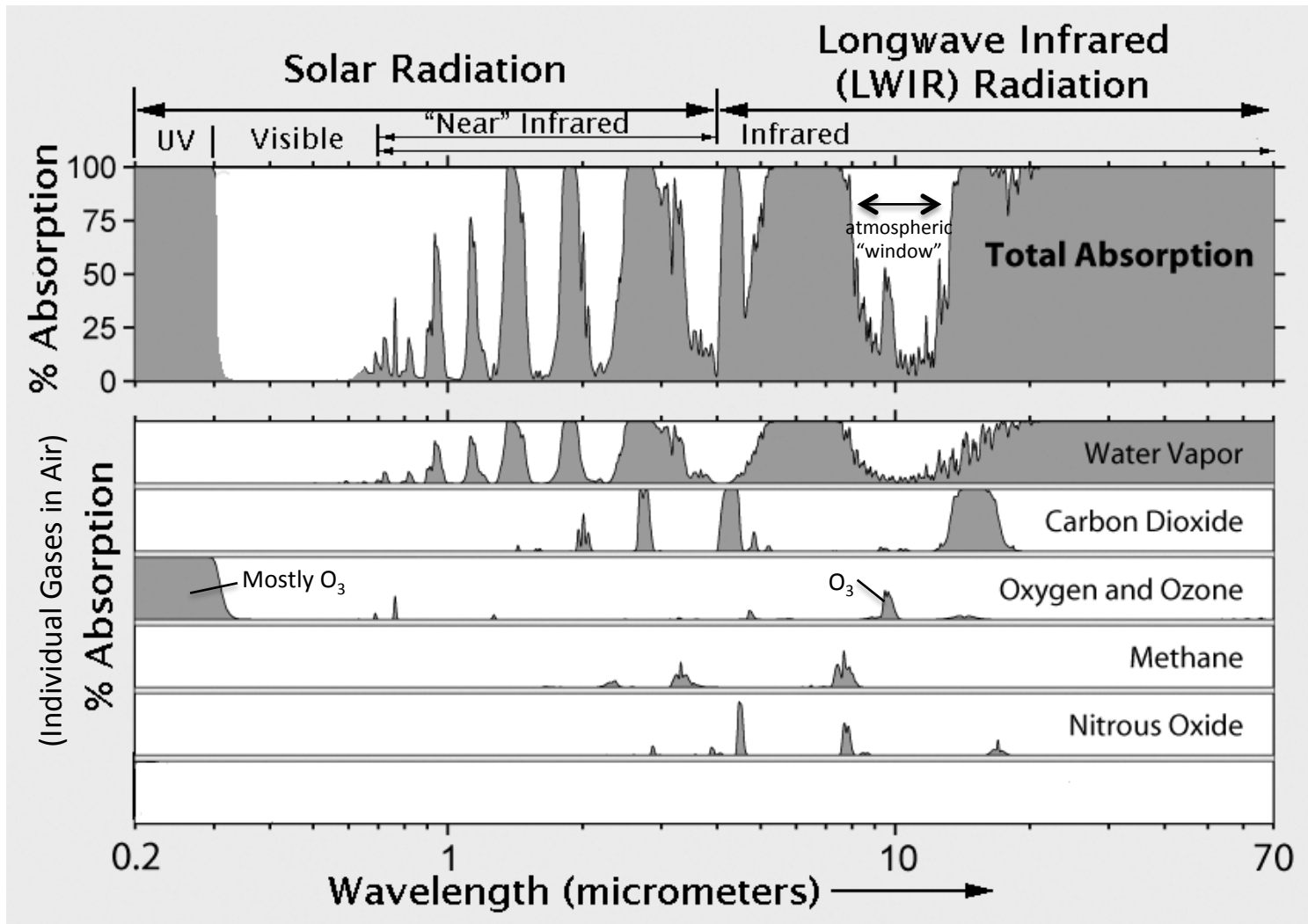


Atmospheric Absorption Spectra

(How well gases in the atmosphere absorb different wavelengths of radiation)



Notes: Components of the Atmosphere

Not Shown in the Figure

- Gases
 - N₂ (nitrogen): 78% of dry air
 - Absorbs no radiation (of any wavelength)
 - Ar (argon): 1% of dry air
 - Absorbs no radiation (of any wavelength)
- Clouds
 - Made of tiny droplets of liquid water or ice crystals
 - Absorb *all* wavelengths of longwave infrared radiation well
 - Reflect most solar radiation well

Notes on Absorption Spectra

- Absorption by ozone (O_3) and oxygen (O_2)
 - Ozone:
 - absorbs a little LWIR radiation
 - absorbs most of the UV radiation from the sun
 - Oxygen:
 - absorbs a little UV (but nothing else)

Notes on Absorption Spectra

(cont'd)

- Atmospheric window:
 - Wavelengths of longwave infrared radiation that no gases absorb well
 - Without clouds, these wavelengths emitted by the earth's surface escape to space, while most other wavelengths are absorbed
 - However, clouds do absorb these wavelengths (and all other LWIR radiation emitted by the earth's surface)

Notes: Scattering

- Scattering *redirects* radiation
 - Air scatters mostly just UV and visible light (especially blue light) from the sun
 - Some scattered radiation is redirected back to space (contributes to total solar radiation *reflected away* by the earth)
 - The rest reaches the earth's surface (but not from the same direction as *direct* rays from the sun)
 - As a result, the sky looks blue (*scattered blue light comes from all directions that we look*)
 - and the sun (direct rays) looks yellow (*scattering redirects blue out of the direct rays from the sun, and the result looks yellow*)