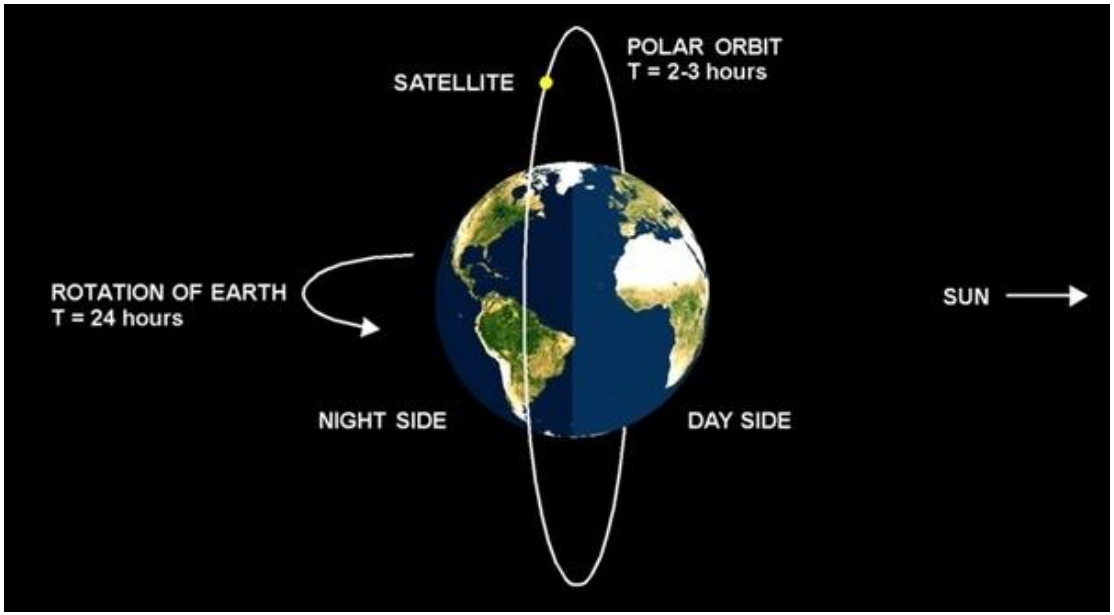
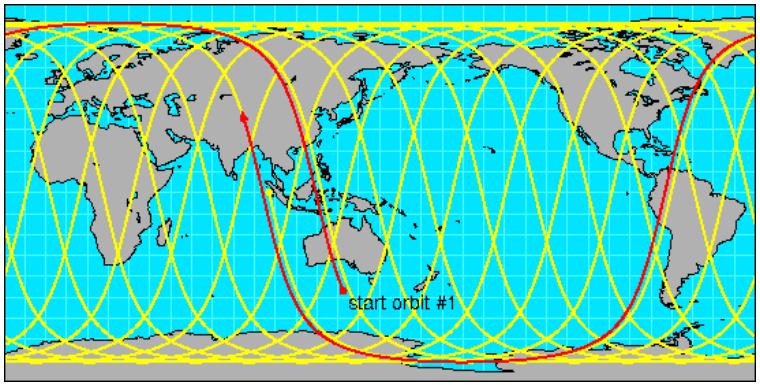
# Satellite Orbits and Aerosol Remote Sensing

A very basic introduction

# Polar Orbit

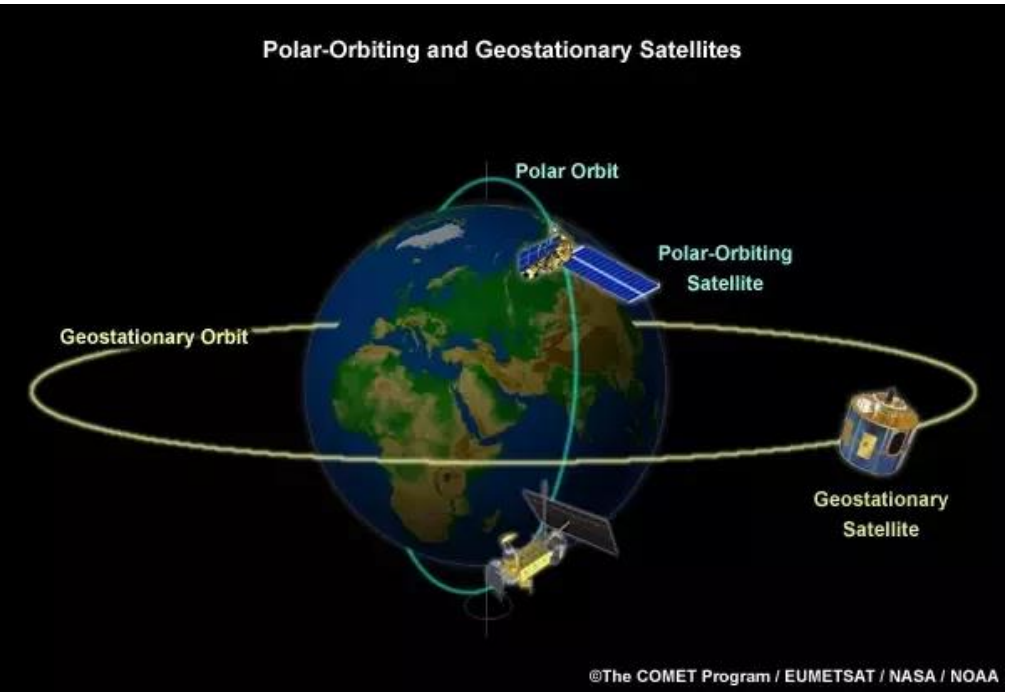
- Examples
  - NOAA A, B -> NOAA 19 (70s to current day)
  - NASA A-train: Terra, Aqua, Calipso, etc
  - European: MetOp series
  - Two passes per day from ~700 km altitude

