

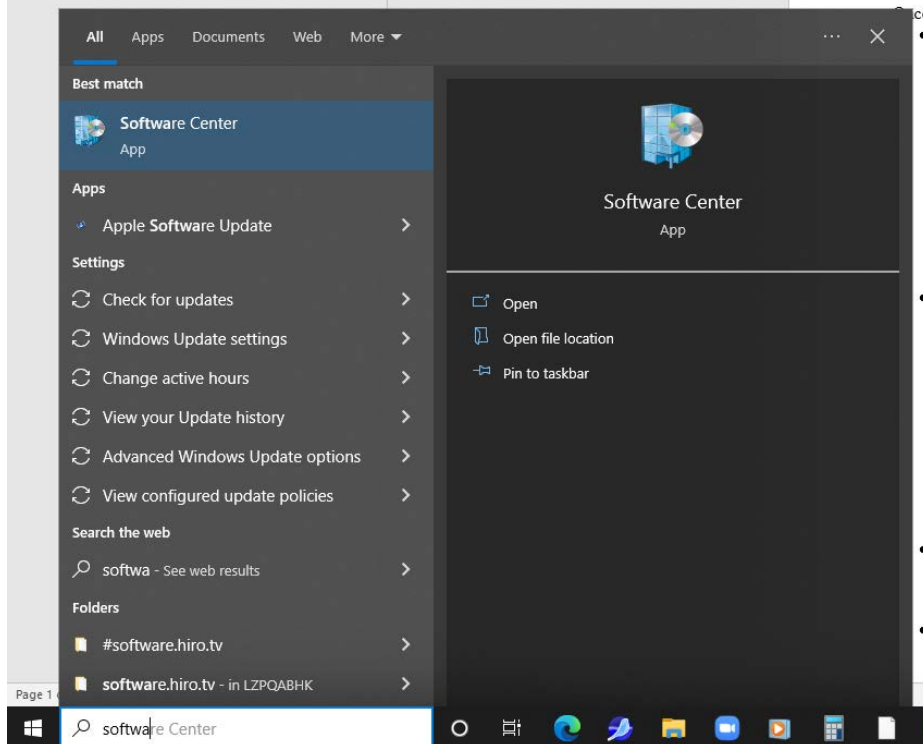
Question #3—Detailed Instructions

This question uses Google Earth to display satellite imagery and will best be done using a high bandwidth network connection such as on campus. If you want to do this question on your own computer you can download Google Earth Pro for free from the following website:

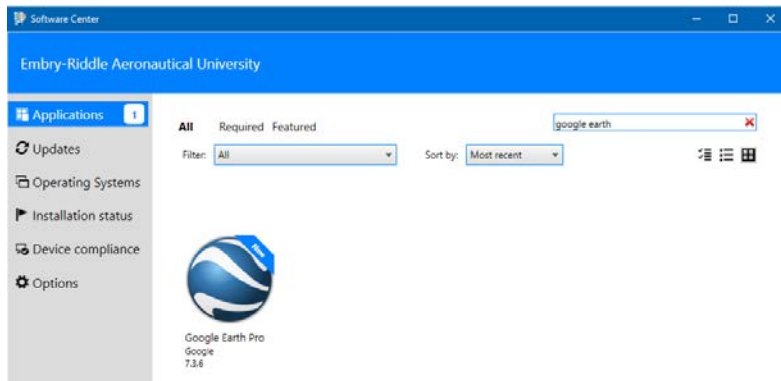
<https://www.google.com/earth/about/versions/>

If you are using a school computer and it does not already have Google Earth it is now available through the Software Center:

In Windows, go to the Start Window and start typing “Software Center.”

