



Making Beautiful Images of NOAA Satellite Data using Python

Instructors: **Dr. Rebekah Esmaili** and **Dr. Amy Huff**

103rd AMS Annual Meeting
January 8, 2023



What You Learned Today

How to:	Python package(s)
<ul style="list-style-type: none">Download NOAA satellite data files	<ul style="list-style-type: none">S3FsRequests
<ul style="list-style-type: none">Open files in netCDF4 (.nc) formatRead metadata for file & data variablesRecognize when data variables are organized in groups	<ul style="list-style-type: none">XarraynetCDF4
<ul style="list-style-type: none">Find maximum & minimum values in an arrayPerform basic array transformationsCombine multiple .nc files into one large fileChange the resolution of data in an array	<ul style="list-style-type: none">XarrayNumPy
<ul style="list-style-type: none">Visualize various types of satellite data on map projections (imagery, point data, gridded data)	<ul style="list-style-type: none">MatplotlibCartopy
<ul style="list-style-type: none">Add “professional touches” to plots (color bar, lat/lon ticks & gridlines, coastlines & borders, land/ocean shading, automatic title)	<ul style="list-style-type: none">MatplotlibCartopydatetime module
<ul style="list-style-type: none">Create a skew-T/log-P plot	<ul style="list-style-type: none">MetPy

We worked with specific examples of satellite data, but these concepts and the workflow are applicable to **any** NOAA satellite data product!



Homework Topics (Practice on Your Own)

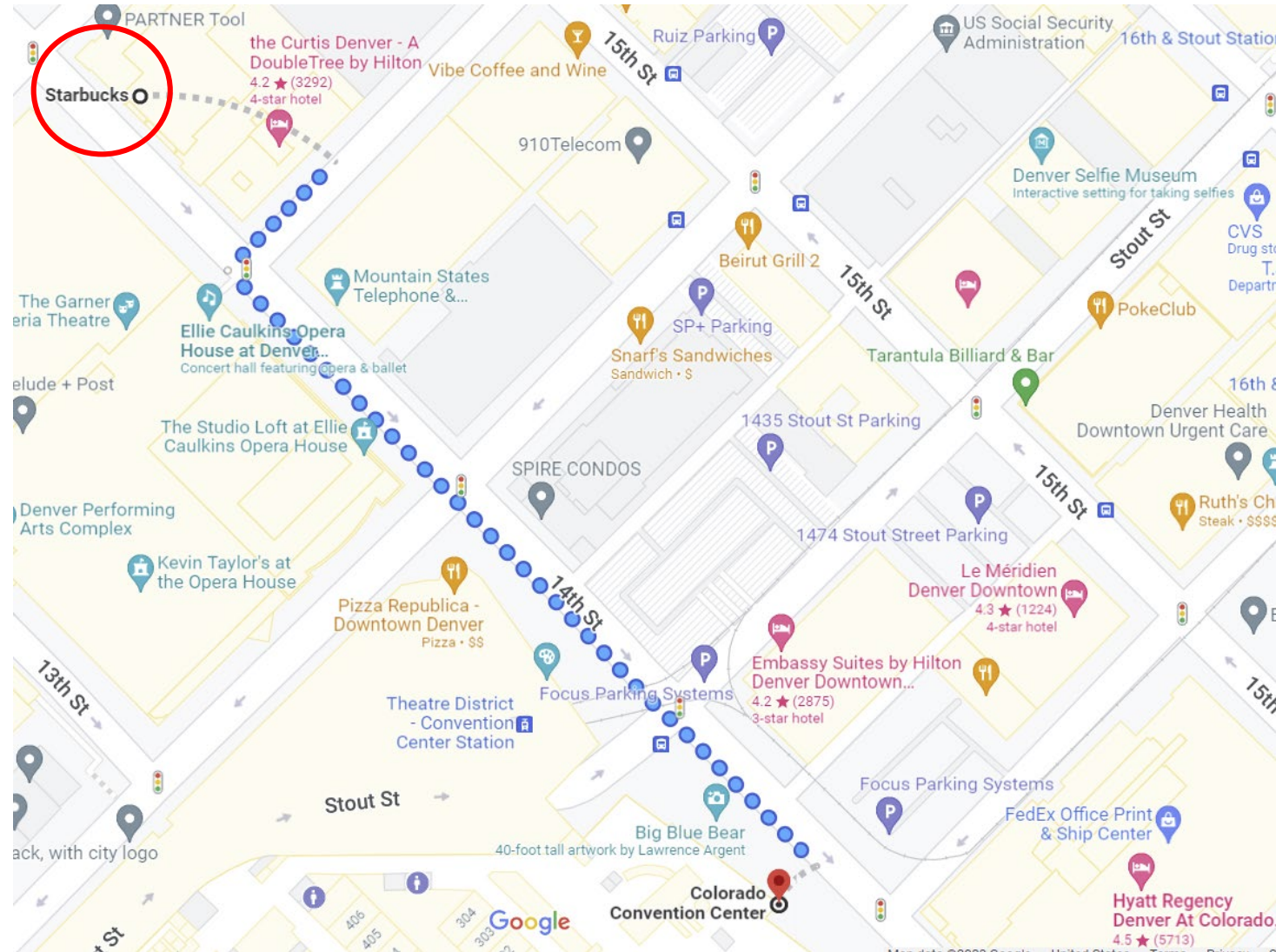
- Add code to save ABI RGB image files and NUCAPS skew-T/log-P image file to a directory on your computer
- Work through any of the in-Notebook exercises we skipped
- Download an ABI or VIIRS data file for one of the same products we covered but for a different day
- Download a data file for a different GOES-R or JPSS product (any day)
- Open the new downloaded data file and read the metadata, explore the data variables, etc.

