Basic human requirements

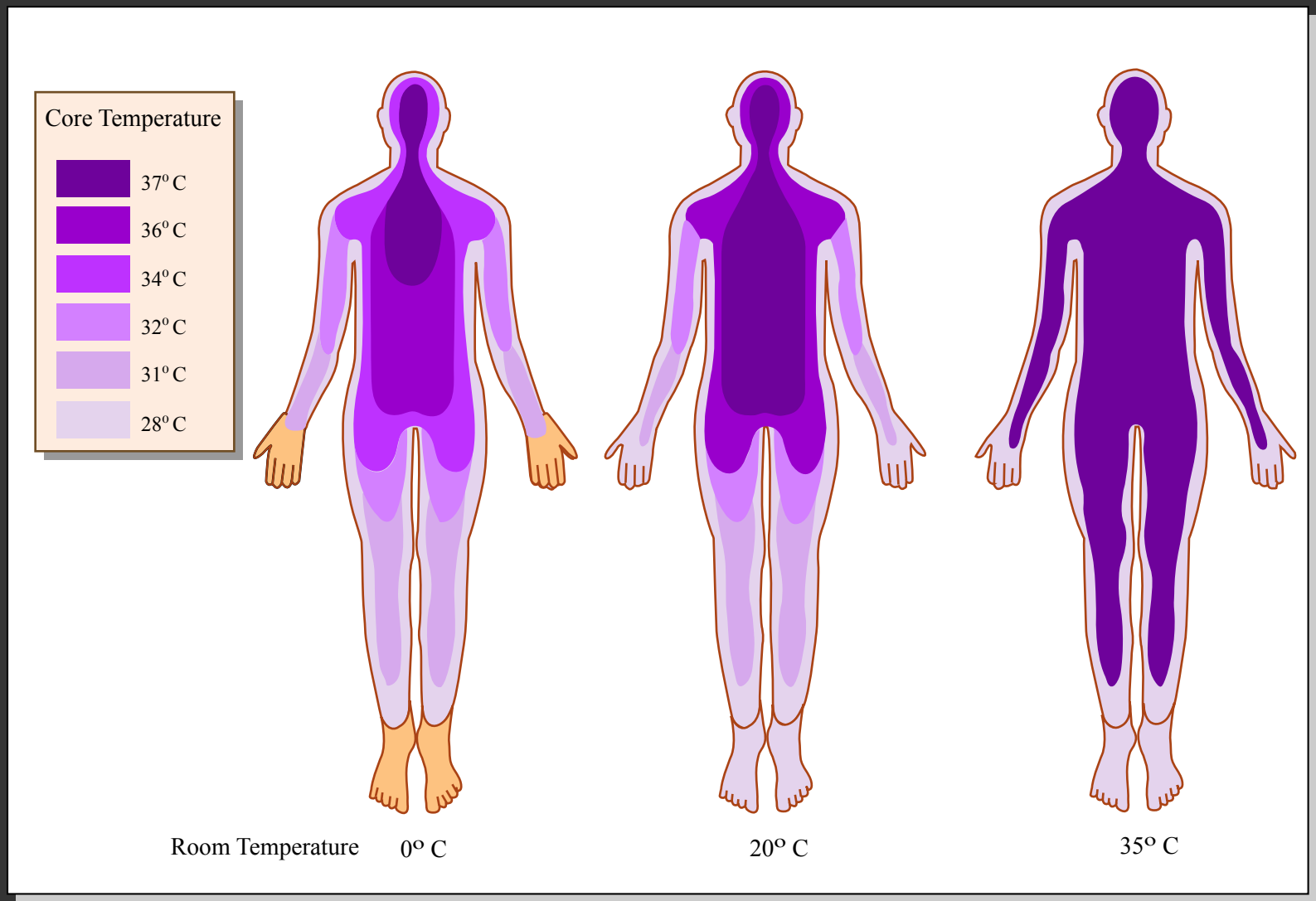
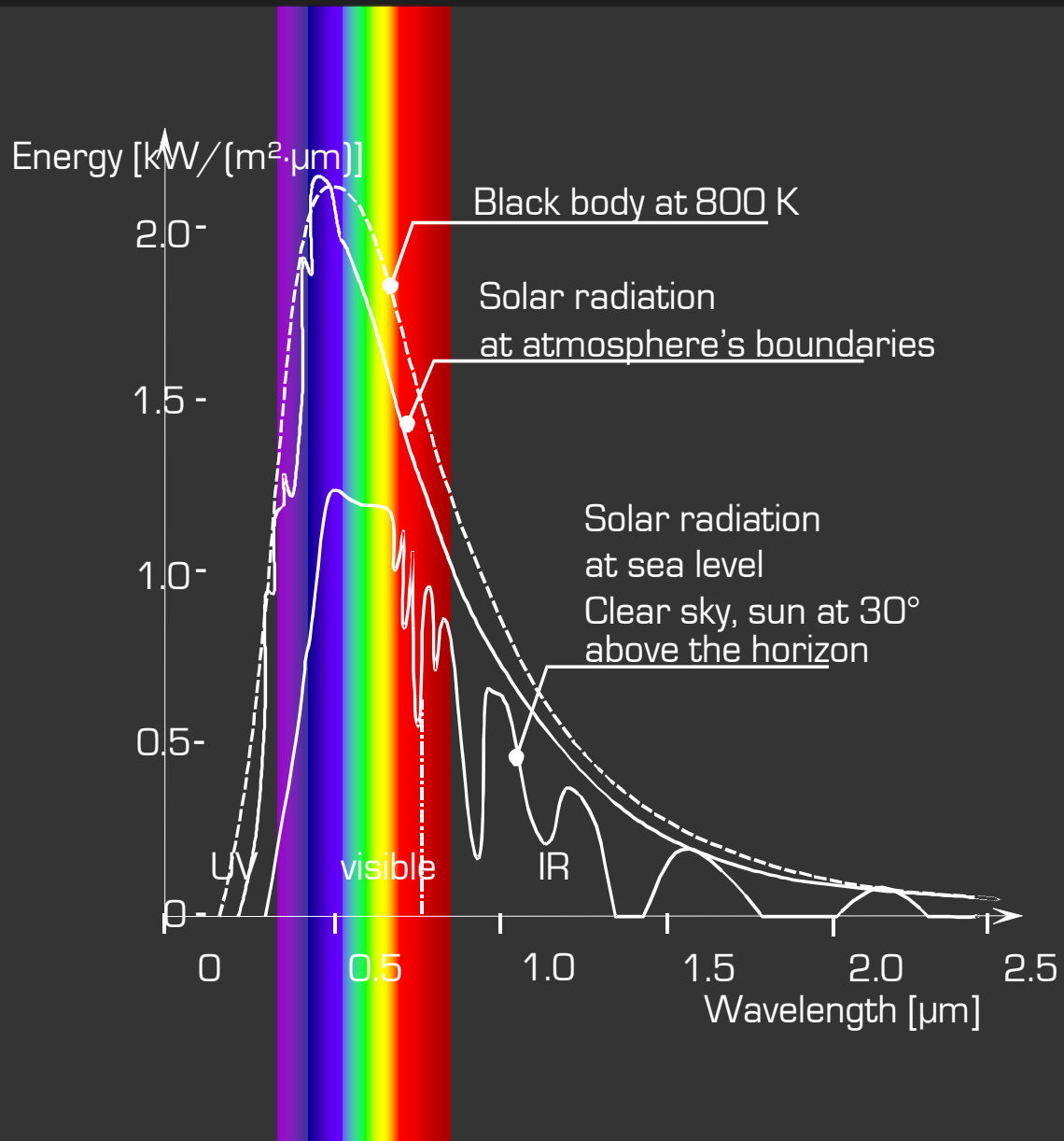


Image by MIT OCW.

Solar radiation



Solar radiation

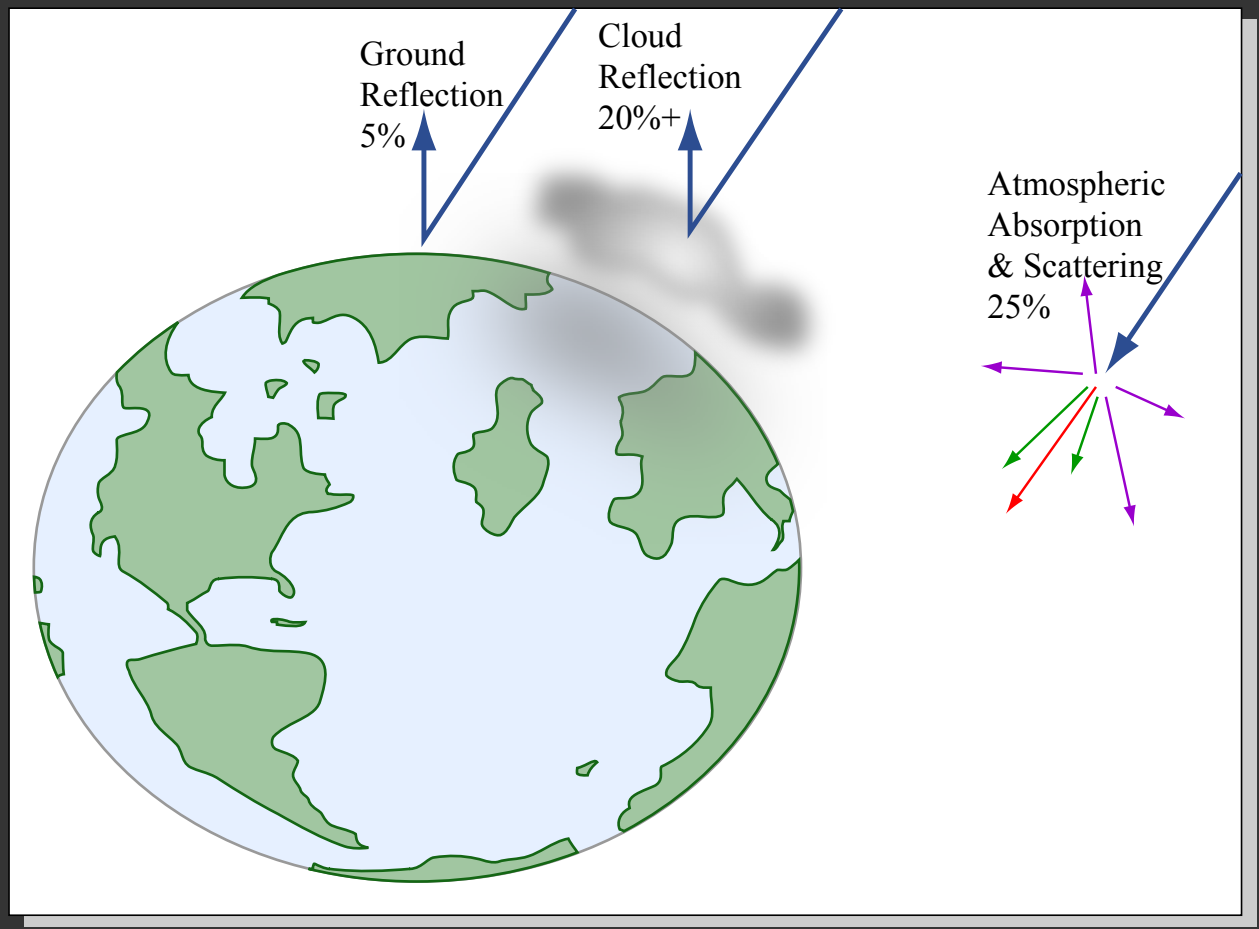


Image by MIT OCW.

