*CICS is now the*

# Cooperative Institute for Satellite Earth System Studies

# CISESS

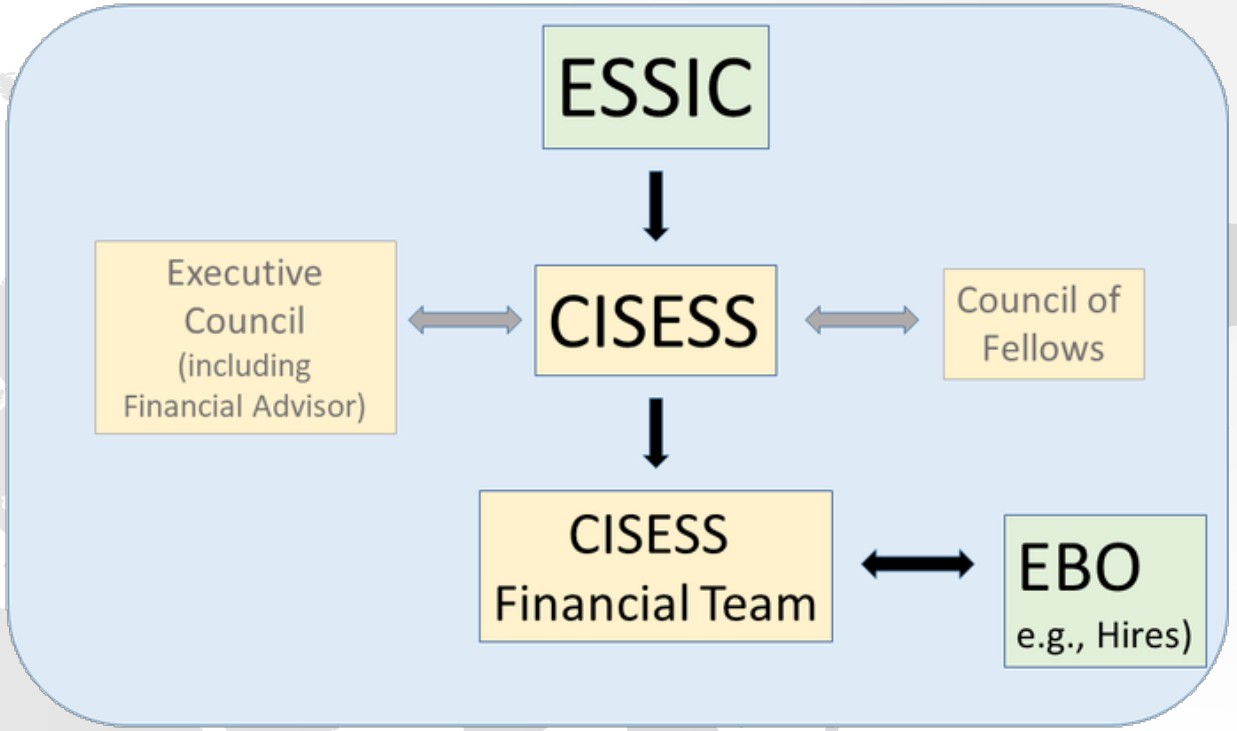


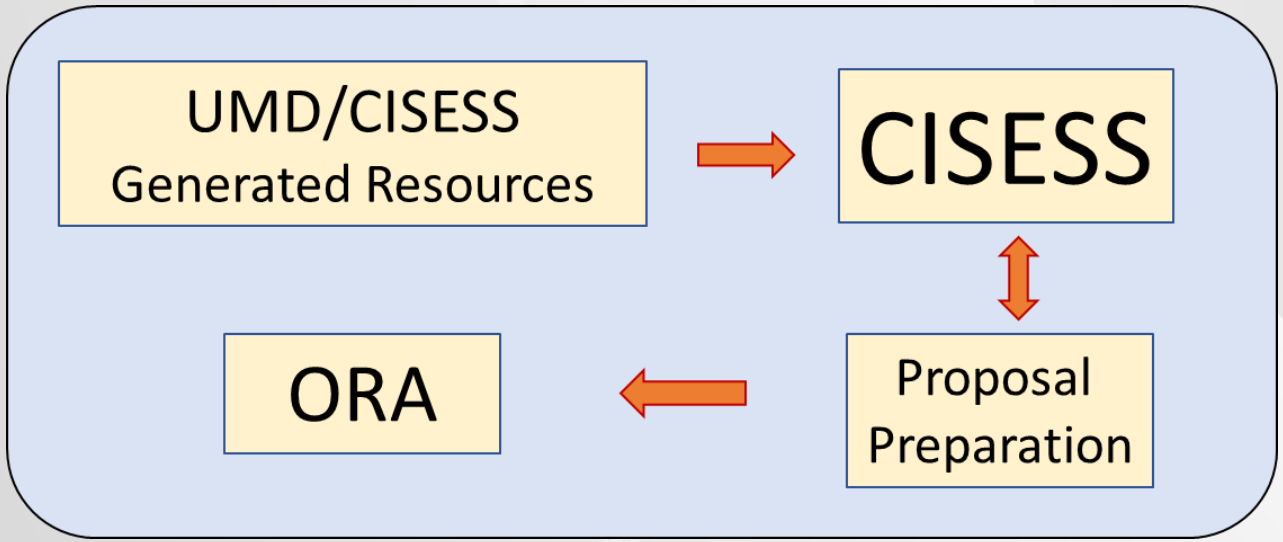
## CISESS Updates

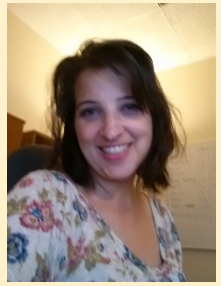
a. CISESS New Financial Structure
b. CISESS Science
d. Progress with the PGTC
e. The Remote Sensing Lab
f. Other

# CISESS Financial Structure

| CICS | 2010 | 2018 |
|---|---|---|
| People | 35 | 120+ |
| Funding per year | $7M | ~$25M |