You have all the tools you need to apply what you've learned today to the satellite data you work with in your research/education!



Amy & Rebekah Office Hours

- Need some extra help? Have a Python or satellite data question?
- Office hours on **Monday, January 9 at 5-6 pm**
- **Starbucks** in the Curtis Denver hotel (DoubleTree by Hilton Hotel)
 - 1405 Curtis Street, Denver, CO 80202
 - Located on 14th Street between Curtis Street & Arapahoe Street
 - **There's a street entrance on 14th Street, you don't have to go into the hotel**



JPSS & GOES-R Satellite Sessions at AMS

Session Name	Day	Time	Room
Session 1 - Overview and Applications of the Future GeoXO Satellite Series	Monday	0830 - 1000	710/712
Session 3 - New Generation Geostationary Observations and Instruments	Monday	1330 - 1500	710/712
Session 9B - Special Session on the GOES Series Satellite System, Part I Amy is presenting	Wednesday	0830 - 1000	710/712
Session 10B - Special Session on the GOES Series Satellite System, Part II	Wednesday	1045 - 1200	710/712
Session 11B - Special Session on the JPSS Series Satellite System, Part I	Wednesday	1330 - 1500	710/712
Session 13A - Other Topics on New Generation Operational Environmental Satellite Systems	Thursday	0830 - 1000	704/706
Session 13B - Satellite Algorithm Development, Verification, Calibration, and Validation, Part I	Thursday	0830 - 1000	710/712
Session 13C - Special Session on the JPSS Series Satellite System, Part II	Thursday	0830 - 1000	711
Session 14A - Satellite Algorithm Development, Verification, Calibration, and Validation, Part II	Thursday	1045 - 1200	704/706
Session 15A - Near-Real-Time [NRT] Processing and Utilization of Satellite System Observations of Extreme Weather, Water, and Climate Events to Support Societal Needs Rebekah is presenting	Thursday	1330 - 1500	704/706
Session 15B - Satellite Algorithm Development, Verification, Calibration, and Validation, Part III	Thursday	1330 - 1500	710/712
Joint Session J16A - Using Artificial Intelligence to Analyze Satellite Earth Observations	Thursday	1545 - 1700	102
Session 16A - Advanced Planning and System Architectures for the Next-Generation Weather Enterprise: NESDIS Ground Enterprise Study	Thursday	1545 - 1700	704/706
Session 16B - Satellite Algorithm Development, Verification, Calibration, and Validation, Part IV	Thursday	1545 - 1700	710/712



Python Educational Resources

- Irving D (2019). Python for atmosphere and ocean scientists. Journal of Open Source Education. 2(11), 37. [doi:10.21105/jose.00037](https://doi.org/10.21105/jose.00037)
- Pangeo Forum: <https://discourse.pangeo.io/>
 - Good resource for Earth Science related Python coding questions
- Pythia Foundations: <https://foundations.projectpythia.org/landing-page.html>
 - A community learning resource for Python-based computing in the geosciences



Course Evaluations & Feedback

- **Sherrie Morris will be sending you a course evaluation**
 - It will be a link to a Google Form questionnaire
 - Very short, will take < 5 minutes to complete!
 - Please complete it if you can, feedback helps us plan future courses!
- AMS will also send a course evaluation (not sure what it entails)
- **If you enjoyed the course, feel free to send an email with your feedback directly to Amy & Rebekah!**
 - Positive feedback shows NOAA the value of providing training to end users, ensures continued support for training courses