Solar radiation

- Earth's orbit
  - seasons

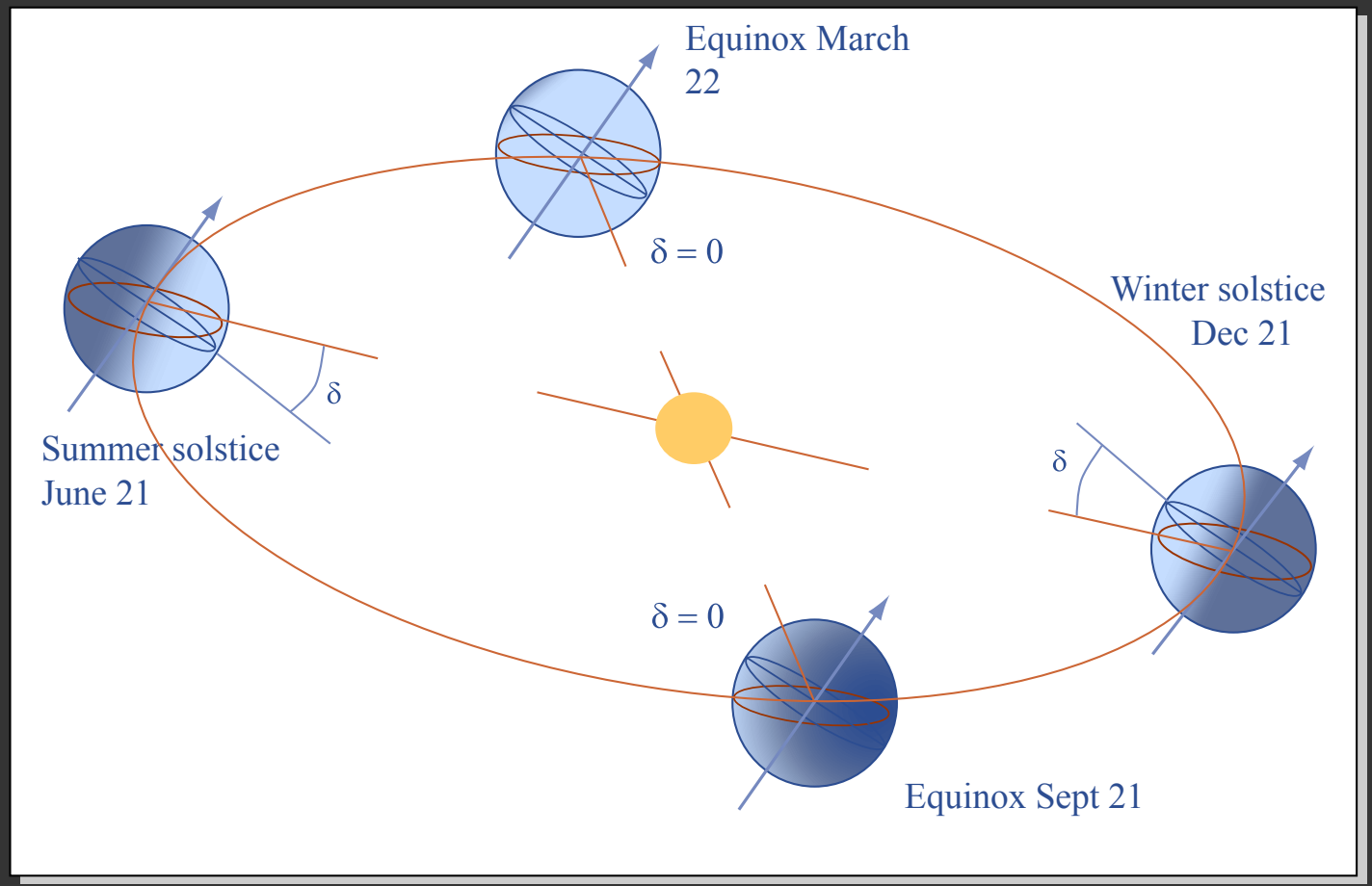
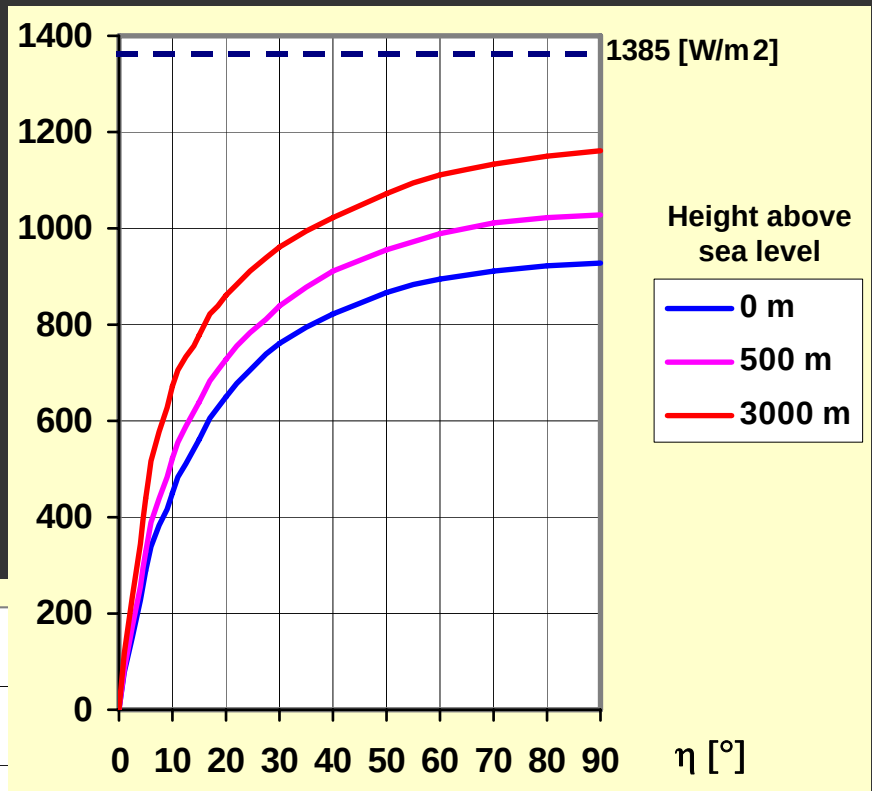


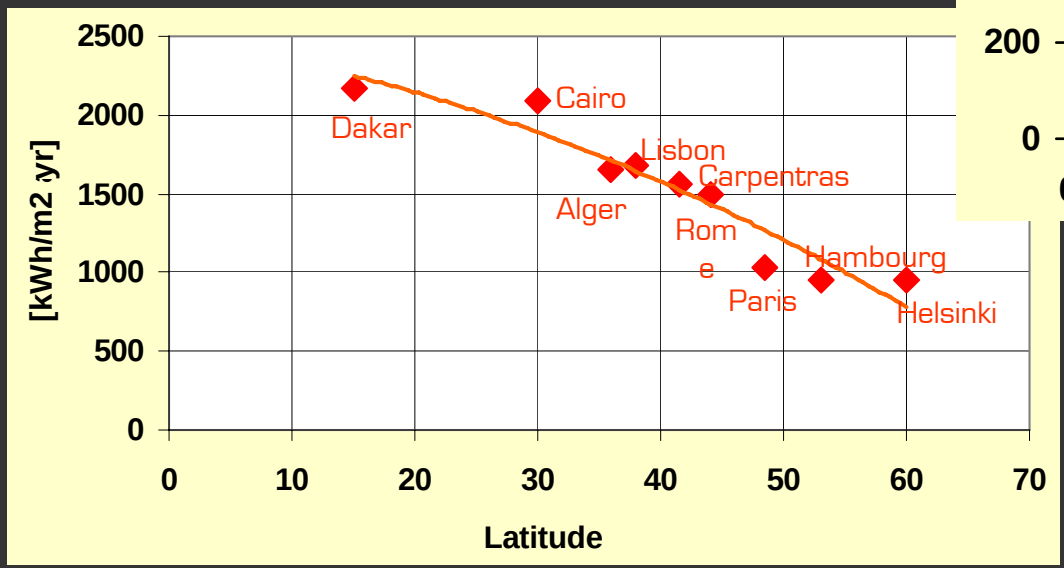
Image by MIT OCW.