**Director of Finances:**
*Heather Mattern*

**Finance Team Location:**
*Third floor*

# CISESS Science

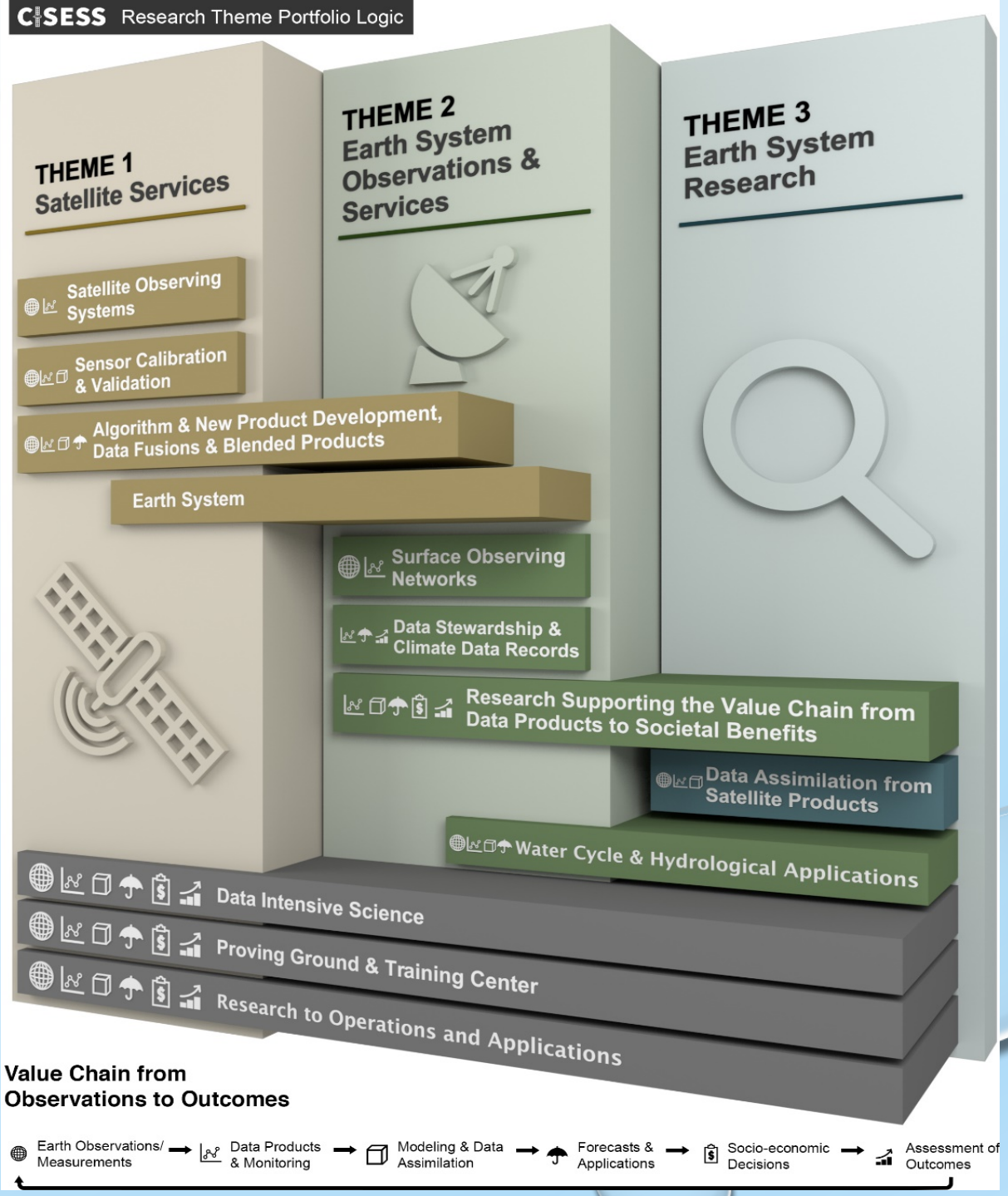
## CICS Main Themes

- Theme 1:  Climate and Satellite Research and Applications,
- Theme 2:  Climate and Satellite Observations and Monitoring,
- Theme 3:  Climate Research and Modeling.

## CISESS Main Themes

- Theme 1:  Satellite Services,
- Theme 2:  Earth System Observations and Services,
- Theme 3:  Earth System Research.

