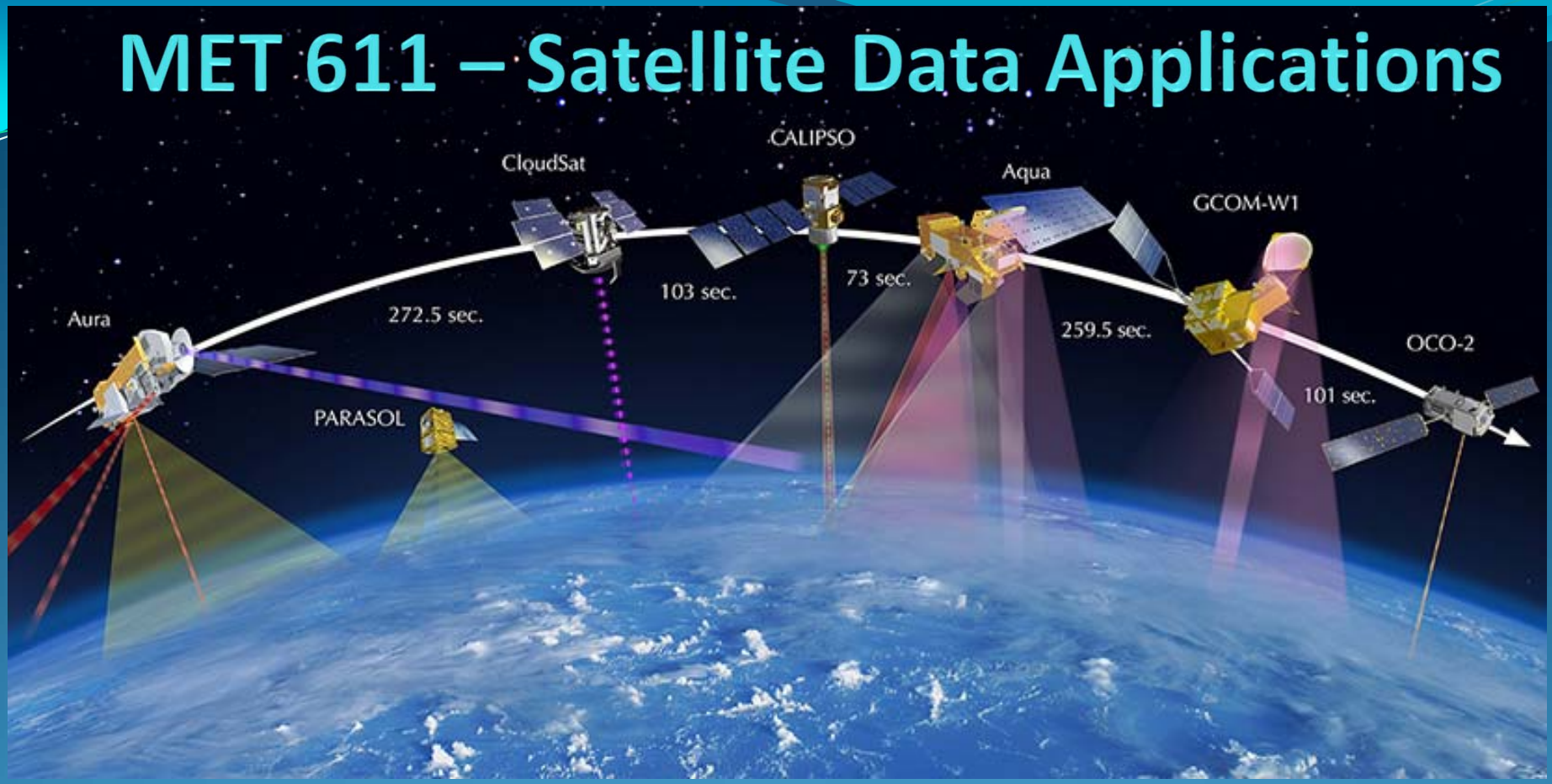
MET 611 – Satellite Data Applications



Semester Project and Brainstorming

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Semester Project

- **Worth 400 points (40% of your grade)**
- In the format of a mini-mock NSF or NASA proposal that will contain specific sections:
  1. An **Introduction** to state the current problems and why you want to propose this project
  2. **Objectives** and significant of the project and hypotheses or questions you want to answer
  3. What kind of **Data**, **Method** and/or **Modeling** approach you will use to conduct the project, and usually you need to show some preliminary or previous results
  4. **Expected Results** and/or potential significance after you finished the project

Semester Project Time Line

Deadline	Project Component
9/15	(Turn in by email, or in class) **Potential Topic:** List of three satellite data sets you plan on using in your "proposal." The minimum is three, you can use more datasets if you choose/need.
10/6	(Turn in by email) **Draft – Literature Review:** 2-3 page (or more) review of literature you plan to include in your "Introduction" section to set the stage for why you are proposing your research. A great idea is to tie your topic to your thesis research. How can you look at your thesis work using satellites? What new question/aspect could you address?
10/20	(Turn in by email) **Draft Outline:** objectives, data set descriptions, specific hypotheses you like to test, methods of how you will use your data.
11/3	By this date you should complete some data analysis using an example (a successful case-study or mini-analysis) using the three data sets. This is to show you can successfully perform the analysis you propose on a small scale.
11/17	Work on your **Abstract and Summary** to tie things together.
12/5, 12/7 and 12/12	Presentations
12/12	**Final Paper/Proposal Due** (10 pages + References)

Semester Project Format

- **FORMATTING:**
  - **Spacing:** 1.5
  - **Page Requirement:** 10 (not counting references, but including figures_
  - **Margins:** 1 inch all around
  - **Font Type:** Times New Roman
  - **Font Size: 12** (no more, no less)
