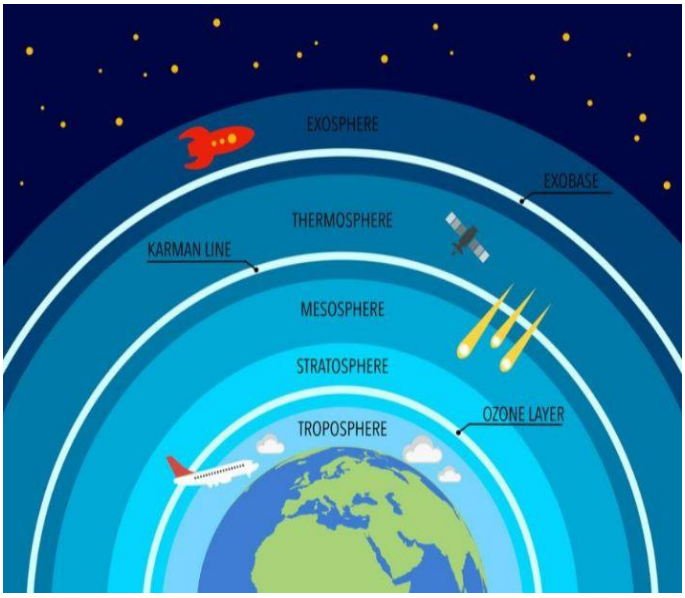
Air quality and pollution
Level 3
Lecture Two

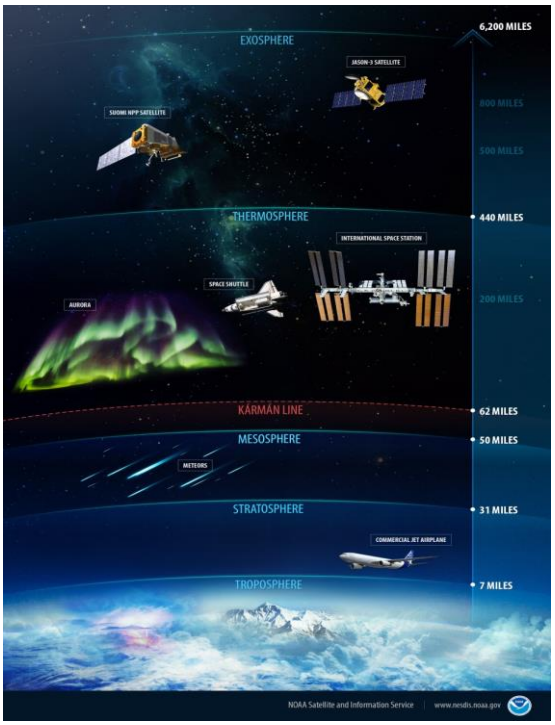
Lecturer: Muthana Waad

Atmospheric Structure and Its Impact on Environmental Health

(Why should an Environmental Health student study the atmosphere?)

The atmosphere isn't just air we breathe; it's a complex system that protects Earth and controls the distribution of pollutants and diseases. It's composed of layers that vary in density, chemical composition, and temperature.





1. Troposphere - "The Environmental Action Zone"

Altitude: From the Earth's surface up to 10-16 km.

Characteristics: Contains 90% of the atmosphere's mass and 99% of its water vapor.

Environmental & Health Importance:

This is the layer where we live and where all weather phenomena (rain, wind, storms) occur.

Pollutant Distribution: Most pollutants from industries and vehicles accumulate here. Due to constant air movement, pollutants are transported from one place to another.

Greenhouse Effect: Gases in this layer (like CO_2) are responsible for warming our planet, and their increase leads to severe health and environmental problems.



2. Stratosphere - "The Protective Shield"

Altitude: From the top of the troposphere up to 50 km.

Characteristics: Very stable layer, which is why jet aircraft fly here to avoid turbulence.

Environmental and Health Importance (Ozone Layer):

This layer contains Ozone gas (O3).

Vital Function: Ozone absorbs harmful ultraviolet (UV) radiation.

Health Connection: Depletion of this layer (the ozone hole) leads to increased UV radiation reaching Earth, causing skin cancers, eye diseases (cataracts), and damage to agricultural crops.



3. Mesosphere - "The Meteor Barrier**"**

Altitude: From 50 km to 80 km.

Characteristics: The coldest layer in the atmosphere (reaching -90°C.(

Environmental Importance:

Acts as a shield, protecting Earth from meteors and space debris, which burn up in this layer before reaching the surface, preventing potentially devastating environmental impacts.

4. Thermosphere - "The Radiation Zone**"**

Altitude: Extends up to 500 km.

Characteristics: Temperatures rise dramatically here (reaching up to 1000 K.(

Environmental & Technological Importance:

Contains the "Ionosphere" which reflects radio waves, essential for communication networks and early warning systems for environmental crises.



5. Exosphere - "The Edge of Space**"**

Begins at 500 km and extends outwards, where particles become extremely rare and gradually fade into outer space.

Important Additions for Environmental Health Students:

Temperature and Health (Environmental Lapse Rate:(In the "Troposphere," temperature generally decreases with altitude. However, sometimes a phenomenon called "Temperature Inversion" occurs (where warmer air sits above cooler air). This traps pollutants and smoke near the Earth's surface (smog), causing severe respiratory issues for populations.

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Air Quality:

As environmental health professionals, our primary focus is on the Troposphere. Any change in gas composition (e.g., an increase in sulfur or nitrogen oxides) leads to acid rain, which devastates aquatic ecosystems and soil.

Climate Change:

Understanding the atmospheric structure helps us comprehend how greenhouse gases contribute to global warming, leading to the spread of climate-related epidemics (such as malaria and cholera) due to changes in insect habitats and increased flooding.

Conclusion: The atmosphere is not just a series of physical layers; it's an integrated system. Any imbalance in the chemistry of any layer (especially the Troposphere and Stratosphere) directly impacts human health and environmental safety.