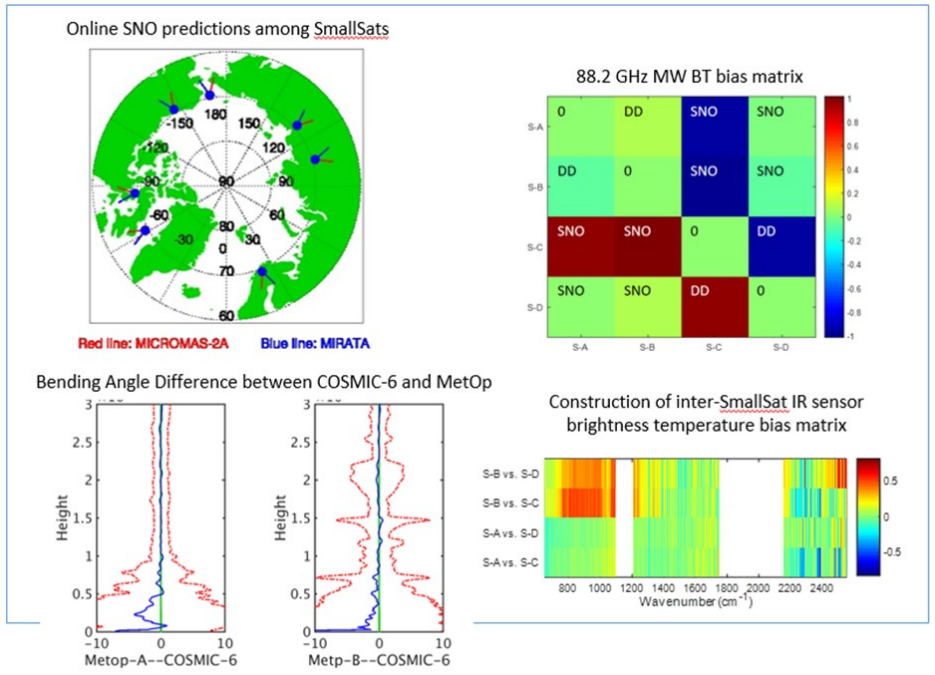
# CISESS
# Science Structure



# Satellite Observing Systems



**Goal:** To support, develop and implement NOAA satellite systems, particularly through support for GOES-R, JPSS, and SmallSat developments.




Calibration and validation support for small satellite data exploitation. Development of a framework to integrate data handling for multi-sensor (microwave, infrared and radio occultation) data from different small satellites.