  - **Page Numbers:** Lower right hand corner.

- **Cover Page (1 page, doesn't count for the 15):** The cover page will have your title, name, course number and contact information

- **Proposal Summary (1/2 page):** like a 250 work AGU or AMS abstract (this summarizes the whole paper). It can have bullets or just be solid text.

- **Introduction (2-3 pages):** This is your background information about the topic you'll be focusing on. This will include your scientific justification for doing the work that you're doing. You'll use most of your literature review here. Feel free to set up sections and sub sections. You need to make a good case for why your topic of interest is important.

- **Research Objectives (1/4-1/2 page):** Brief description of what you propose to do and why it is important. You can set up going research topic goal(s) as bullets here to make it very clear. (you should use your case study to show an example from each goal if you have more than one).

Semester Project Format

- **Expected Significance (1/4-1/2page):** Why is your idea important to people or to the research community (ocean modeling, hurricanes, etc). How do you think this will help your field of interest? You can use information from your objectives and literature review for this. Some folks included these ideas in one, the other, or both.

- **Technical Approach and Methodology (4-6 pages with figures and tables):** Here is where you describe your data sets, study region(s), and how you will analyze them. After you describe your methodology (how you're going to use each data set and combine them to address your research objective) include your case study to show that it is possible. ***Include figures and tables in the text not at the end***.

- **Summary (1/2-1 pages):** Here you summarize your case study example results and how it shows the potential of addressing your research goals described in the "Research Objectives" section. This is the "Look see, I CAN use these data sets to get information about xxxxxx (hurricane intensification, pyrocbs, vog, etc), that will help me address my goals." Will be very similar to the project summary, that's ok.