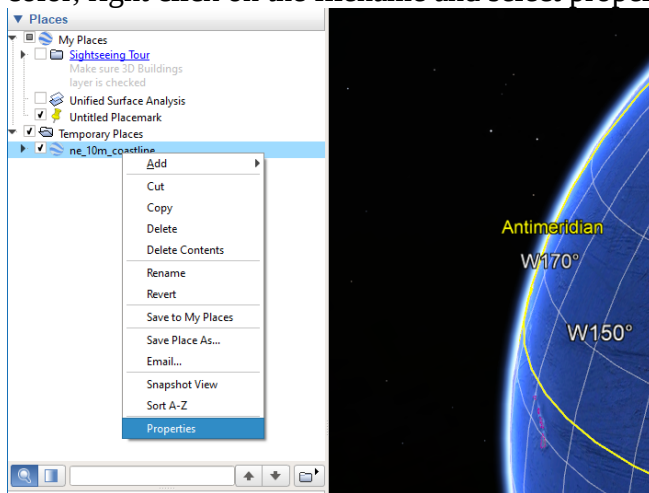


In the Software Center search for “Google Earth.” Double click on the Google Earth Pro icon and follow the installation instructions.

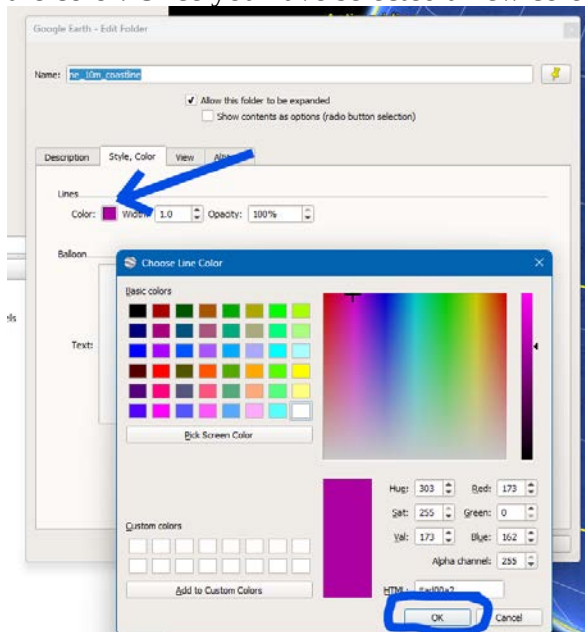


Note: Google Earth is available on all desktops in the COA 3rd floor Weather Lab and should be installed on those in COA 351 and COA 353. However, be sure to save your results to a storage device or Onedrive, as these computers lose any new files that are stored whenever they are rebooted!

Before obtaining imagery, open the world_coastlines.kmz file to put coastlines into Google Earth—this layer disappeared in 2021 and users must manually upload a replacement map layer. This file can be found in the Exam 2 Module. In Windows, the file downloads to your Downloads folder. Opening the file will automatically open Google Earth if it is not already open. It is best to change the map color to one that shows up better, e.g., yellow, which also matches the default country outlines. The coastline filename will be displayed under the Temporary Places dropdown on the left of the Google Earth display window. To change the map color, right click on the filename and select properties:



Select the “Style, Color” tab and click on the color to open a color pallet from which to change the color. Once you have selected a new color, click “OK.”



Once you have loaded the appropriate coastlines, make liberal use of the “u” key to put Google Earth into a straight overhead view, and the “n” key to make north straight up on the screen.

Next you will be obtaining full disk view GOES satellite imagery in kmz format to demonstrate and measure parallax or displacement error. “.kmz” files are zipped “.kml” files (Keyhole Markup Language), which are the file format of Google Earth files.

- Use the following URL to go to a roughly four day listing of GOES-East Band 13 Clean Longwave Window images:

<https://cdn.star.nesdis.noaa.gov/GOES19/ABI/FD/13/>

Scroll to the end of the listing, which are the most recent files:

202106011330_G0ES16-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 13:11	47568479
202106011330_G0ES16-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 13:42	9391158
202106011330_G0ES16-ABI-FD-13-1808x1808.jpg	10-Mar-2021 13:42	464477
202106011330_G0ES16-ABI-FD-13-330x330.jpg	10-Mar-2021 13:42	29449
202106011330_G0ES16-ABI-FD-13-542x542.jpg	10-Mar-2021 13:42	3862146
202106011330_G0ES16-ABI-FD-13-678x678.jpg	10-Mar-2021 13:42	94979
202106011330_G0ES16-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 13:42	47684663
202106011400_G0ES16-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 13:53	9406907
202106011400_G0ES16-ABI-FD-13-1808x1808.jpg	10-Mar-2021 13:53	495306
202106011400_G0ES16-ABI-FD-13-330x330.jpg	10-Mar-2021 13:53	29557
202106011400_G0ES16-ABI-FD-13-542x542.jpg	10-Mar-2021 13:53	3864140
202106011400_G0ES16-ABI-FD-13-678x678.jpg	10-Mar-2021 13:53	95913
202106011400_G0ES16-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 13:53	47745659
202106011500_G0ES16-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 14:01	9449823
202106011500_G0ES16-ABI-FD-13-1808x1808.jpg	10-Mar-2021 14:01	496997
202106011500_G0ES16-ABI-FD-13-330x330.jpg	10-Mar-2021 14:01	29567
202106011500_G0ES16-ABI-FD-13-542x542.jpg	10-Mar-2021 14:01	3868712
202106011500_G0ES16-ABI-FD-13-678x678.jpg	10-Mar-2021 14:01	95251
330x330.jpg	10-Mar-2021 14:01	29567
542x542.jpg	10-Mar-2021 14:01	3868712
678x678.jpg	10-Mar-2021 14:01	95251
G0ES16-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 13:53	47745659
latest.jpg.zip	20-Apr-2020 17:32	44
latest.jpg	10-Mar-2021 14:01	9449823
thumna11.jpg	10-Mar-2021 14:01	29567

- Use the following URL to go to a roughly four day listing of GOES-West Band 13 Clean Longwave Window images:

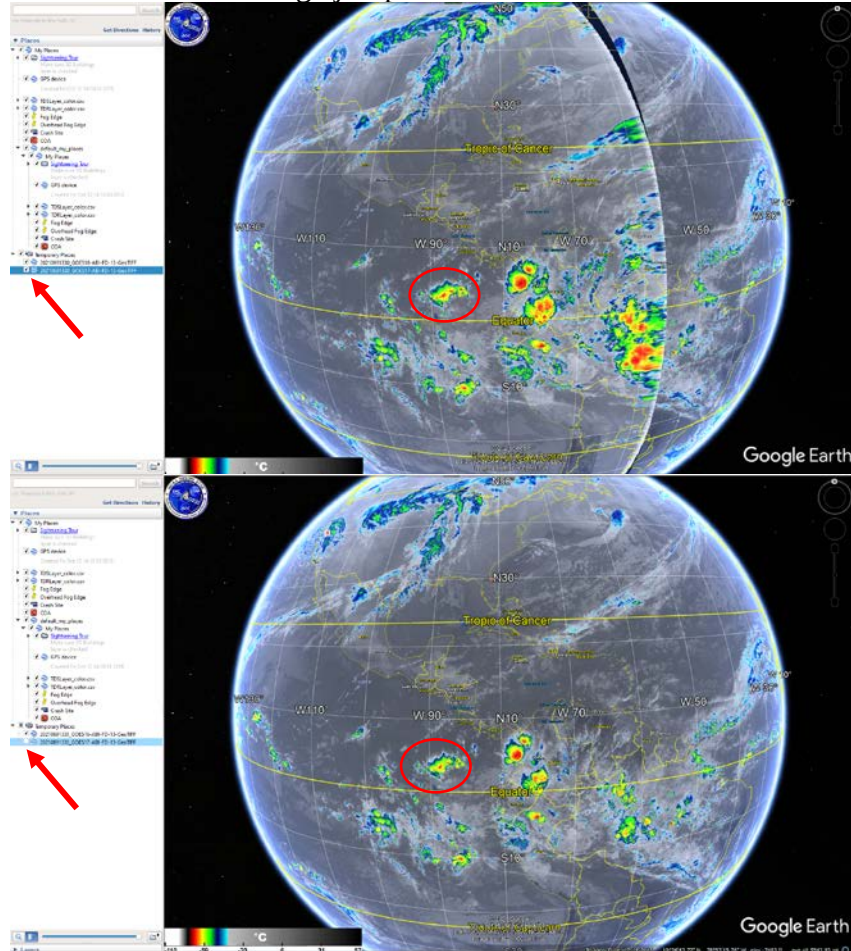
<https://cdn.star.nesdis.noaa.gov/GOES18/ABI/FD/13/>

