



# Noctilucent Clouds

“Night-Shining” Clouds





# Noctilucent Clouds

- **Occur in Mesosphere ~80 km altitude**
  - Highest clouds
- **Made of water frozen on dust particles (condensation nuclei)**

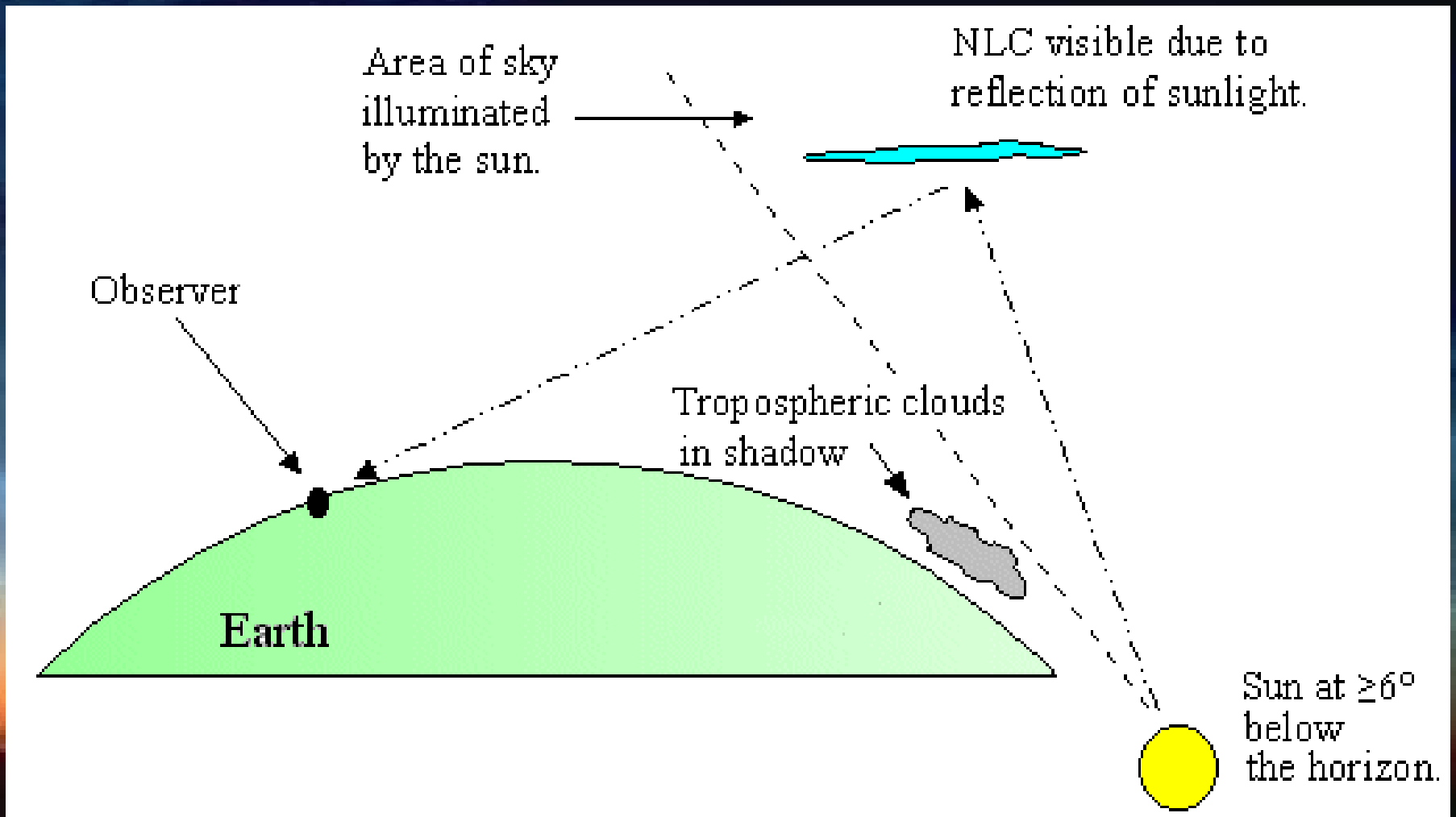
# Where does the water come from?

- Mesosphere is very dry; water must come from somewhere else
- Summer upwelling of moist air
- Space shuttle/ rockets
- Volcanic eruptions