Solar course

- Earth's orbit
  - seasons

    latitude and elevation's impact





Parameters in incoming radiation

- Earth's orbit
  - seasons

    latitude and elevation's impact

    earth's inertia

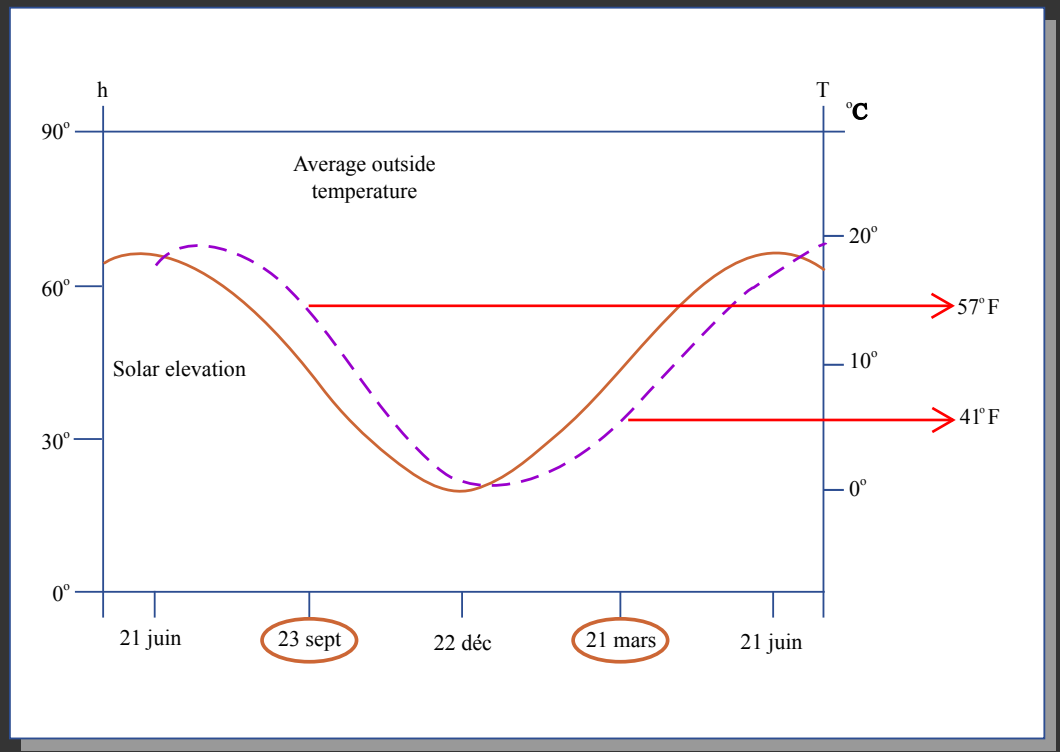


Image by MIT OCW.

a 16°F difference for the same solar elevation

Critical for solar protections

Solar radiation

- Earth's orbit
  - seasons
  - day

Solar radiation

Apparent movement of the sun

- lococentric (local) referential

elevation η ↔ latitude L

azimuth ϕ ↔ declination δ

↔ solar time H^{solar}

$\eta_{noon} = 90° - L + \delta$

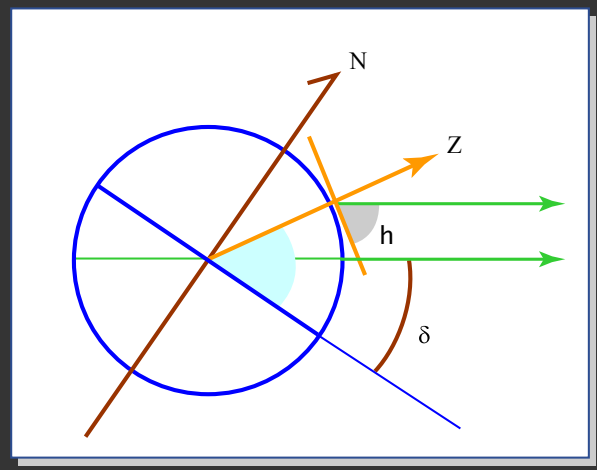


Image by MIT OCW.

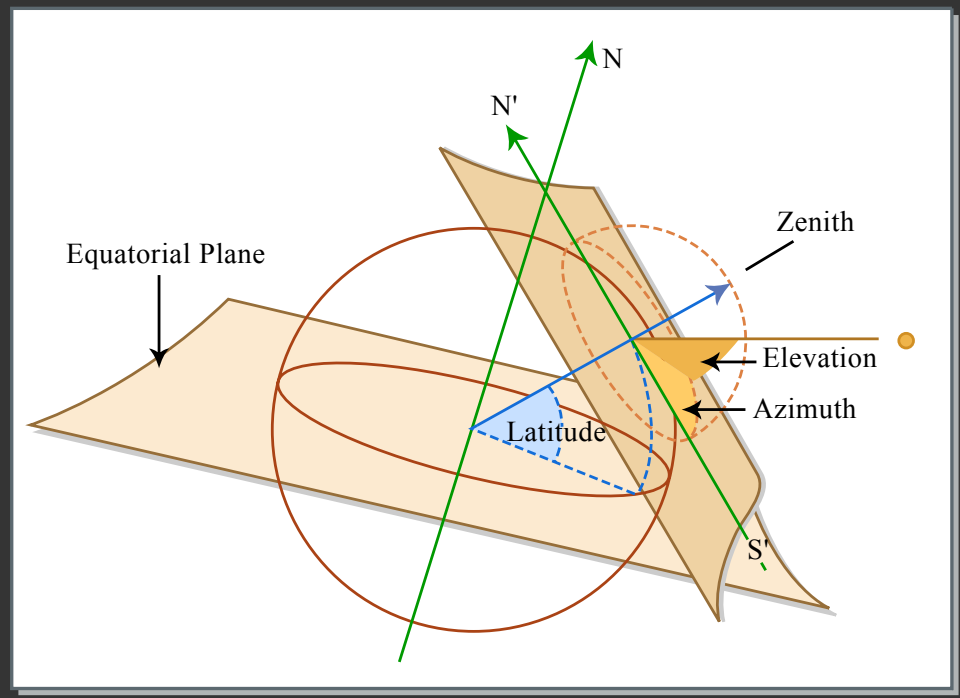


Image by MIT OCW.

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

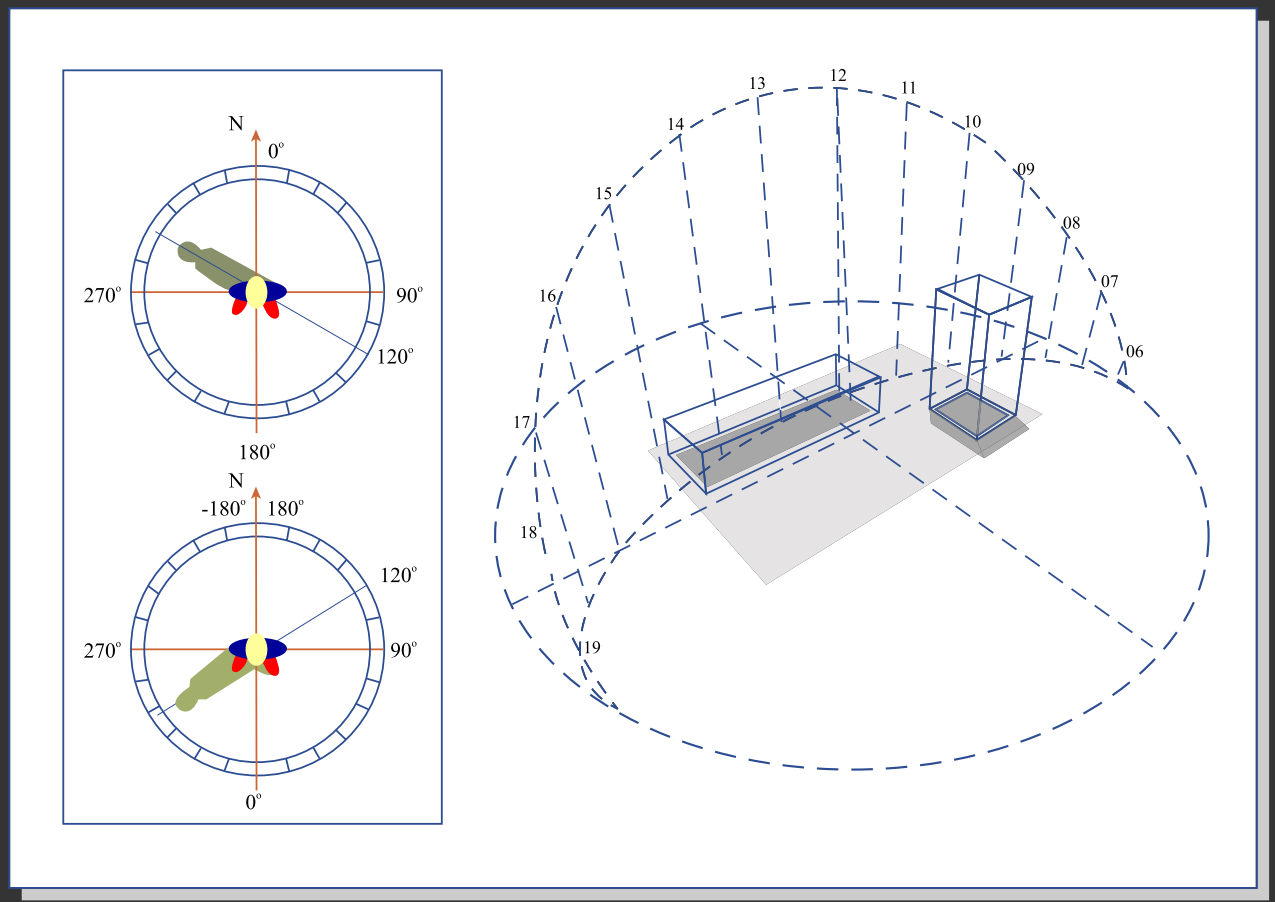


Image by MIT OCW.