Scroll to the end of the listing, which are the most recent files:

202106011330_G0ES17-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 13:44	9047249
202106011330_G0ES17-ABI-FD-13-1808x1808.jpg	10-Mar-2021 13:44	461750
202106011330_G0ES17-ABI-FD-13-330x330.jpg	10-Mar-2021 13:44	26040
202106011330_G0ES17-ABI-FD-13-542x542.jpg	10-Mar-2021 13:44	3920065
202106011330_G0ES17-ABI-FD-13-678x678.jpg	10-Mar-2021 13:44	87183
202106011330_G0ES17-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 13:41	45301820
202106011400_G0ES17-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 13:51	9042590
202106011400_G0ES17-ABI-FD-13-1808x1808.jpg	10-Mar-2021 13:51	461416
202106011400_G0ES17-ABI-FD-13-330x330.jpg	10-Mar-2021 13:51	26842
202106011400_G0ES17-ABI-FD-13-542x542.jpg	10-Mar-2021 13:51	2927820
202106011400_G0ES17-ABI-FD-13-678x678.jpg	10-Mar-2021 13:51	86944
202106011500_G0ES17-ABI-FD-13-1808x1808.jpg.zip	10-Mar-2021 14:02	9038630
202106011500_G0ES17-ABI-FD-13-1808x1808.jpg	10-Mar-2021 14:02	461052
202106011500_G0ES17-ABI-FD-13-330x330.jpg	10-Mar-2021 14:02	26853
202106011500_G0ES17-ABI-FD-13-542x542.jpg	10-Mar-2021 14:02	2923118
202106011500_G0ES17-ABI-FD-13-678x678.jpg	10-Mar-2021 14:02	86936
202106011500_G0ES17-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 14:03	48248931
202106011600_G0ES17-ABI-FD-13-1808x1808.jpg	10-Mar-2021 14:11	460799
202106011600_G0ES17-ABI-FD-13-330x330.jpg	10-Mar-2021 14:11	26887
202106011600_G0ES17-ABI-FD-13-542x542.jpg	10-Mar-2021 14:11	87114
202106011600_G0ES17-ABI-FD-13-678x678.jpg	10-Mar-2021 14:11	26887
330x330.jpg	10-Mar-2021 14:11	2923118
542x542.jpg	10-Mar-2021 14:11	87114
678x678.jpg	10-Mar-2021 14:11	26887
G0ES17-ABI-FD-13-GeoTIFF.kmz	10-Mar-2021 14:03	48248931
latest.jpg.zip	10-Mar-2021 14:02	9038630
thumna11.jpg	10-Mar-2021 14:11	26887

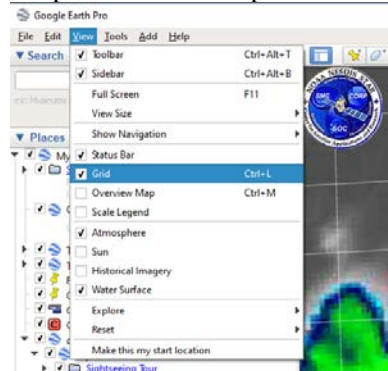
- Find a single time that contains a simultaneous .kmz file for both GOES East and West (see highlighted files in the images above), and click the link to download and **save** those files to your computer; note that .kmz files are not always available for all times, so you may have to scroll up and search for an appropriate time.
- Be sure to confirm that you have downloaded files with identical dates and times:
Note: 2021 = year, 069 = Julian day (day of the year) 13:42 = UTC time
20210691330_GOES16-ABI-FD-13-GeoTIFF.kmz 10-Mar-2021 13:42
20210691330_GOES17-ABI-FD-13-GeoTIFF.kmz 10-Mar-2021 13:41
- Open both files in Google Earth.
- Find an area where there is an overlap between the two images (not too close to the edge of either where there is too much distortion) and use the checkbox to the left to click back

