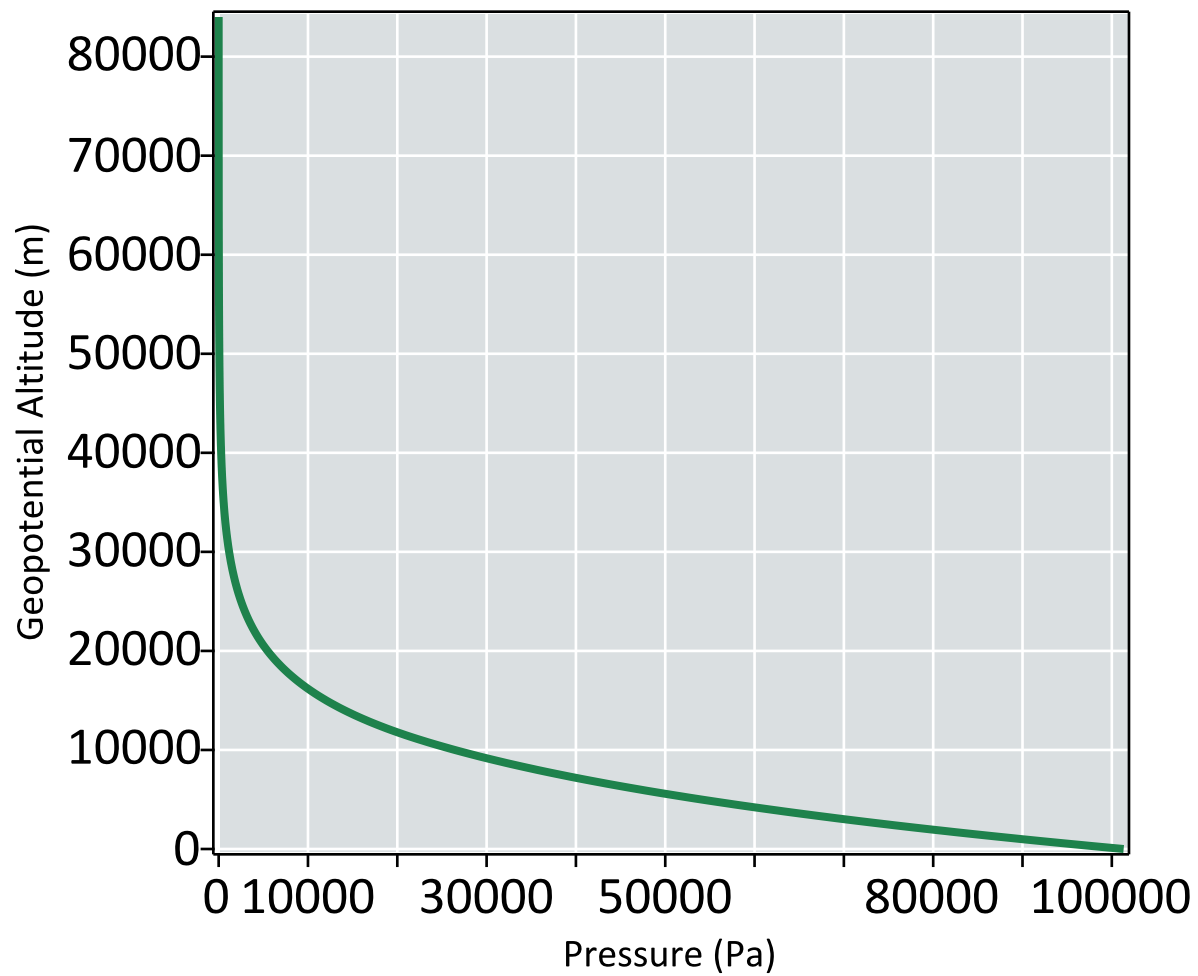
geopotential altitude

```
> plot_style := labeldirections = [horizontal, vertical],  
  thickness = 3, color = ColorTools:-Color("RGB",[30/255, 130/255,  
  76/255]), axes = boxed, size = [500,400], titlefont = [Calibri,  
  16], axesfont = [Calibri], labelfont = [Calibri, 12], title =  
  "US Standard Atmosphere 1976",background = ColorTools:-Color  
  ("RGB", [218/255, 223/255, 225/255]), axis = [gridlines = [10,  
  color = ColorTools:-Color("RGB", [1, 1, 1])]]:  
  
  heights := [seq(i, i = 0..84000, 100)]:  
  
> temps := Atmosphere~(heights, temperature, useunits = false):  
  plot(temps, heights, labels = ["Temperature (K)", "Geopotential  
  Altitude (m)"], plot_style)
```