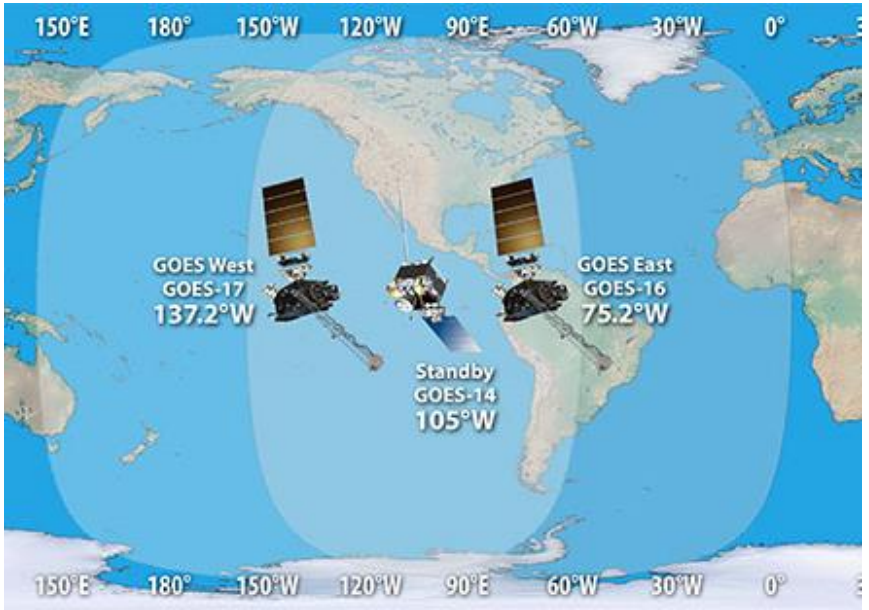


# Geostationary Orbit

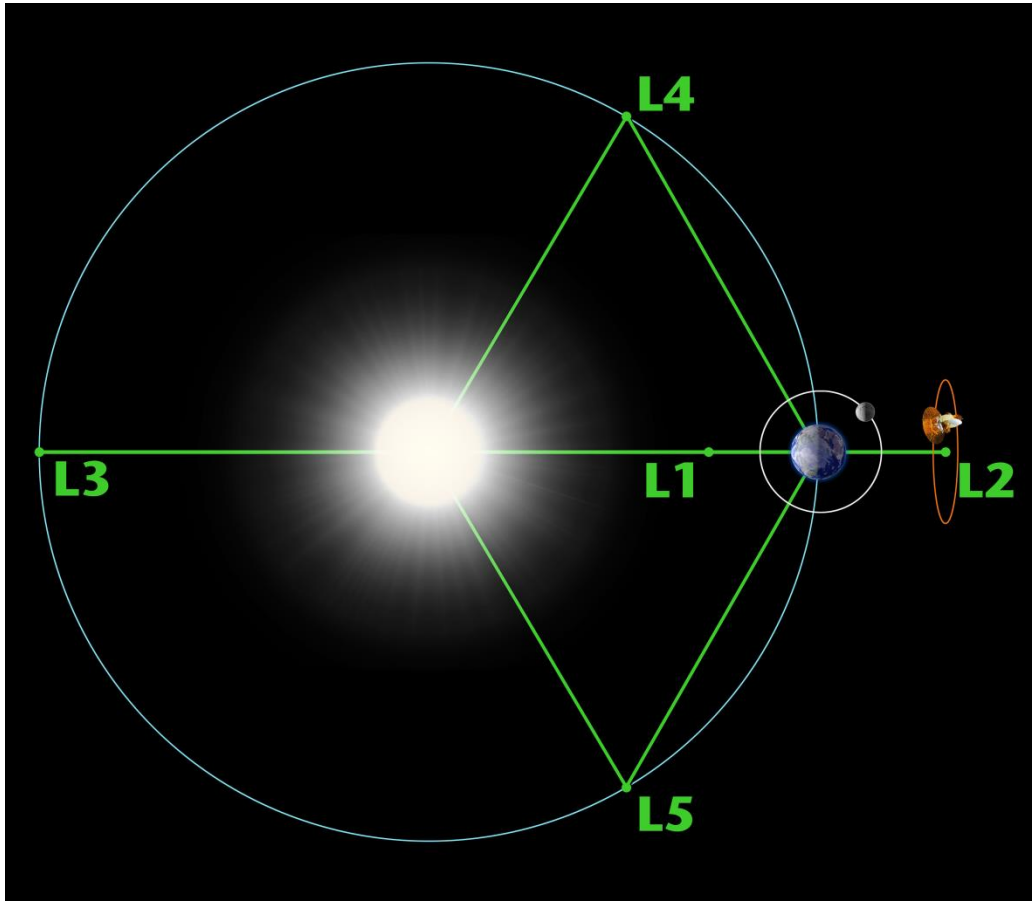
- Examples
  - NOAA/NASA GOES (Geostationary Operational Environmental Satellites) series
  - Orbits at the rate of rotation of the Earth
    - Always views the same spot on earth
  - Orbit altitude ~36,000 km