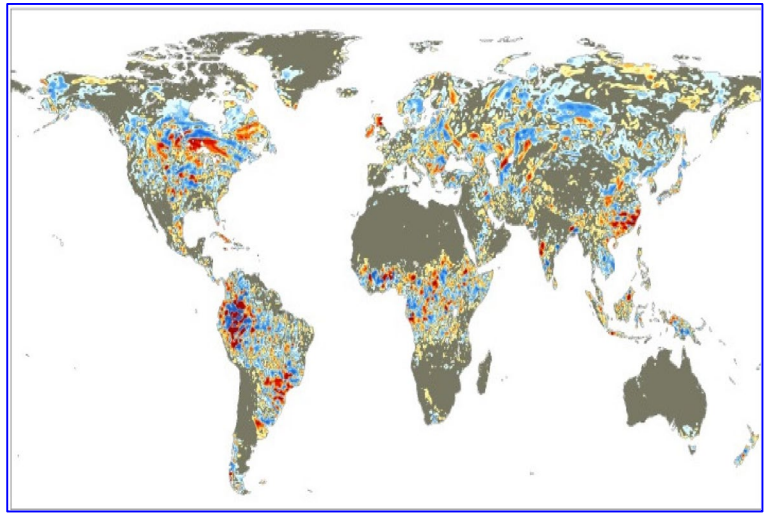
The tools, techniques and algorithms that are developed will be incorporated into STAR's Integrated Calibration/Validation System (ICVS).

Source: Xi Shao

# Earth System Data Assimilation
## (DA of Satellite Products)

(Supporting STAR, ARL)

**Goal**: To develop improved methods for integration of information by data assimilation, particularly satellite-derived products, with models of the Earth System and its components.



### Assimilation of Soil Moisture

RMSE for the predicted 3-h Prec. The red color indicates degradation, whereas the blue color is improvement. (Source: Jifu Yin)

### Scientific Support for NESDIS/JCSDA Data Assimilation Activities

This research aims to accelerate and optimize the DA of passive microwave, infrared, and active (lidar/scatterometer) sensors and other new sensors into NOAA systems implemented in the JCSDA and NOAA supercomputers. Research applicable to LEO, GEO and SmallSats.

### Assimilation of Tropospheric Trace Gases to Support NOAA Air Quality Forecasting Systems. Assimilation of GOES smoke and dust AOD data for improved emission estimates in HYSPLIT

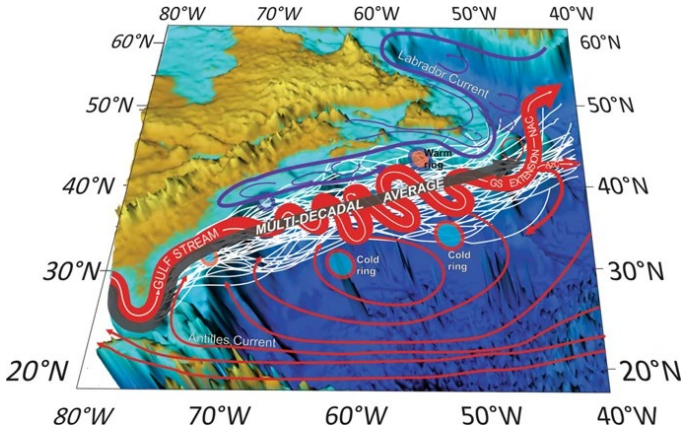
Extend the existing data assimilation tools in NOAA, GSI/JEDI, to assimilate the gaseous species, such as surface ozone, CO, NO2, and SO2 to improve U.S. National Air Quality Forecast Capability (NAQFC).

# Data Stewardship

(Supporting NCEI)

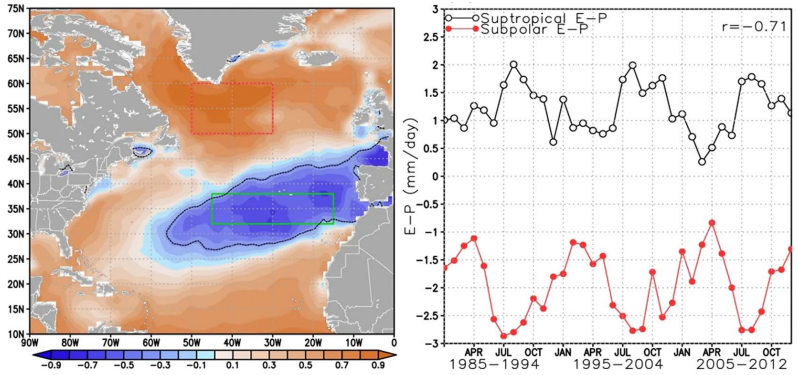
**Goal**: To develop systems that provide stewardship and data access for the Federal Government's billion-dollar investment in high-quality environmental data.