- **References:** List your references. (Doesn't count for your 10 pages)

Presentation Criteria

- **Presentation content is broken up into different criteria.**
- **Worth 80 points out of the 100**

	Excellent	Sufficient	Bare Minimum	Insufficient	Total
Introductory Material (20, 15, 10, 5 points)					
Motivation (10, 7.5, 5, 2.5 points)					
Data Description (10, 7.5, 5, 2.5 points)					
Example/Case Study (30, 22.5, 15, 7.5 points)					
Summary/Conclusion (10, 7.5, 5, 2.5 points)					

Presentation Criteria

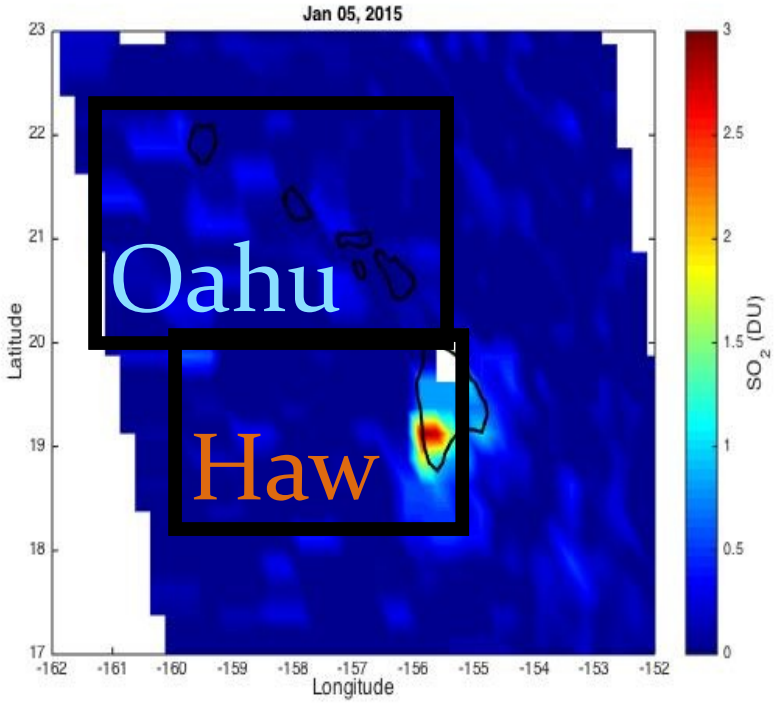
- **Public Speaking Based Categories**
- **Worth 20 points out of the 100**

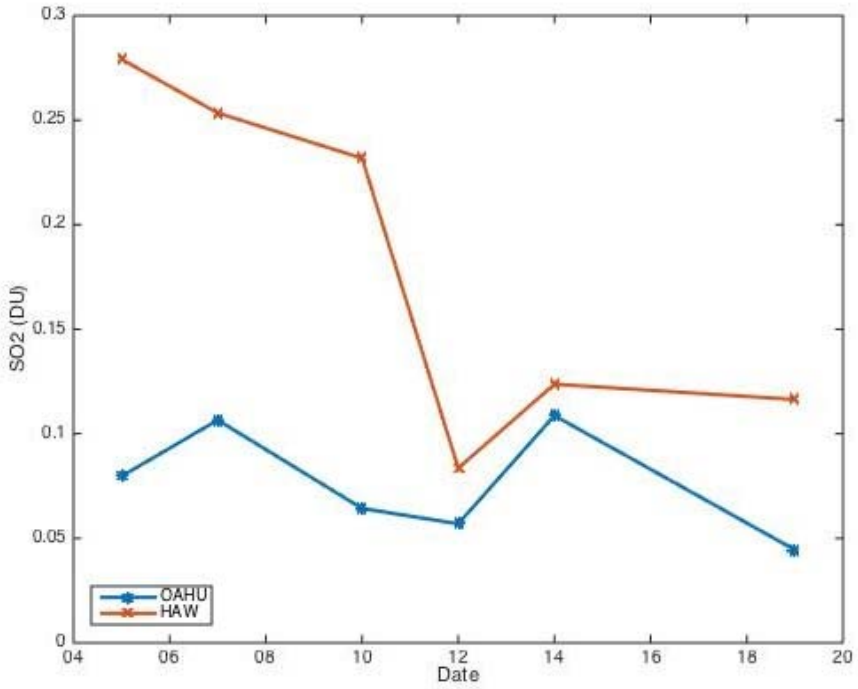
	A	B	C	D	Total
Speaking Skills (10 points)	Poised: clear; articulate; volume; steady pacing, enthusiasm, confidence (10)	Clear on all points but not as polished (7.5)	Mumbling, lack of eye contact; uneven pace; little or no expression (5)	Inaudible or too loud; rate is to slow or too fast; seems uninterested; monotone (2.5)	
Non-verbal Audience Response; Eye Contact (5 points)	Involves the audience; makes eye contact; holds audience's attention (5)	Involves and holds audience's attention most of the time; some eye contact (4)	Lost topic or attention; mostly presented fact without engagement; no eye contact; reads from report (3)	Incoherent audience loses interest; could not determine point of presentation (2)	
Length of Presentation (5 points)	Within +/- 2 minutes of allotted time (5)	Within +/- 4 minutes of allotted time (4)	Within +/- 6 minutes of allotted time (3)	Much too long or too short (2)	
Total/Score					