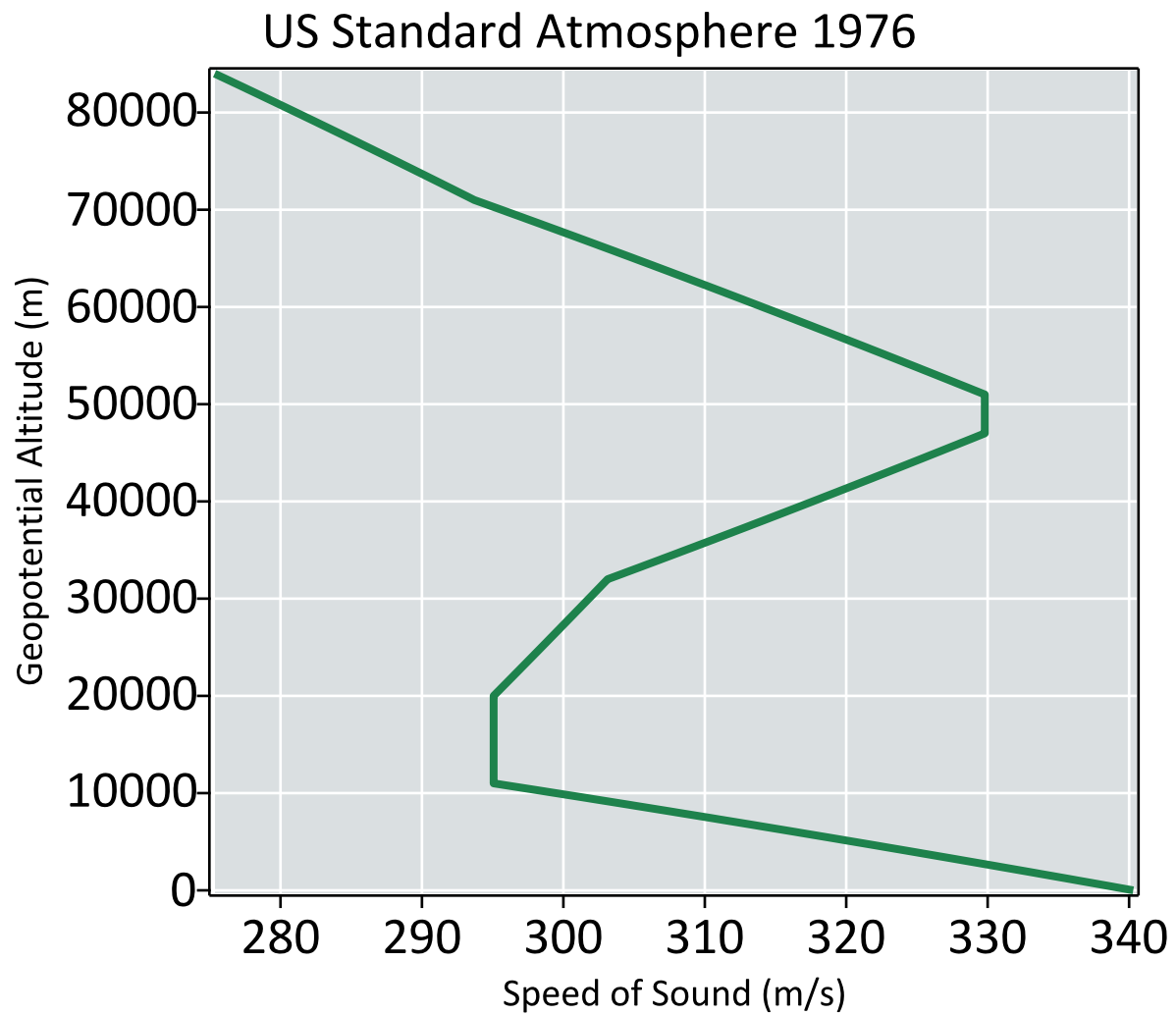


```
> press := Atmosphere~(heights, pressure, useunits = false):  
  plot(press, heights, labels = ["Pressure (Pa)", "Geopotential  
  Altitude (m)"], plot_style)
```

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```
> speeds := Atmosphere~(heights, speedofsound, useunits = false):  
plot(speeds, heights, labels = ["Speed of Sound (m/s)",  
"Geopotential Altitude (m)"], plot_style)
```



```
> viscs := Atmosphere~(heights, viscosity, useunits = false):  
plot(viscs, heights, labels = ["Viscosity (Pa s)", "Geopotential  
Altitude (m)"], plot_style)
```

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