Develop and provide authoritative satellite Climate Data Records (CDRs) for the atmosphere, oceans, cryosphere, and land. **(And the corresponding needed research.)**




Resilience of the Gulf Stream path on decadal and longer timescales (D. Seidov, A. Mishonov, J. Reagan & R. Parsons)

*"The Ocean Heat Content, the key ocean climate change parameter, is the best indicator of the Gulf Stream path's variability on decadal and longer time scales."*



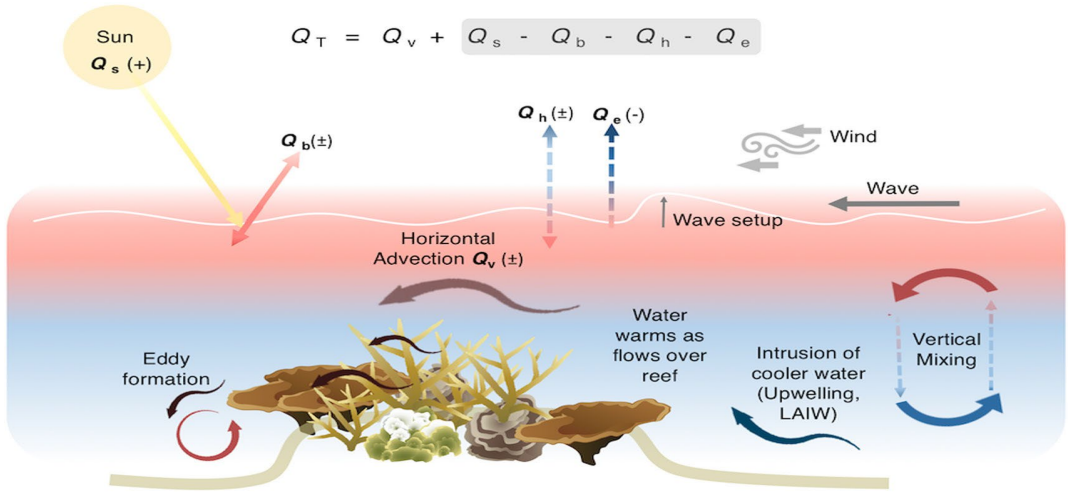

Water Vapor Transfer and Near-Surface Salinity Contrasts in the North Atlantic Ocean (J. Reagan, D. Seidov & T. Boyer)

*"These results provide a first step to ultimately utilizing Near Surface Salinity in the North Atlantic as a proxy for estimating changes in the hydrological cycle."*

# Research Supporting the Value Chain from Data Products to Societal Benefits

(Supporting NCEI)

Goal: To transform NOAA satellite/instrumental data and computational model outputs into information that can be used in decision-making for the benefit of the society.




- Cloud cover and murky water;
- Acclimatization through experience of milder heat stress over a long time scale;
- Longer recovery time between bleaching events; and
- High-velocity flow conditions that removes the toxins produced by the heat.

## Resistant Coral Reef Ecosystems

Study of biological and physical factors that can protect coral against high temperature bleaching

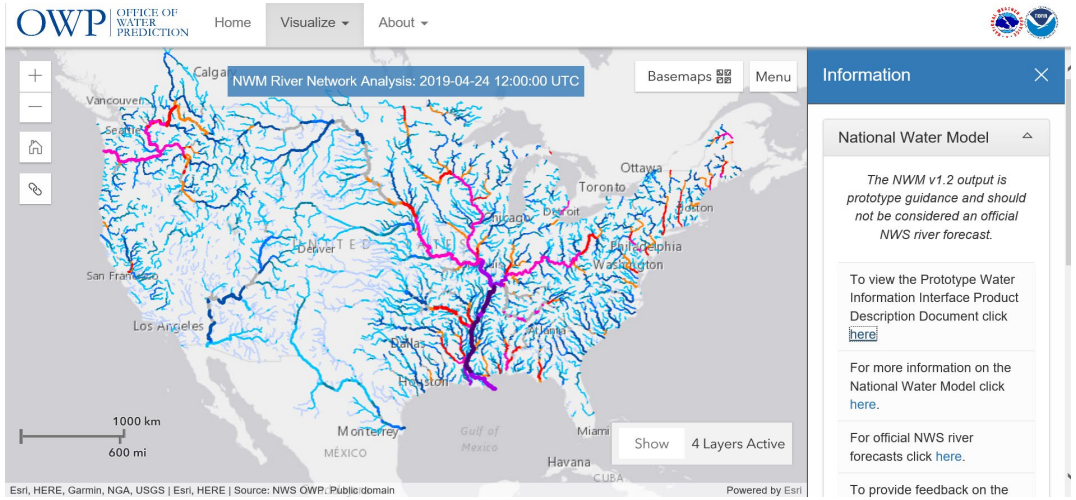
Knowledge of these factors will aid decision making on how best to preserve coral reefs from the real-time danger of climate change