Solar radiation

Apparent movement of the sun

- lococentric (local) referential

  cylindrical projection

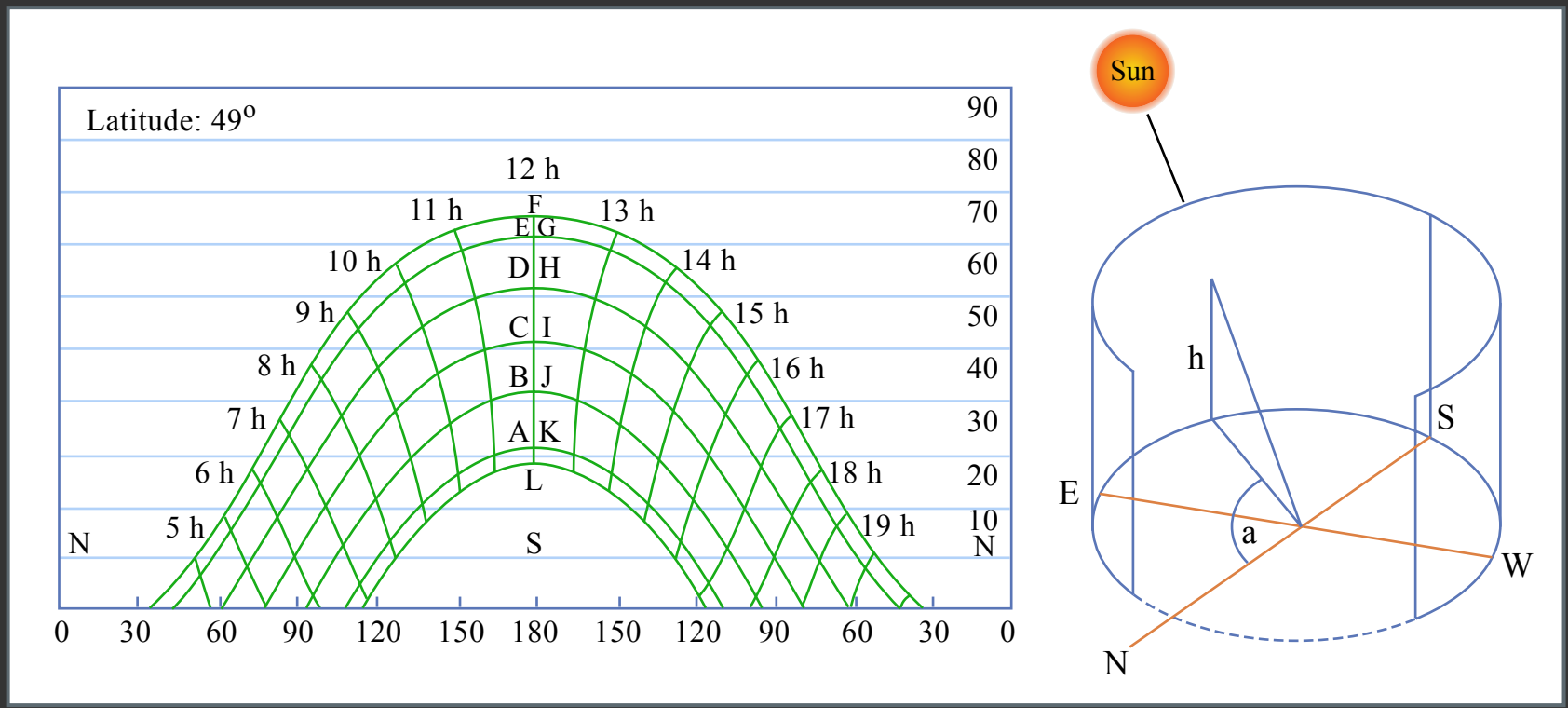


Image by MIT OCW.

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

    cylindrical projection

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

    cylindrical projection

    stereographic projection

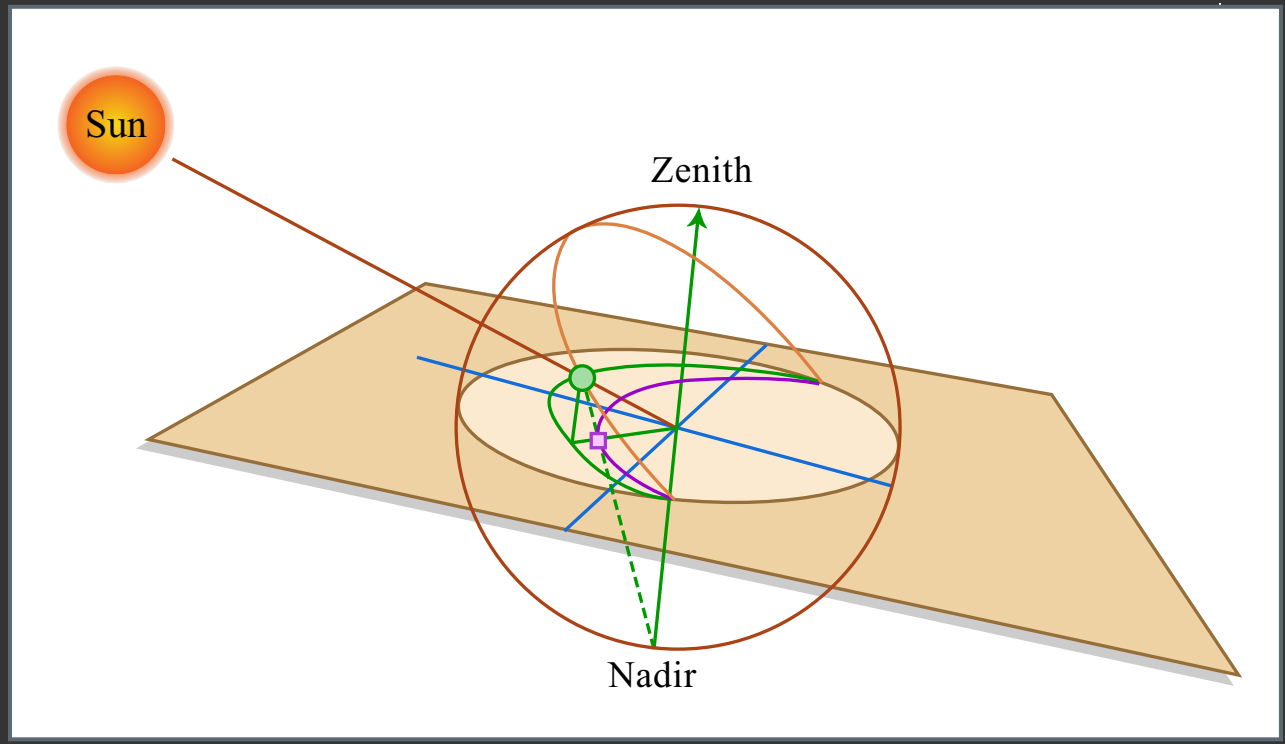


Image by MIT OCW.

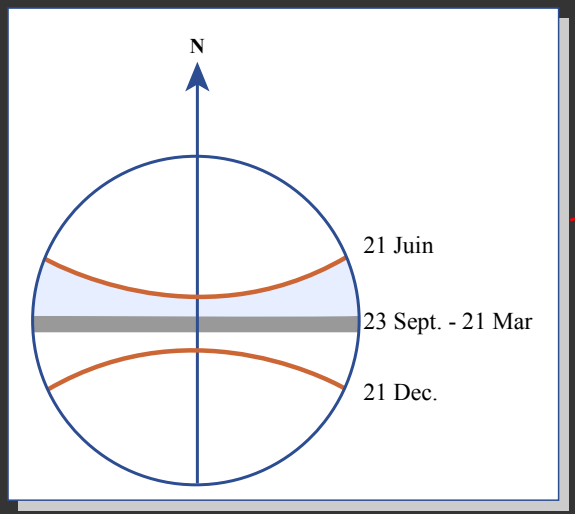
Solar radiation

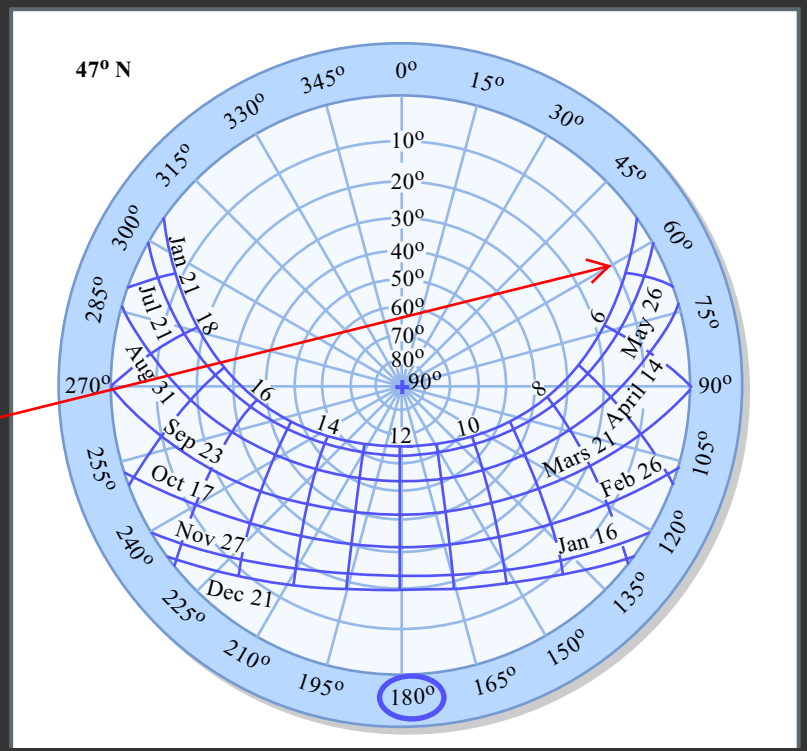
Apparent movement of the sun

- lococentric (local) referential

  cylindrical projection

  stereographic projection





Images by MIT OCW.