Example Projects

- **Spaceborne Radar Observations of the Vertical Structure of Tropical Cyclones**
  - TRMM, GPM, and CloudSat
- **Detecting and Tracking Vog from Space**
  - MODIS L2 Aqua Aerosol Data, OMI Aerosol Data, and CloudSat/CALIPSO
- **Comparison of monthly station rainfall data for the U.S. Affiliated Pacific Islands to global satellite derived climatological rainfall and cloud datasets.**
  - GPCP, TRMM, and ISCCP Clouds
- **Examining the Horizontal and Vertical Distributions of Volcanogenic SO2: A case study of volcano Chaitén**
  - MODIS Aerosol, OMI SO_2, and CALIOP Aerosol Products
- **Characteristics of PyroCbs from Satellites**
  - GFEDv3 level 3, MODIS level 3 and level 2, and Cloudsat/CALIOP
- **Vertical Structure of a Kona Storm**
  - CloudSat/CALIPSO, Reanalysis Data, MODIS L3 Atmosphere Products, and GOES-11
- **Impact of Sea Salinity to Ocean Data Assimilation**
  - GHRSST, Sea Surface Salinity, Soil Moisture and Ocean Salinity (SMOS) sea surface salinity (SSS)

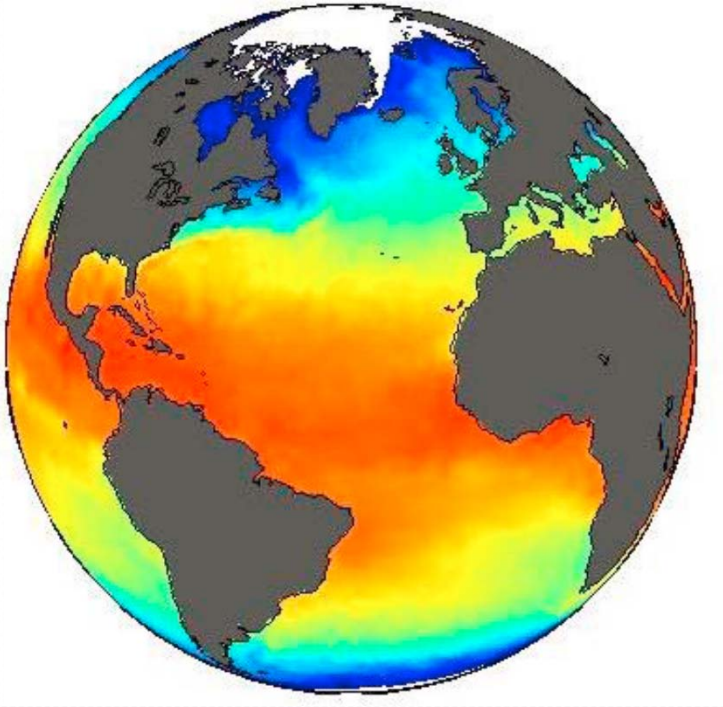
Example Figures from the Vog Project

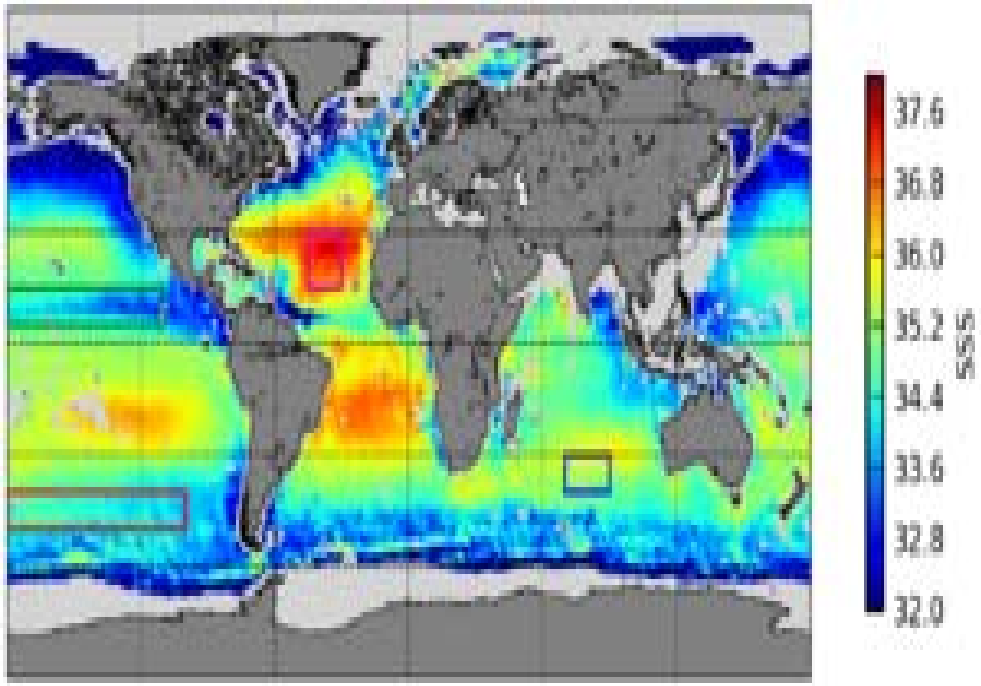




- By analyzing daily OMI SO_2 data, and subsetting to get an average value over a specific region, this student was able to compare SO_2 concentrations in and out of the Vog plume on specific days.

Example Figures from the Sea Salinity Project





- The student combined various data sets for SST and Sea Surface Salinity (SSS) to look at how data assimilation techniques could be improved. Her overall interest was related to improving how the ocean is represented in global climate models.