Source: Scott Heron

# Water Cycle Research

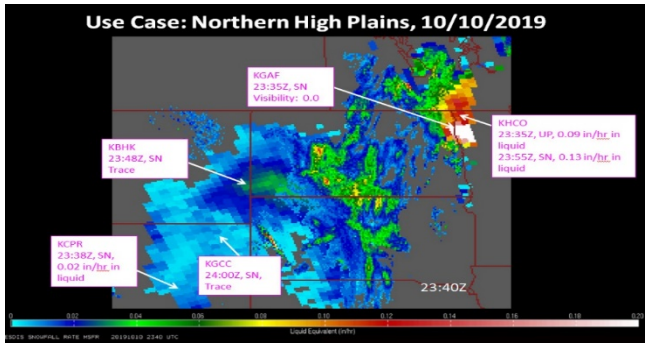
(Supporting NWC)

**Goal:** To enhance, refine, and validate algorithms that derive land surface and water cycle products from satellite observations in order to improve the performance of the National Water Model towards end-to-end prediction of the water cycle.

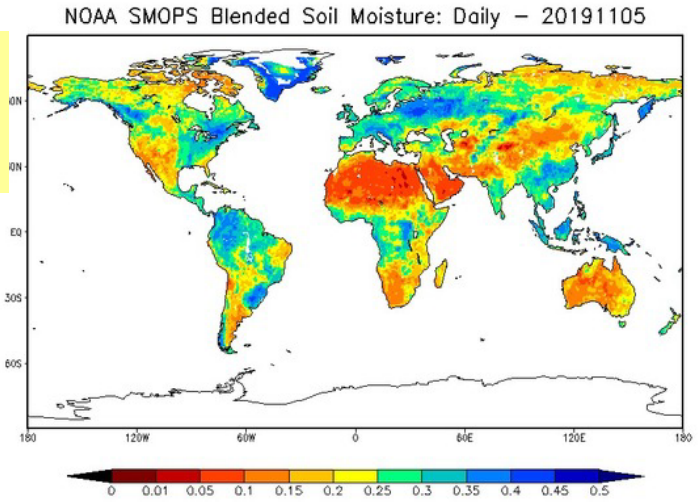


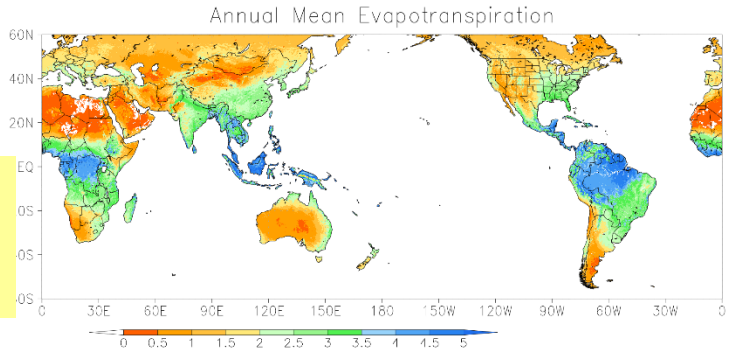

*Experimental National Water Model River Network Analysis for 24 April 2019. Source: https://water.noaa.gov/map*

**Snowfall rate**
Source: H. Meng, J. Dong, C. Kongoli, R. Ferraro.




**Soil moisture** (SMOPS)
Source: Jerry Zhan, Jicheng Liu, Jifu Yin



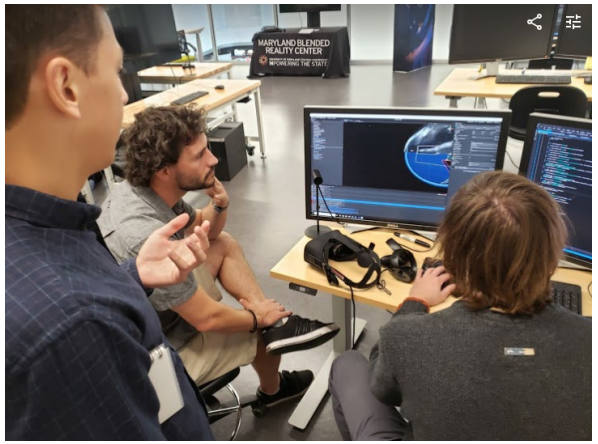

**Evapotranspiration**
Source: Jerry Zhan, Chris Hain, Mitch Schull

# CISESS Proving Ground and Training Center

Goal: operate as a testbed for new products, facilitate research-to-operations (R2O) activities, and train Earth System forecasters with satellite products developed at CISESS.