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

    cylindrical projection

    stereographic projection

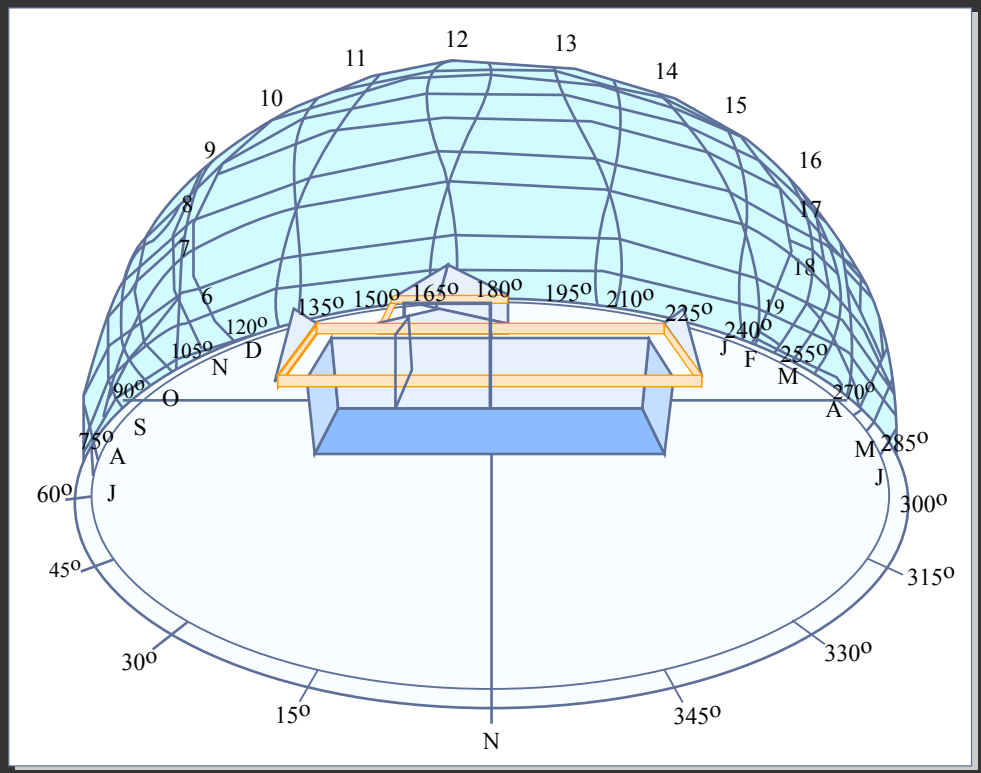


Image by MIT OCW.

Solar radiation

Apparent movement of the sun

- lococentric (local) referential

cylindrical projection

stereographic projection

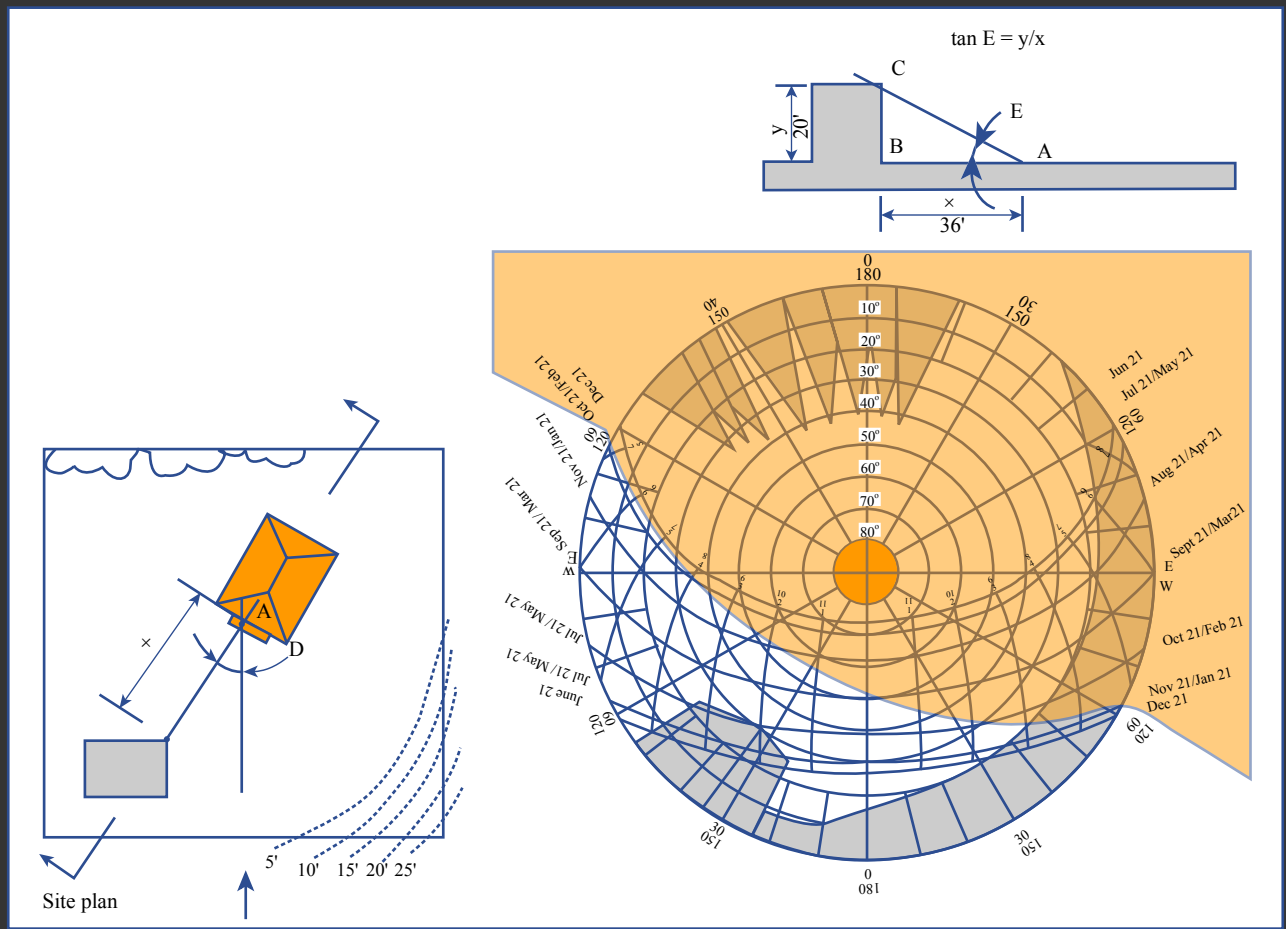


Image by MIT OCW.

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

    cylindrical projection

    stereographic projection

Horizontal sun protections

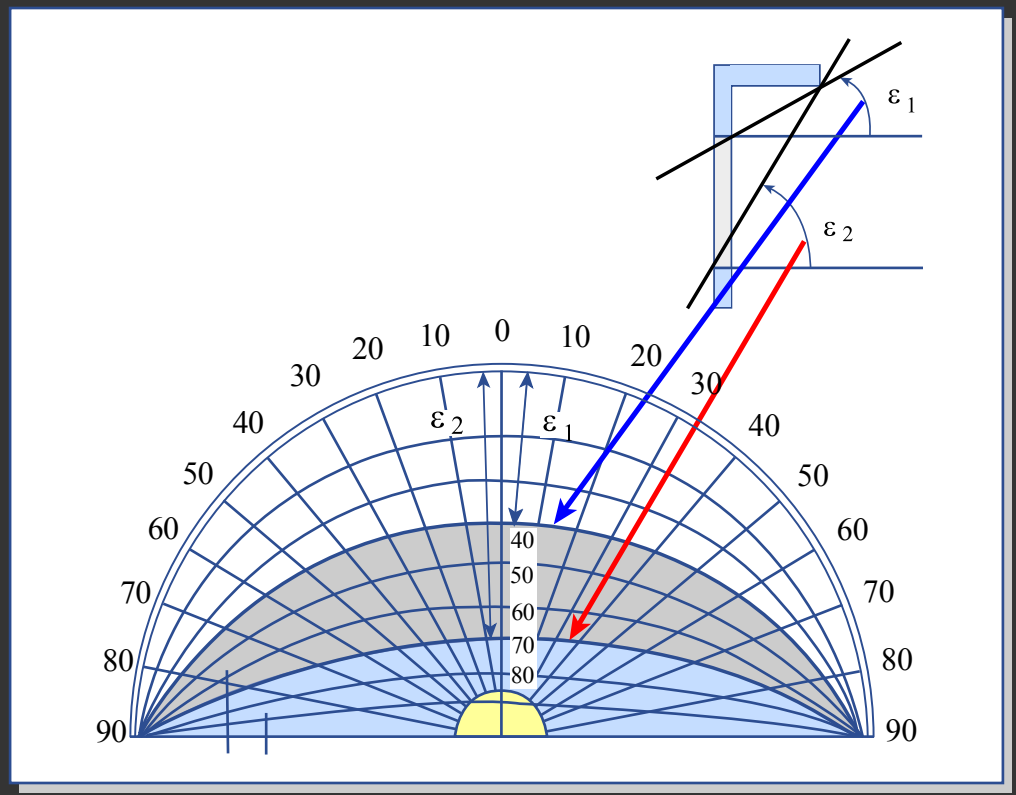


Image by MIT OCW.

Solar radiation

Apparent movement of the sun

- lococentric (local) referential

  cylindrical projection

  stereographic projection

Vertical sun protections

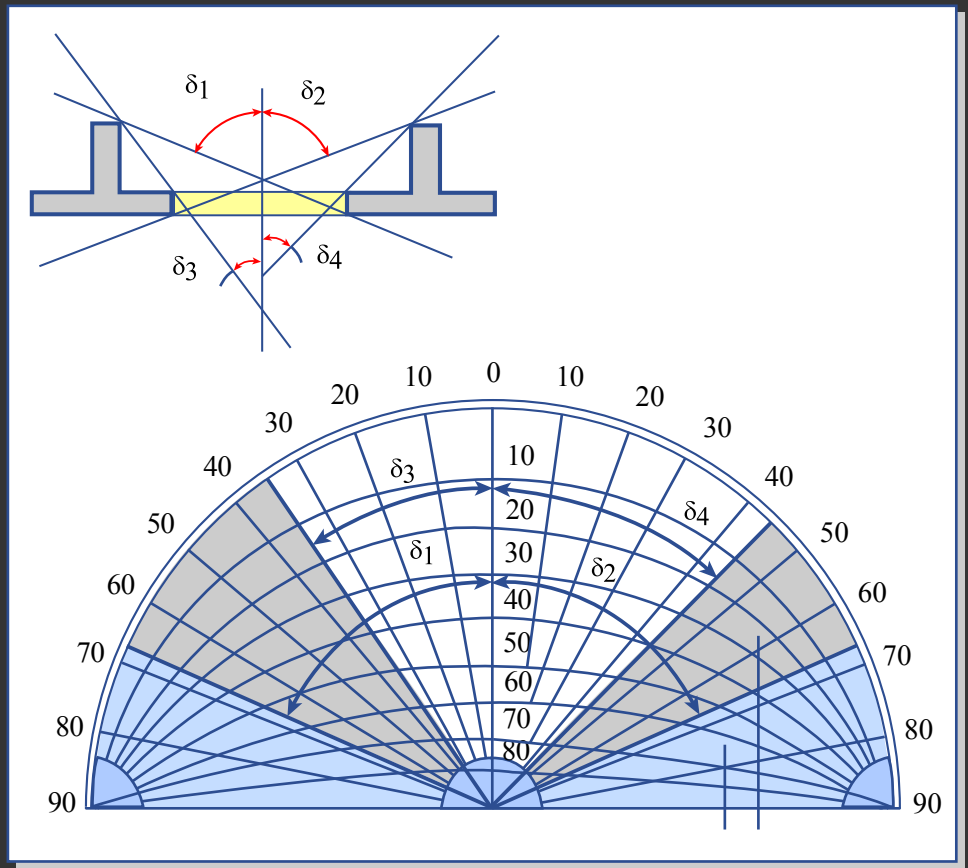


Image by MIT OCW.