Example Figures from Rainfall Project

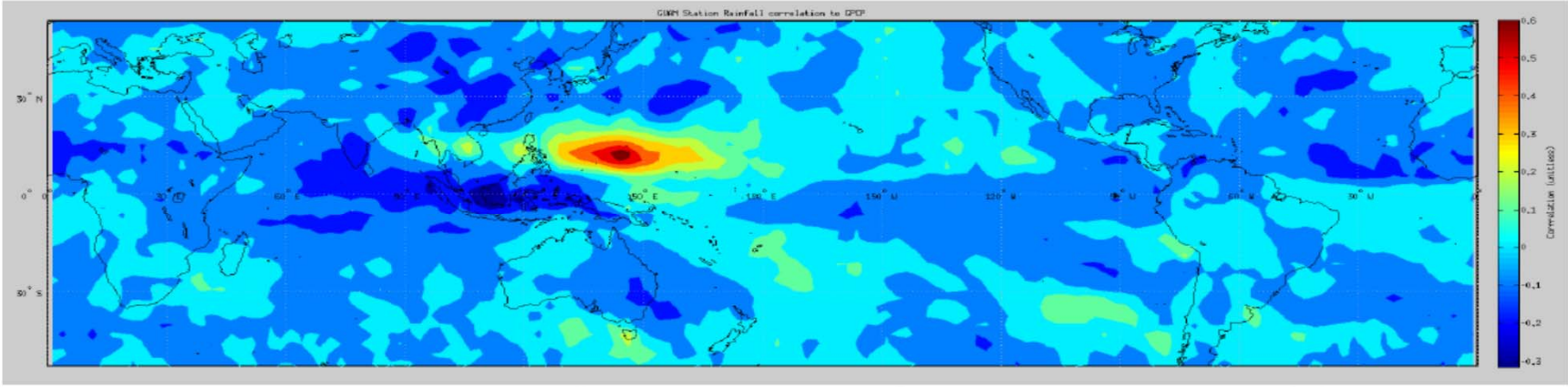


Figure 1: Correlation of Guam monthly rainfall to GPCP monthly rainfall.

	guam	koror	yap	chuuk	pohnpei	majuro	kwajalein	pago pago	nino34
guam	1.000	0.021	0.268	0.152	0.152	0.133	0.208	0.065	-0.034
koror		1.000	0.429	0.246	0.252	0.177	0.071	0.009	-0.238
yap			1.000	0.291	0.268	0.131	0.120	0.074	-0.217
chuuk				1.000	0.469	0.242	0.245	0.029	-0.215
pohnpei					1.000	0.332	0.328	0.008	-0.173
majuro						1.000	0.459	-0.003	-0.171
kwajalein							1.000	0.033	-0.062
pago pago								1.000	-0.041
nino34									1

Table 1: Cross-correlation table between the monthly rainfall anomaly time series at each station and the NINO3.4 index. Correlations in red are not significant at the 95% test level and correlations in yellow are not significant at the 99% test level. All correlation values in white cells are significant at the 99% test level.

- Student looked at rain gauge data form various Pacific Islands and compared the data to the space based observations and then performed an analysis to see if ENSO impacted precipitation.

BRAINSTORMING

- Get into Groups of 3-4 students
- Take a moment to jot down what topics you are interested in. Refer back to last weeks class where we introduced all the satellites we'll be covering.
- Discuss your interests with you group. Everyone take a turn to talk about why they're interested in. Have the group give feedback on your ideas.

BRAINSTORMING

- Once you have topics you'll need to identify potential satellites that you can use to look into questions related to your topic. Consider if you will need map vs. vertical profiles, the spatial resolution of the data and the temporal range and resolution of the data. See the List Below:

  - **MODIS** – L2 or L3 Aerosol, Cloud, Land & Ocean (Map)
  - **CloudSat** – Clouds (Vertical Profiles)
  - **CALIPSO** – Clouds and Aerosol (Vertical Profiles)
  - **OMI and TOMS** – Aerosol, SO_2, O_3 (Map)
  - **GPCP** – Global Precipitation (Map)
  - **TRMM** – Tropical Precipitation (Map & Vertical Profiles)

BRAINSTORMING

- Once you have a general theme or topic and potential data sets you can start to think about specific questions you can try to answer
- **Suggestions:**
  - **Case Studies** of single events are always a good choice, they are focused in time and a specific location
  - **Climatologies** are also interesting, especially when comparing two different data sets for the same region (if you're trying to see if they are related to each other).
  - **Combining "map" and "vertical"** data for an event can give a holistic picture (e.g. a hurricane, volcanic event, dust or fire)
  - Combining the project with your **Thesis Research** topic can help make the write up easier.

BRAINSTORMING

- Take a few days to think about your project. Use the brainstorming sheet as a jumping off point.

- Send an email by 5 pm 9/15 that includes:
  - Topic – a preliminary title
  - List of the THREE data sets you'll be using
  - Potential question you'll be addressing