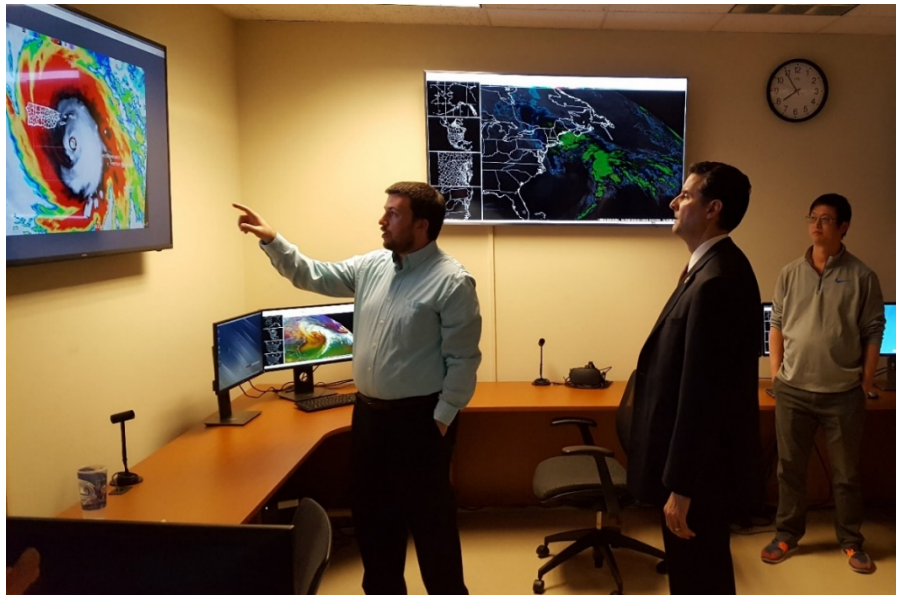
- *4 AWIPS Work Stations*
- *Roof-mounted SBN dish*
- *2 dedicated servers*
- *Convenient access to NCWCP*
- *Supported in-part by:*
  - GOES-R / GLM
  - JPSS PGRR


# PGTC Lab Overview



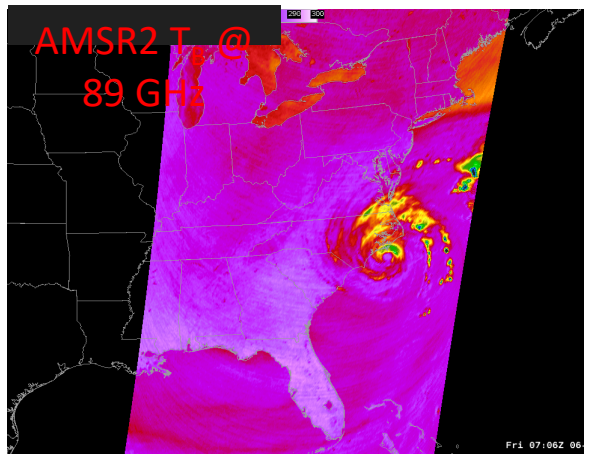

**Examples:**

- *Support for GOES-R and JPSS Programs*
- *Implement AWIPS-2, McIDAS-X, and WDSS-II*
- *Train Students and Scientists on this software*
- *Develop New Products and Visualizations*
- *Explore the use of VR in forecasting environments (interacting with UMD's Graphics and Visual Informatics Laboratory, GVIL)*



**Distinguished Visitors:**

- *Amitabh Varshney, Dean*
- *Wallace Loh, President*
- *Laurie Locascio, VPR*
- *Congressman Sarbannes*
- *Delegate Pat Young*