Solar radiation

- Apparent movement of the sun
  - lococentric (local) referential

    cylindrical projection

    stereographic projection

    Combined protection

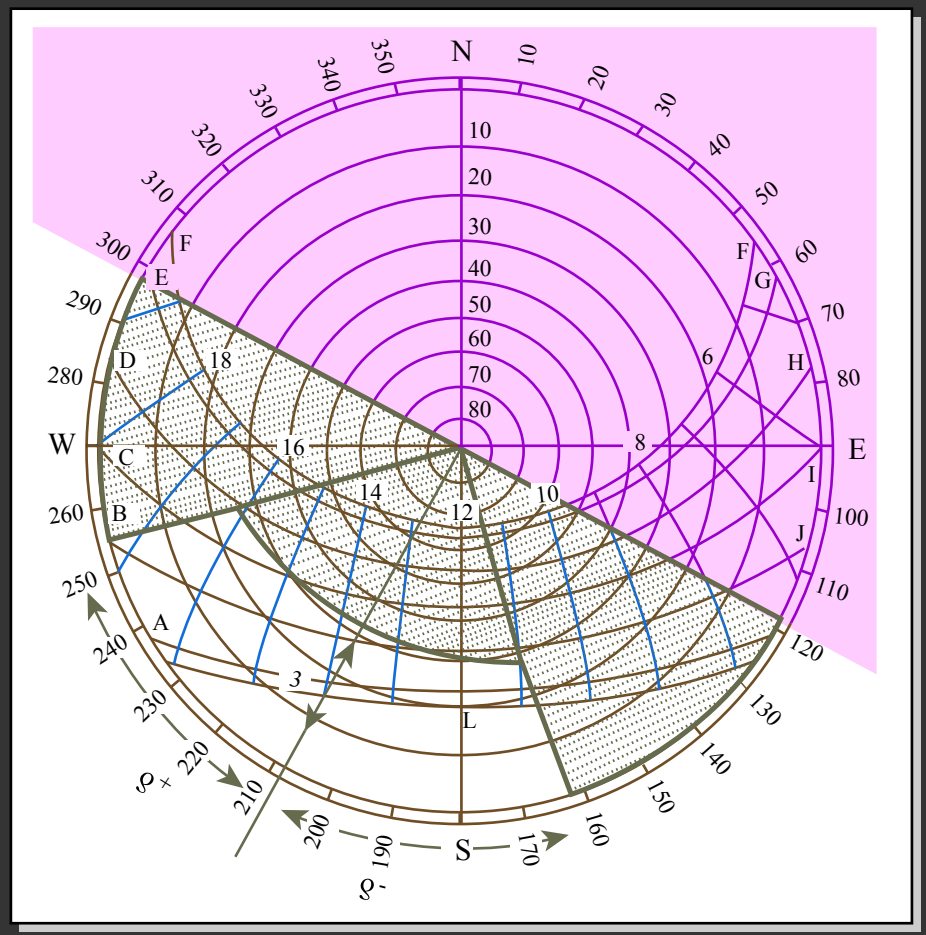


Image by MIT OCW.

Solar radiation

- Daylight

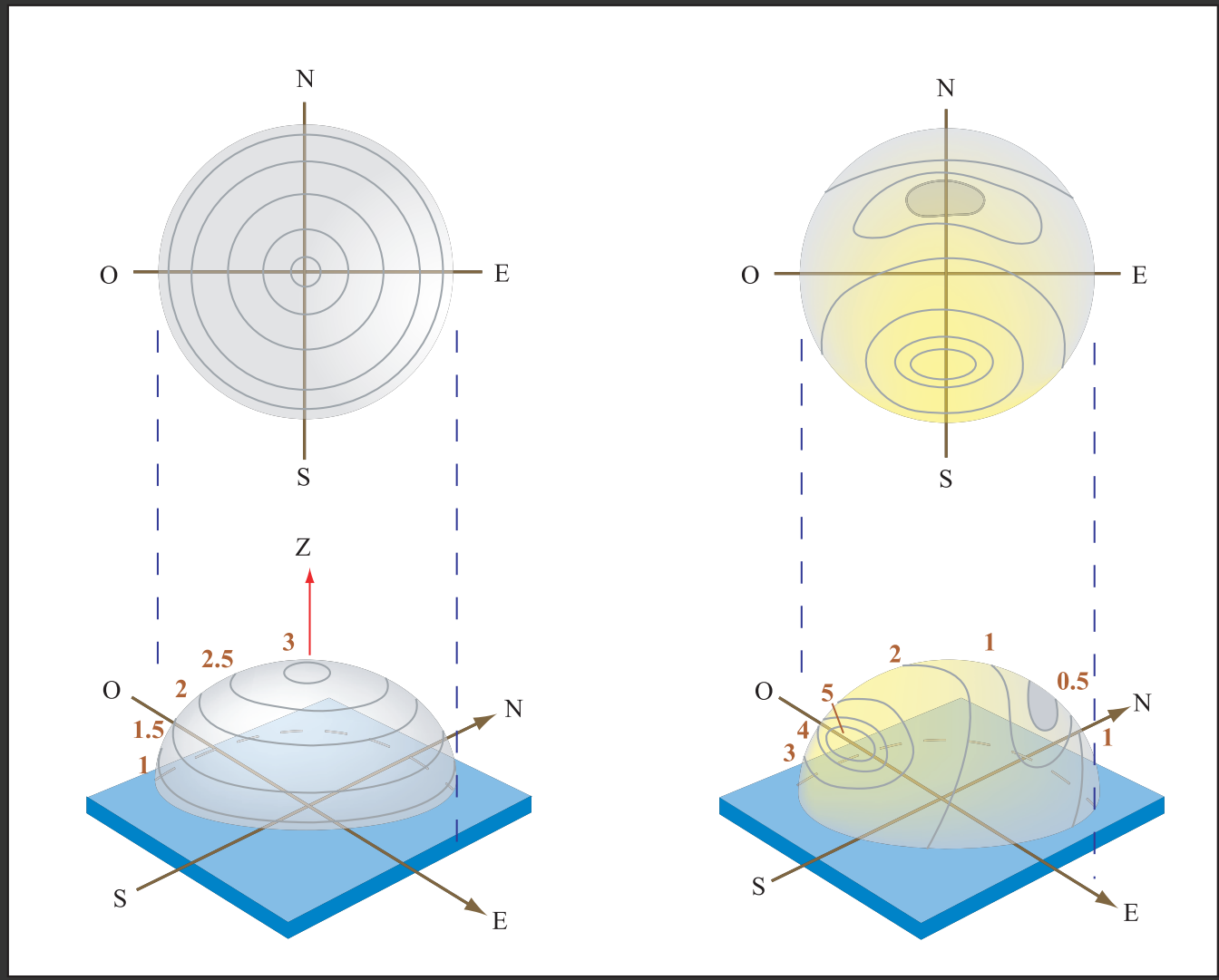
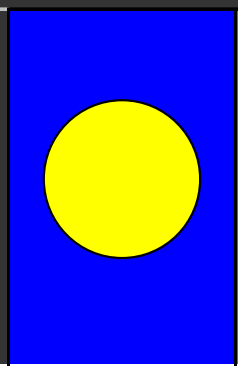
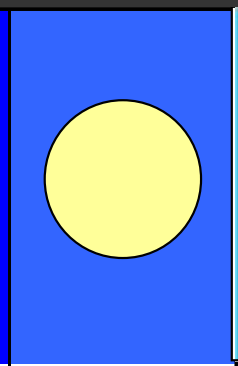
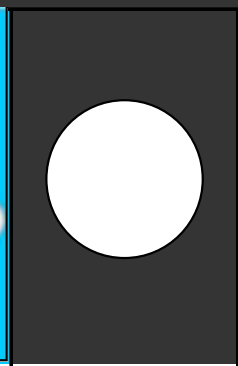
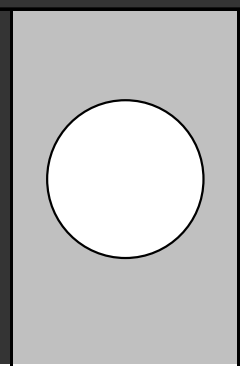
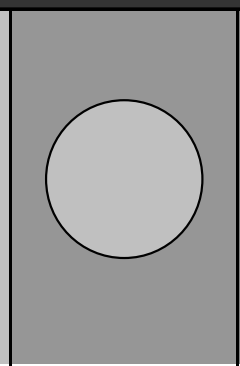
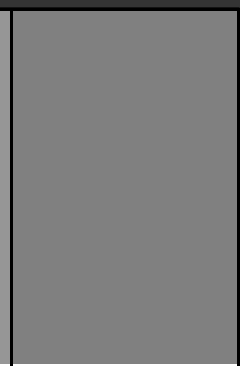


Image by MIT OCW.