# Where do the particles come from?

- **Micro meteors**
- **Comets**
- **Volcanic eruptions**

# Can only be seen at twilight

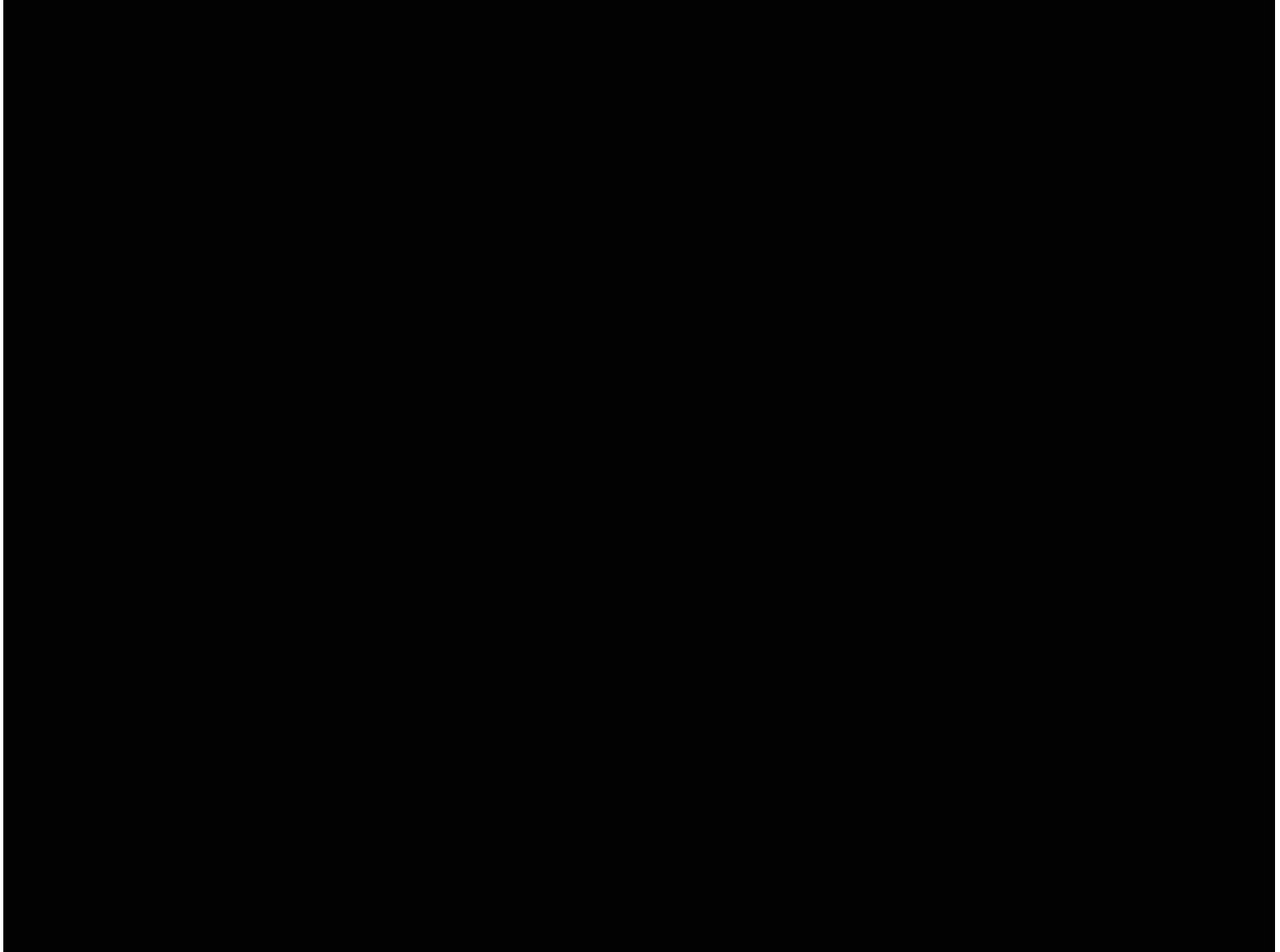


# Conditions for Formation

- **Only form where and when mesosphere is coldest**
  - **Polar regions**
    - Can be seen between  $50^{\circ}$  -  $70^{\circ}$  north and south of equator
      - Why not seen all the way to the poles?
  - **Summer months**
    - Seasonal air movements move coldest air to poles in summer



# NASA video clip (click box)



# The Mystery

- **No recorded observations before 1885**
- **Brightness, frequency and extent has been growing ever since**

**Why?**

# First Recorded in 1885

- **Could the clouds have existed before this?**

**YES!**

- **Krakatoa erupted in 1883, creating dramatic sunsets that many enjoyed watching. The clouds could have existed unnoticed before this.**

# **Increasing Brightness, Frequency and Extent: Related to Global Climate Change?**

**“greenhouse” gases increase**

**=**

**colder mesosphere**

**=**

**more noctilucent clouds**

# **Effect of Greenhouse Gases**

**Why does the Mesosphere get colder?**

**If more of Earth's emitted longwave radiation is held close to the surface, it is not available to cause warming in the upper atmosphere**

**(not known for sure, more study needed)**

**Increasing Brightness, Frequency and  
Extent:  
Not Related to Global Climate Change?**

**Maybe related to increase in rocket  
launches in recent times.**

**Each launch adds significant amount of  
water to mesosphere. Water needed  
for cloud formation.**

# **The Mesosphere is Important!**

**We won't fully understand how and why  
our climate is changing until we  
understand what's happening up there**

**The Mesosphere can no longer be the  
“Ignorosphere”**