# Building a CISESS Remote Sensing Lab

## Objectives

- Provide an end-to-end demonstration of remote sensing capabilities, from instrument hardware development to data applications.
- Encourage undergraduate and graduate students *from different areas* to get involved in different aspects of remote sensing, from instrument design and calibration to geophysical information retrieval

# CISESS Remote Sensing Lab

## Activity 1 – Hu (Tiger) Yang

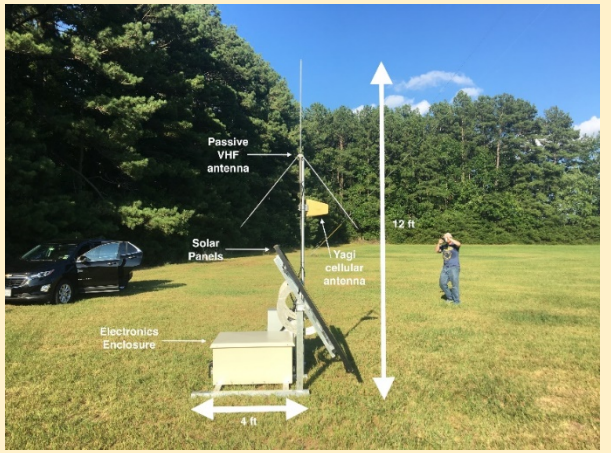
Design and build a ground-based radiometer for better understanding of observations from the microwave instrument hardware, therefore providing better science support for the JPSS program

Ground Based Microwave Radiometer (GMS)

Advisor:
Norman Grody

## Activity 2 – Mason Quick

The Lab will be employed to perform maintenance of instruments being used in the DCLMA. The activity involves network device configuration, testing of power supplies, and re-wiring cable connections.



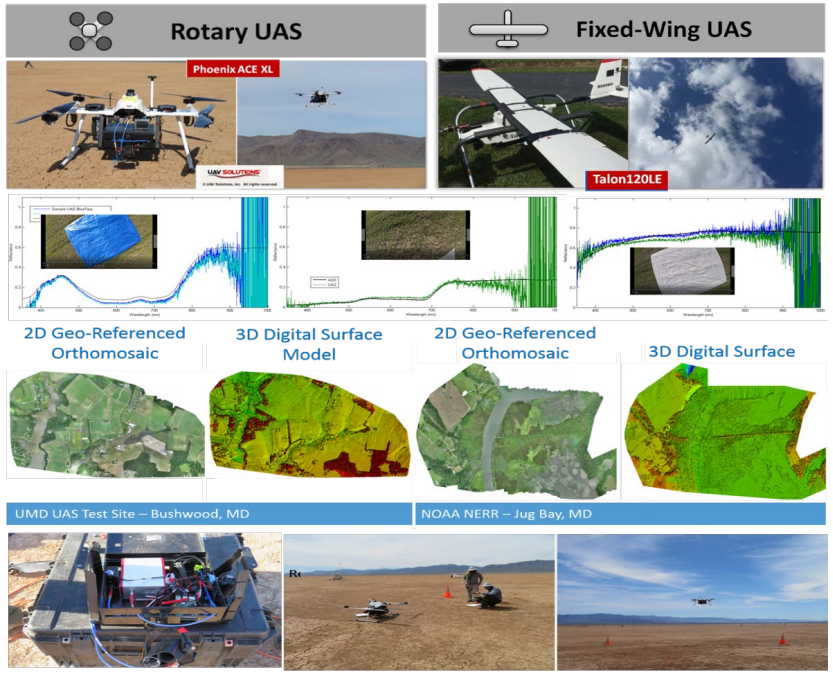

Solar Powered LMA Antenna

# Activity 3 - Xi Shao (UMD) , Frank Padula and Aaron Pearlman (Geothinktank LLC.), UMD-UAS Test Site Team

# GOES-R Near-Surface Unmanned Aircraft System (UAS) Feasibility Demonstration Study

## Activities

- This project provides science, engineering and testing support for GOES-R near-surface Unmanned Aircraft System (UAS) feasibility demonstration study.
- It supports GOES-R near-surface UAS design, performs hardware procurement for the prototype UASs, and supports the integration, initial testing and field campaign of GOES-R UAS.
- Employs 3-D printer technology for prototyping the enclosure/case for integrating the multiple payload components, connectors, and mounting gear, and more.




## Results

- Supported UAS System design and procurement
- Performed sensor integration
- Completed successful test flights at UMD UAS test sites
- Supported GOES-R field campaign UAS deployment in Red Lake, AZ in Apr., 2017


Thanks