and forth between the two images to locate where there is significant parallax error, i.e., tall features in the image jump side to side:



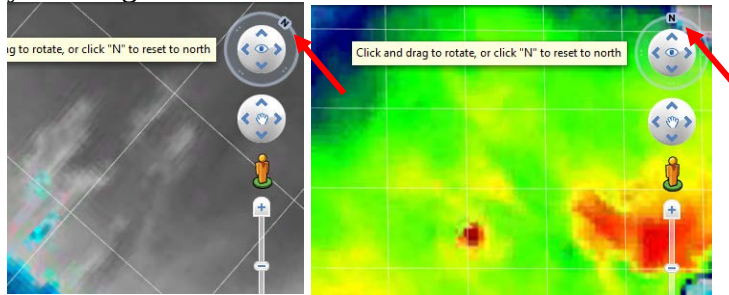
Low-zoomed pair of images.

- Find a location of tall, cold clouds with significant parallax error and zoom in to a specific feature that you can track from one image to the other, then go to the “View” dropdown at the top and check the “Grid” checkbox to add a lat/lon grid:

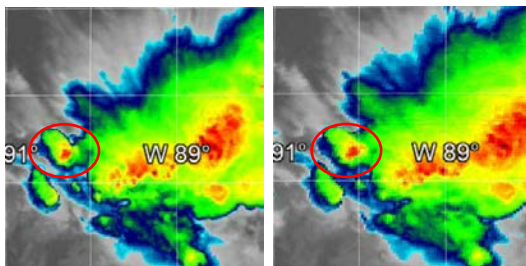


- To get a direct overhead projection of your satellite image, press the letter “U” on the keyboard. After you have zoomed in, press the letter “N” on your keyboard (or give a

single “tap” [a quick click] to the “N” on the direction circle) to make north straight up in your image:

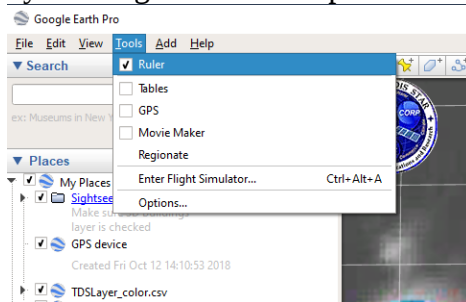


- Trackable feature is circled:
From GOES-East From GOES-West



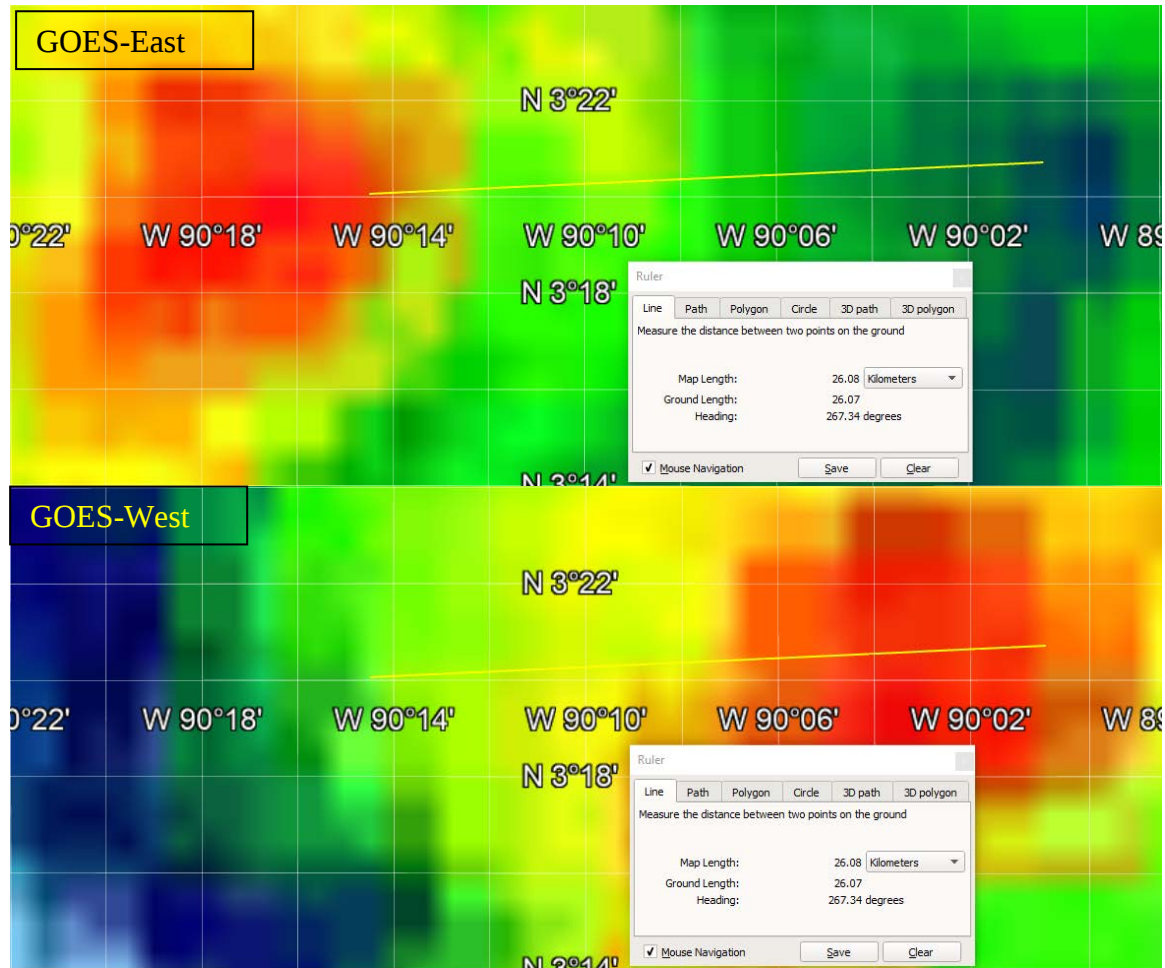
Moderately zoomed pair of images.

- Zoom in even further to magnify the parallax effect when jumping between images to where you will easily be able to **measure** the displacement error, and invoke the “ruler” by clicking the Tools dropdown and selecting “Ruler:”



- Find a spot on your parallax error feature where you can identify a comparable location on both the GOES-East and GOES-West images to actually track from one image to the other and measure the placement difference in that feature using the ruler. Use the snipping tool, the check/uncheck feature, and the appropriate lat/lon boxes to save images of the ruler overlaid on the feature in GOES-East extending to the exact comparable spot in GOES-West and displaying the distance measurement. What is the value of the parallax error? Write and label this value as the first entry (before all the appropriate imagery) in your powerpoint for Question # 3:
“Displacement error = _____”
- Example: In the following images I have used the eastern edge of the red cold cloud feature, identified above, to track from image to image; the yellow line is the Google Earth “ruler,” extending from the comparable position in the GOES-East image to the comparable position in the GOES-West image. Note that I used the *identical* “snips” to

clearly show just how much the feature moves from the GOES-East view to the GOES-West view. This works best for display in PowerPoint to insert the identically placed images on separate slides so that in slide show view one can jump back and forth and see the shift in the cloud features. The parallax error here is 26.08 km. Also note that your **ruler line should be oriented mostly west-east**, parallel to the latitude lines.



Highly zoomed pair of images.