Homework 1: Clouds and atmospheric convection Jan 13th, 2021
Report due Feb 3rd 11am.

Turn in your report either at the beginning of next class or before next class in my mailbox. For the report, you may find it useful to save a few screenshots to illustrate and justify your answers.

Part I - Information on clouds from space

The following websites are examples of websites that provide satellite imagery:

- https://www.windy.com/fr/-Satellite-satellite?satellite,2020-01-24-15,13.096,-59.616,4
- `https://www.star.nesdis.noaa.gov/GOES/fulldisk_band.php?sat=G16`
- http://cimss.ssec.wisc.edu/clavrx/campaign/Barbados/
- https://worldview.earthdata.nasa.gov/ used in Part I
- http://www.ssec.wisc.edu (this website lists several geostationary statellites, once on this site click Data/Imagery, Geostationary satellite images, Geostationary image browser : http://www.ssec.wisc.edu/data/geo/)

1. Browse the different satellites (in the VIS, IR, WV...) and their geographical extents (GOES-E, GOES-W, Himawari ...). Then answer the following questions:

(1a) What information on clouds do the visible VIS and infrared IR satellite pictures provide?

(1b) Pick a geostationary satellite, for instance "MET-PRIME" or "GOES-EAST" and select the widest possible longitudinal and latitudinal extent of the visualization (typically referred to as"FULL DISK"). Compare the VIS (for instance canal visible 1 for MET-PRIME or 2 for GOES-EAST) and IR (for instance canal IR10 for MET-PRIME or 14 for GOES-EAST). At what latitudes do the 2 products yield similar cloud cover? Conversely, at what latitudes do they differ? In that case, which one gives the largest cloud cover?
Can you explain those observations?

2. Now find a satellite which includes a map of enhanced IR, or another similar chanel representative of cloud top temperature.

(2a) Start at mid latitudes (approximately 45° latitude). What is the typical temperature range of the clouds there? Estimate approximately the averaged cloud top temperature. What altitude does this temperature correspond to? (Note: you may find it useful to find a map of mean temperatures versus latitude and altitude).

(2b) Continue at subtropical latitudes (approximately 30° latitude). What is the typical temperature of clouds there, and what altitude does that correspond to?

(2c) Finally, in the tropics (10° latitude or so), what is the typical temperature of clouds, and what altitude does that correspond to?

Part II - Cloud satellite visualization (no report due for this part)

Do the online course on satellite visualization:
https://www.meted.ucar.edu/asmet/asmet10/index.htm
There is no report due for this part, but you are expected to go to the end of this online course. This is one of many online resources provided by UCAR, you will need to sign in with your email (free service) to access. Note that for this class, I only require you to know the 3 satellite products: visible, infrared and water vapor. The other satellite products (dust, severe convection...) are discussed in this online course, but will not be asked in this class and will not be on the final exam.