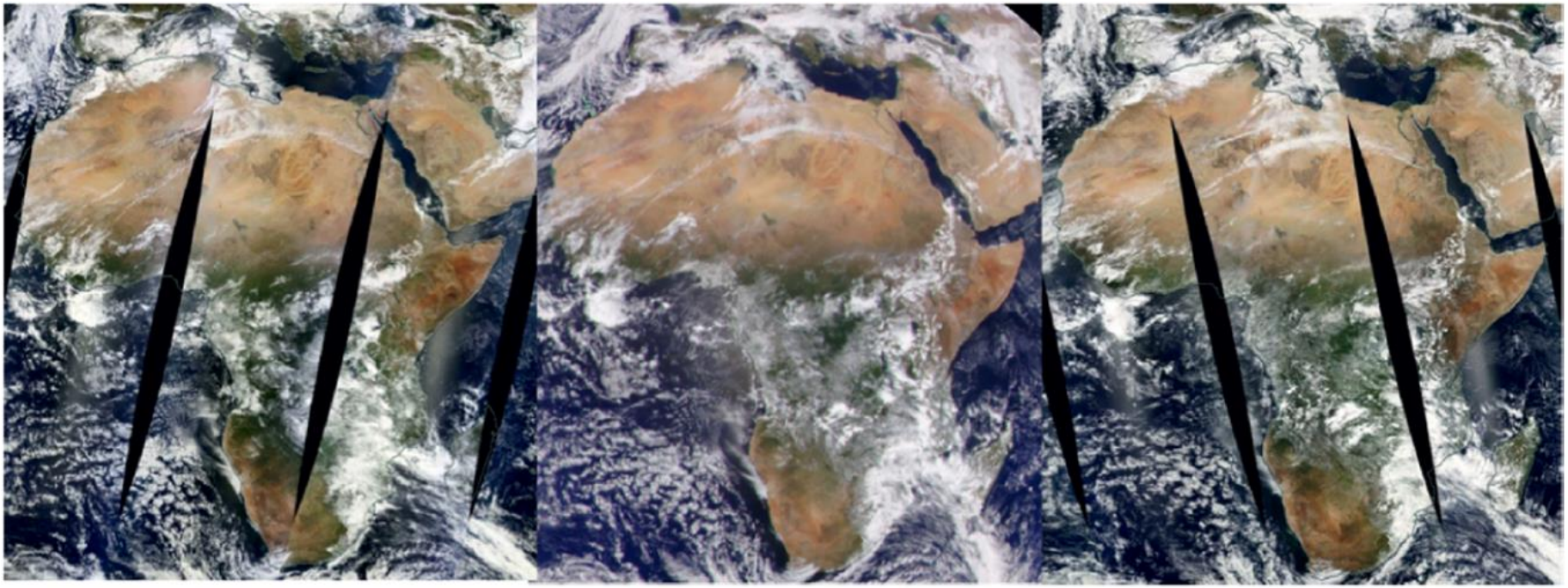


# Lagrange Points

- Five special points where a small mass can orbit in a constant pattern with two larger masses
- DSCVR/EPIC is at L1, ~1,500,000 km from earth
  - FYI James Webb telescope will go to L2





MODIS Terra

EPIC 10:56 GMT

MODIS Aqua

10:30 equatorial crossing time

13:30 equatorial crossing time

**FIG. 2. *DSCOVR* EPIC "enhanced" image of (center) Africa taken at 1056 UTC 22 Mar 2016. (left) MODIS *Terra* and (right) MODIS *Aqua* 2,330-km-wide swaths of the same area taken on the same day. Note that West Africa follows UTC while East Africa is UTC + 3 h. *Terra* crosses the equator at 1030 LT so that the western swath of the left panel (*Terra*) resembles the cloud structure on the left part of the EPIC image. Since *Aqua* crosses the equator at 1330 LT, the eastern *Aqua* swath part of the right (*Aqua*) and middle (EPIC) panels are alike. Also note that the adjacent swaths of the MODIS examples are approximately 100 min apart.**

# Principles of Aerosol Remote Sensing from Space

Two Key assumptions:

- Reliable Atmospheric Aerosol Model/Type

  … AOD, SSA, Phase Function, etc.

- Parameterization of Surface Characteristics

  … Primarily Surface Reflectance