Solar radiation

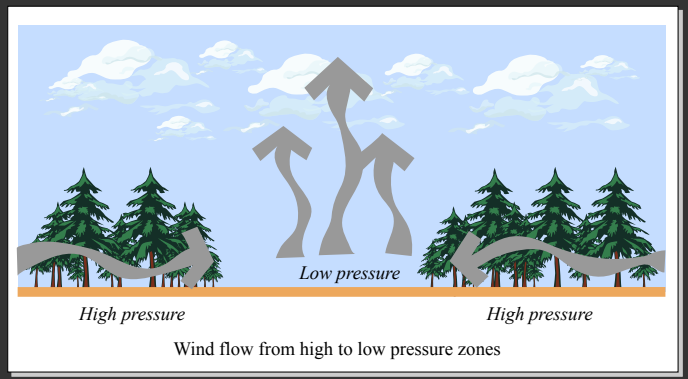
- Daylight

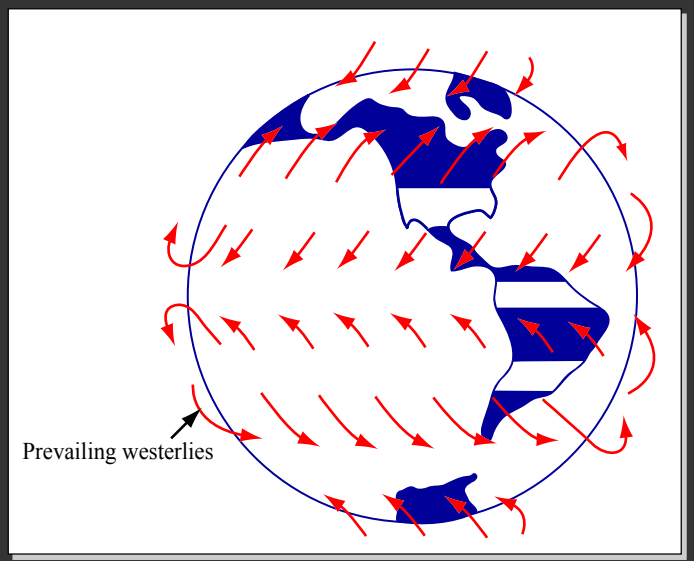
							
Sky type	**Clear**	**Milky-white**	**Partly cloudy**	**Whitish**	**Light grey**	**Dark grey**	**Dark**
Sun	**Shiny**	**Clear**	**Partly veiled**	**Veiled**	**Still visible**	**Barely visible**	**Invisible**
Global radiation [W/m^2]	**800 to 900**	**600 to 800**	**300 to 700**	**250 to 400**	**200 to 300**	**100 to 200**	**20 to 100**
Diffuse component	**10 to 20%**	**20 to 40%**	**20 to 50%**	**40 to 80%**	**50 to 100%**	**75 to 100%**	**100%**

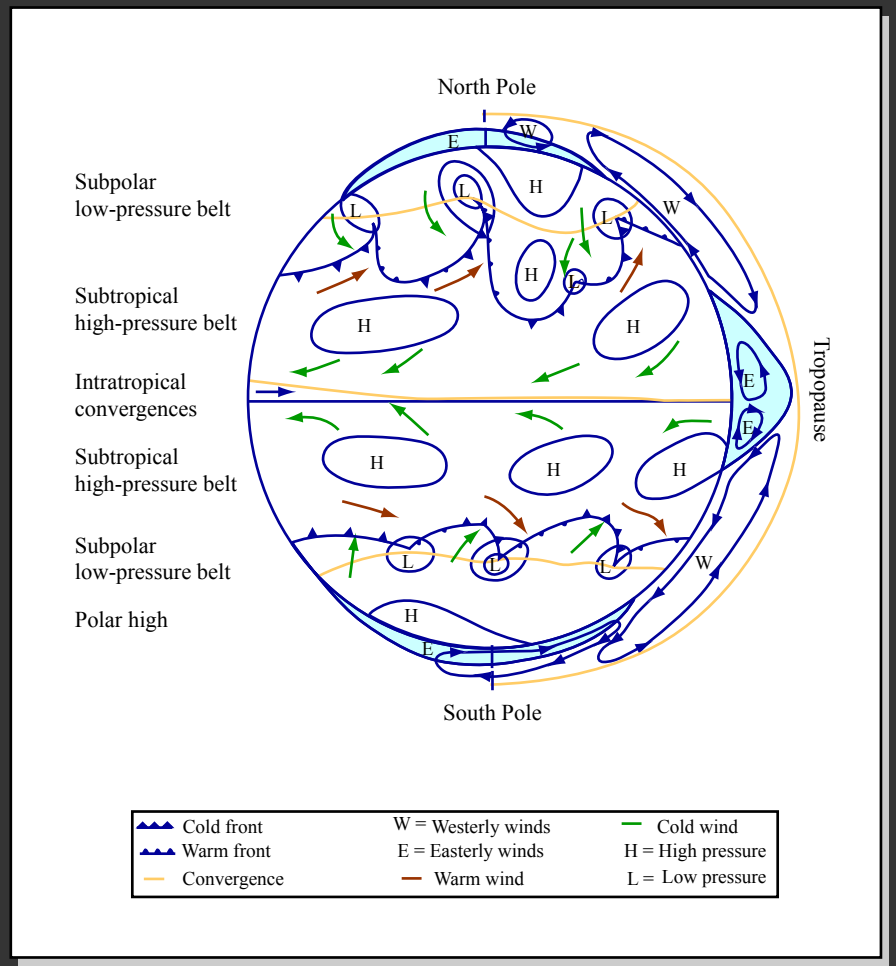
Climate

Atmospheric phenomena (global climate)

- Wind flows and Coriolis force







Images by MIT OCW.

Climate

- Atmospheric phenomena (global climate)
  - Wind flows and Coriolis force
  - Water

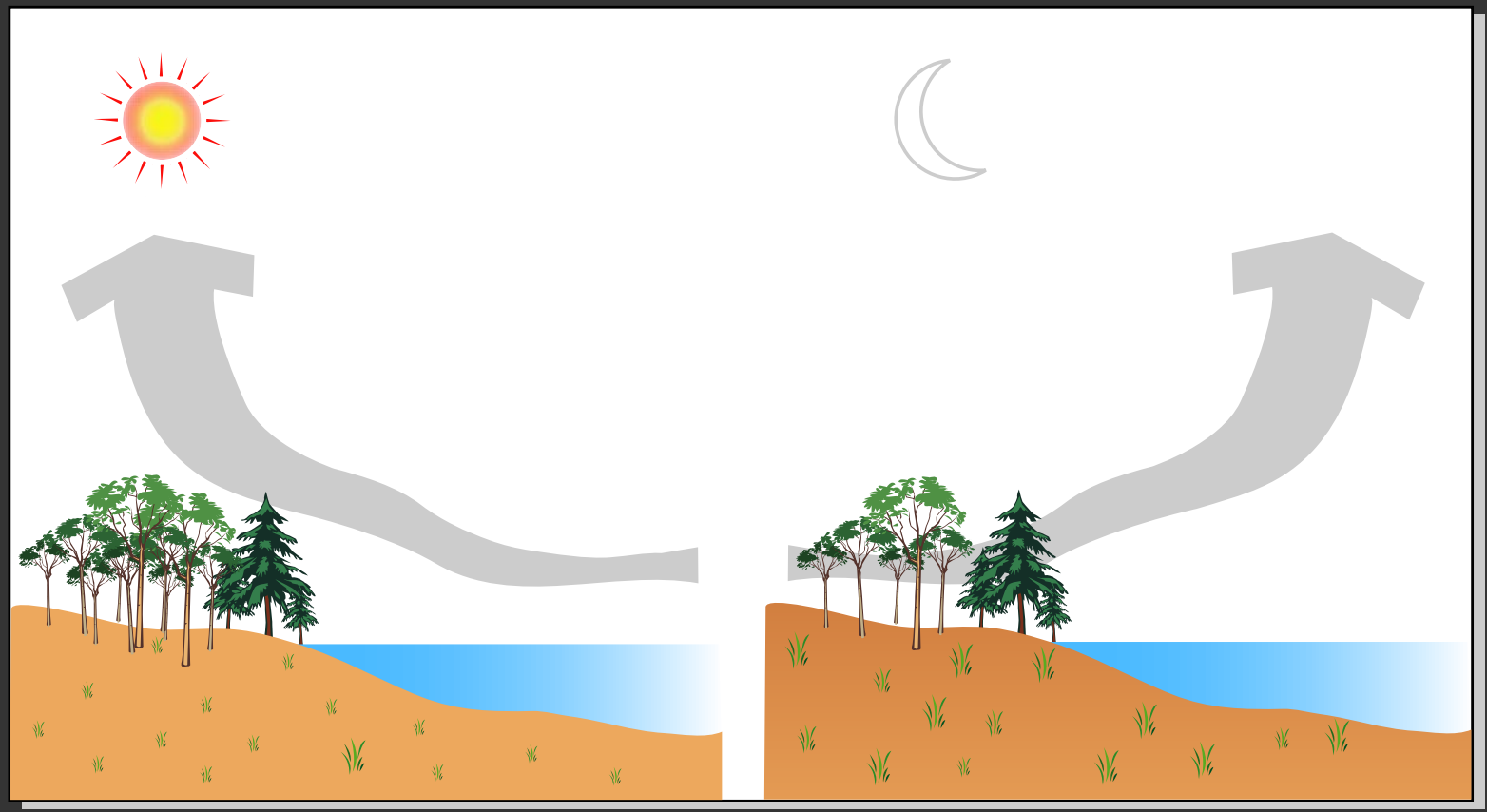


Image by MIT OCW.

