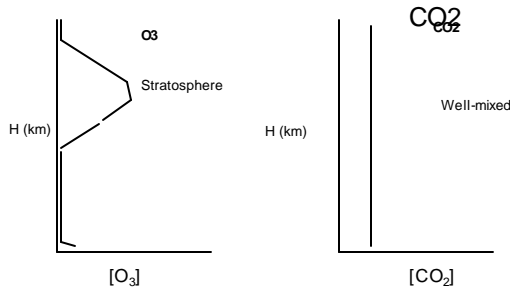


## Issues that need clarification based on Interviews

## Difference between GHG and Aerosols

- GHG
  - Gases that influence GH effect of the atmosphere due to their radiative properties in the infrared (longwave)
  - Absorption/emission
- Aerosols
  - Particulates or gases in the air that affect radiative processes, visibility and health - Pollution
  - They can affect radiation in both visible (shortwave) by reflecting or absorbing radiation and/or in the infrared (longwave) by absorbing and emitting radiation

## Vertical distribution of Ozone (O<sub>3</sub>) and Carbon Dioxide (CO<sub>2</sub>)



## GH Effect What is being Trapped?

- Radiation is being trapped not CO<sub>2</sub>
- CO<sub>2</sub> is a well-mixed gas that slowly diffuses upward and is carried horizontal and vertically by atmospheric motion (winds).
- Its vertical distribution shows its well-mixed

## Natural Variability of Climate System

- Two main sources
  - Sun
  - Volcanic eruptions
- Sun
  - 11-year variability
  - Longer-term variability associated with Milankovitch cycles
- Volcanic eruptions
  - Inject aerosols and gases in atmosphere
  - When eruption is very strong ejection reach stratosphere which is stable (very little vertical motion). Small aerosols and gases can remain in several years.
  - Aerosols affect mostly shortwave radiation (reflecting it) => cooling of atmosphere below. Compensation for GH effect warming?
  - Volcanic eruption effect on climate can last several years (e.g., Pinatubo)
  - Aerosol can also serve as surfaces on which catalytic destruction of O<sub>3</sub> can take place

## Shortwave (SW) vs. Longwave (LW) Radiation

- Shortwave 0.4 – 4 microns (VIS, NIR)
  - Sun Maximum emission is in visible (0.4 – 0.8 microns)
  - Shortwave radiation interacts with matter via absorption and reflection, and with gases via absorption and diffusion
- Longwave 4 – 100 microns (NIR, IR, LWIR)
  - Earth Maximum emission is in infrared (~10 microns)
  - Longwave radiation interacts with matter and gases via absorption and (immediate) emission