Climate

- Atmospheric phenomena (global climate)
  - Wind flows and Coriolis force
  - Water
  - Mountains

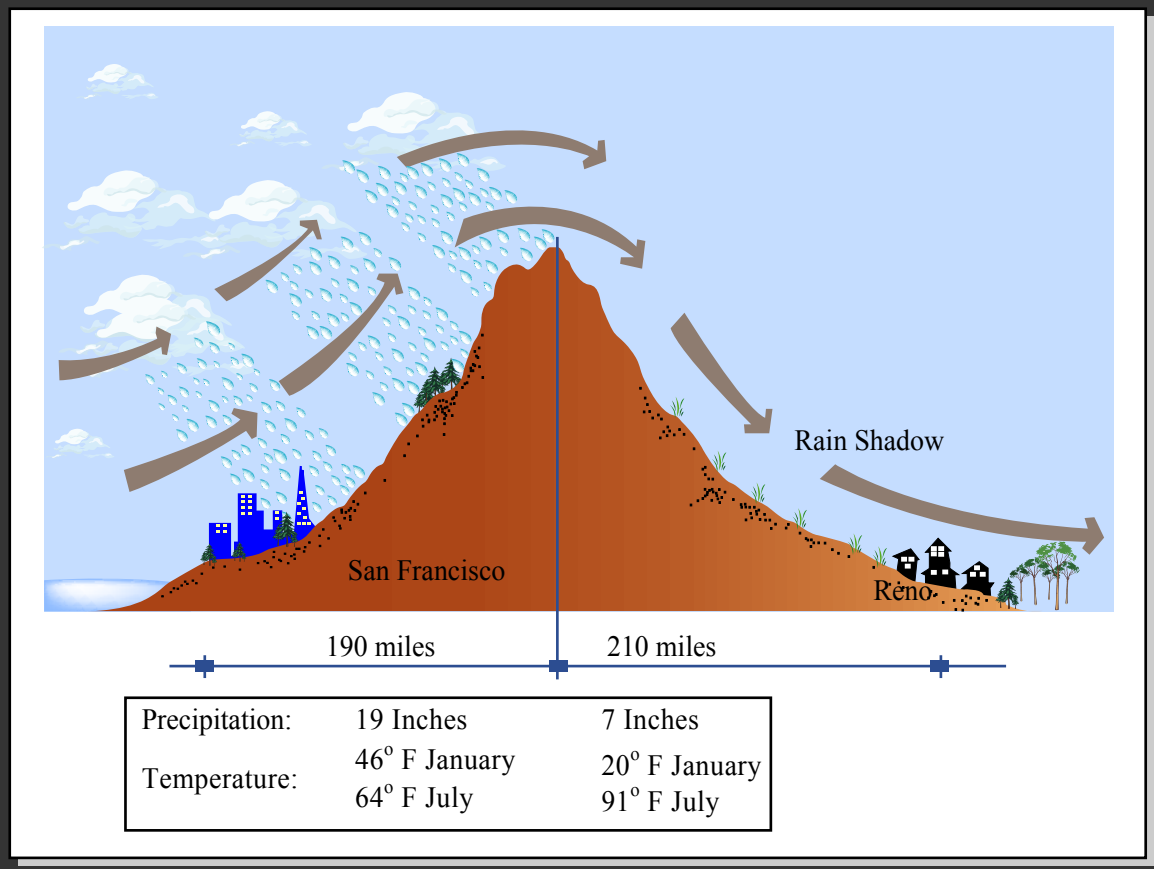
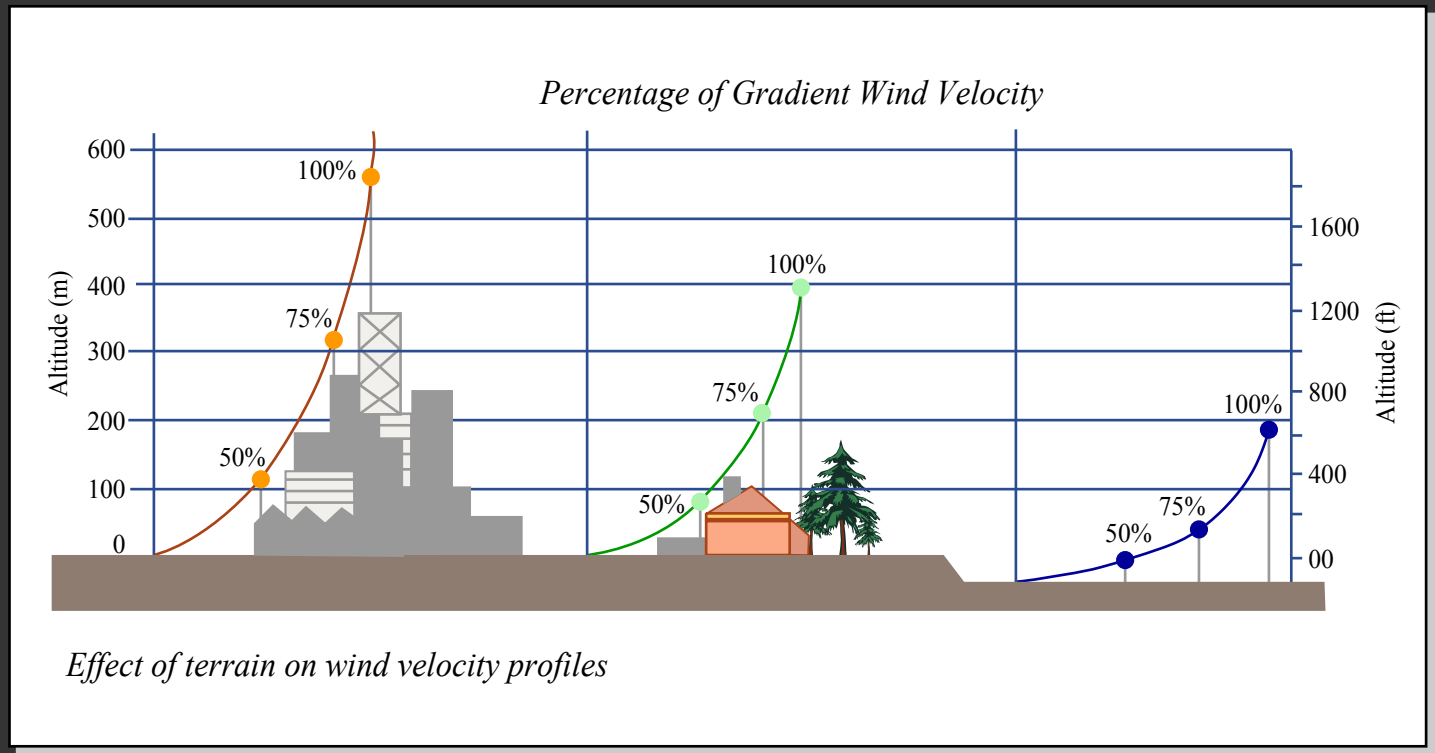


Image by MIT OCW.

Climate

- Atmospheric phenomena (global climate)
  - Wind flows and Coriolis force
  - Water
  - Mountains
  - Friction



Effect of terrain on wind velocity profiles

Image by MIT OCW.

Climate

- Atmospheric phenomena (global climate)
  - Wind flows and Coriolis force
  - Water
  - Mountains
  - Friction
  - Greenhouse effect

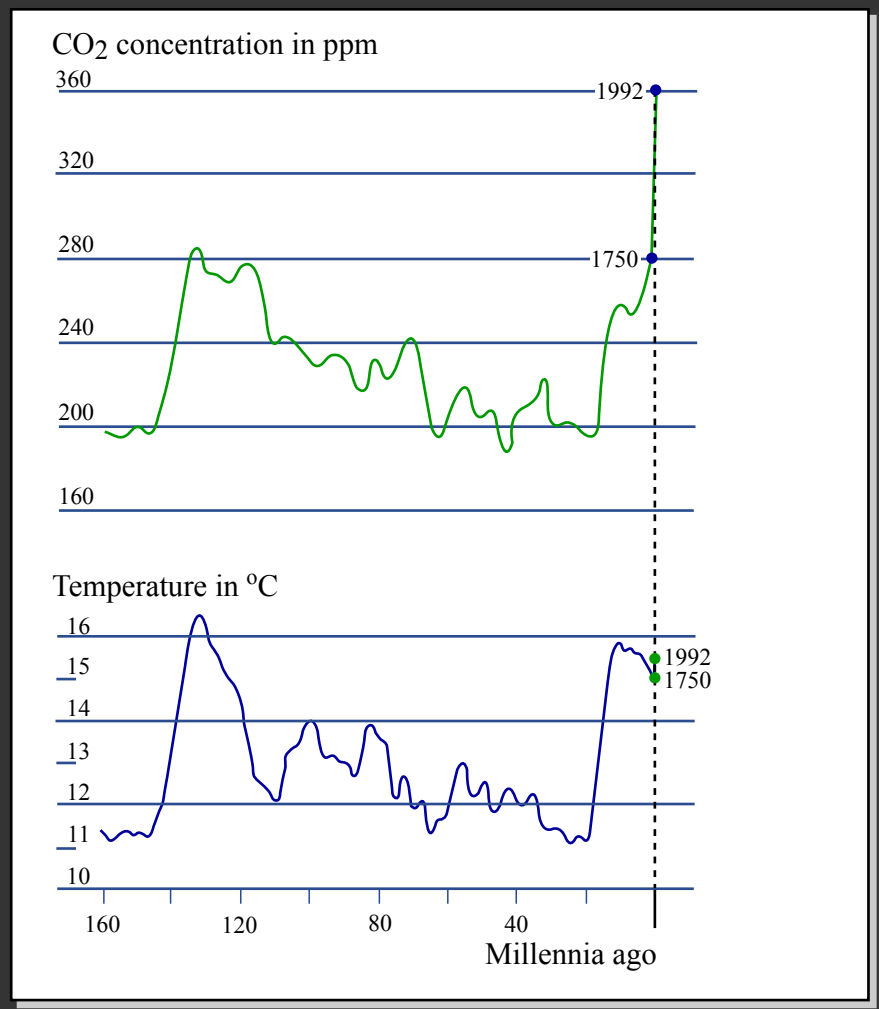


Image by MIT OCW.

Human needs and outside environment

- Reading assignment from Textbook:
  - “Introduction to Architectural Science” by Szokolay: § 1.3
- Additional readings relevant to lecture topics:
  - "How Buildings Work" by Allen: Chap 1
  - "Heating Cooling Lighting" by Lechner: § 5.1 - 5.6 + § 6.1 - 6.13
  - “Sun Wind Light“ by Brown & DeKay: § 1 - 6 in Chap 1A