The University of Texas at San Antonio
UTSA Center for Advanced Measurements in Extreme Environments

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2021 Professional Development Teacher Workshop

June 21-22, 2021

Hosted Virtually: via Zoom

Monday, June 21, 2021		
8:45 a.m.	Zoom Meeting Open for Roll Call (6/21Session)	Click Here to Access Meeting
9:00 a.m.-9:30 a.m.	Keynote Address **Presented by: Dr. Carmen Cruz** Lead Education Program Specialist NASA California Office of STEM Engagement	NASA STEM Engagement
9:30 a.m.-11:30 a.m. (AM Session)	***Hypersonics/Wind Tunnel*** Presented by: Dr. Christopher Combs Assistant Professor Department of Mechanical Engineering (5 minute break)	UTSA Hypersonics Lab Dr. Chris Combs Twitter page
11:35 a.m.-12:05 p.m. (AM Session)	Hands-on Activity Lesson for Hypersonics/Wind Tunnel Session	Presented by UTSA Hypersonics Lab
12:05 p.m.-12:30 p.m. (AM Session)	Open Group Discussion for Hypersonics/Wind Tunnel Session	
12:30 p.m. – 1:00 p.m.	*Lunch Break*	
1:00 p.m. - 3:00 p.m. (PM Session)	***Data Science*** Presented by: Dr. Kiran Bhaganagar Associate Professor Department of Mechanical Engineering	UTSA Laboratory of Turbulence, Sensing & Intelligence Systems (TSIS)
3:00 p.m. - 3:30 p.m. (PM Session)	Hands-on Activity Lesson for Data Science Session (5 minute break)	Presented by UTSA TSIS Lab
3:35 p.m. - 4:00 p.m. (PM Session)	Open Group Discussion for Data Science Session	
4:00 p.m.	Closing for Day 1	See you tomorrow!

Tuesday, June 22, 2021		
8:45 a.m.	Zoom Meeting Open for Roll Call (6/22 Session)	Click Here to Access Meeting
9:00 a.m.- 11:00 a.m. (AM Session)	***Oceans & Hurricanes*** Presented by: Dr. Alberto Mestas-Nuñez Associate Professor in Practice Department of Geological Sciences (5 minute break)	Dr. Mestas Webpage
11:05 a.m.- 11:35 a.m. (AM Session)	Hands-on Activity Lesson for Oceans and Hurricanes Session	Presented by the UTSA Ocean Science Lab
11:35 a.m.- 12:00 p.m. (AM Session)	Open Group Discussion for Oceans and Hurricanes Session	
12:00 p.m. - 1:00 p.m.	*Lunch Break*	
1:00 p.m. - 3:00 p.m. (PM Session)	***Snow and Ice and Polar Expeditions*** Presented by: Professor Stephen Ackley Associate Professor of Research Department of Geological Sciences	UTSA Laboratory for Remote Sensing and Geoinformatics
3:00 p.m. - 3:30 p.m. (PM Session)	Hands-on Activity Lesson for Polar Expedition Session (5 minute break)	Presented by UTSA LRSG Lab
3:35 p.m. - 4:00 p.m. (PM Session)	Open Group Discussion for Polar Expedition Session	
4:00 p.m.	Survey and Closing for Day 2 Thank you for your participation!	

NOTE: Please see the following pages for each session overview.

CAMEE

Hypersonics/Wind Tunnel

Presented by: Dr. Christopher Combs
Assistant Professor
Department of Mechanical Engineering

Hypersonic flight is an emerging field with the potential to provide truly disruptive technologies that impact the commercial aviation, defense, and space exploration sectors. Velocities faster than five times the speed of sound or Mach 5—roughly 4,000 miles per hour—are generally considered to be hypersonic. At hypersonic velocities, a flight from New York to Los Angeles could take less than 30 minutes (compared to 5 hours on a conventional commercial aircraft). The Space Shuttle, Apollo capsule, Russian Soyuz, and future missions returning from the Moon or Mars all reenter the Earth's atmosphere at hypersonic velocities. In this session, Dr. Chris Combs will provide an introduction to some of the key concepts related to hypersonic travel, while also discussing high-speed wind tunnels, measurement techniques, and related challenges.

Educational Resources:
NASA Hypersonics guide with additional links:
https://www.grc.nasa.gov/WWW/BGH/index.html
NASA "What are wind tunnels?": https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-are-wind-tunnels-k4.html
NASA Wind tunnel design with additional links:
https://www.grc.nasa.gov/WWW/k-12/airplane/tunnozd.html
Compressible aerodynamics calculator:
http://www.dept.aoe.vt.edu/~devenpor/aoe3114/calc.html
Video "How close are we to hypersonic travel?":
https://www.youtube.com/watch?v=NOMeK2jb8Xs
NASA "Tyranny of the rocket equation":
https://www.nasa.gov/mission_pages/station/expeditions/expedition30/tryanny.html

Data Science

Presented by: Dr. Kiran Bhaganagar
Associate Professor
Department of Mechanical Engineering

Recent years have witnessed the creation of novel ways to generate and interpret data that has resulted in data revolution. Researchers across all disciplines see the newfound ability to link and cross-reference data from diverse sources as improving the accuracy and predictive power of scientific findings. In this session, teachers will be introduced to the concept of data as a scientific tool to understand scientific phenomena. The attendees will be introduced to various geophysical problem using various data collection methods. An overview of advanced measurement techniques will be presented. This will be followed by hands-on-activities of working with the datasets and understanding the geophysical phenomena using scientific data. The session will include resources that the teachers can use in their classrooms. The overarching goal of this session is to introduce the multifacets of data-sciences in scientific research.

Educational resources: https://mynasadata.larc.nasa.gov/

Oceans & Hurricanes

Presented by: Dr. Alberto Mestas-Nuñez
Associate Professor in Practice
Department of Geological Sciences

This session will provide an overview of the Atlantic Ocean and how interacts with the atmosphere in generating hurricanes. Some of the topic discussed will include: How do hurricanes work? What are the components of a hurricane? Where do hurricanes come from, where do they go, and why? How are they named? How do we interpret a hurricane forecast? Why some atmospheric perturbations grow to become hurricanes, but others don't? How will hurricane activity be affected by climate change? How do we measure atmospheric conditions inside a hurricane? We will then look at how hurricanes impact the ocean, focusing on applications of ocean remote sensing and remotely operated buoyancy glider observations. The session will end with a hands-on demonstration of educational resources related to the ocean that can be used with the K-12 curriculum.

Snow and Ice and Polar Expeditions

Presented by: Dr. Stephen Ackley
Associate Professor of Research
Department of Geological Sciences

This session will provide briefly review the major snow and ice elements of the Cryosphere and how they have been responding to global warming in recent times, particularly the sea ice covers of the polar ocean, and the large ice sheet of Antarctica. An overview of the two month winter research cruise of the research icebreaker, NB Palmer, into the sea ice cover of the Ross Sea Antarctica will be shown, with examples of the sophisticated technologies that are used to determine the details of how the ice cover grows, deforms and decays in its annual cycle and interacts with the atmosphere and ocean in the annual cycle. These technologies include Autonomous underwater vehicles, airborne drones, weather balloons, lidars, automatic cameras, autonomous buoys and floats, and ocean sampling using cast systems from the vessel. Remote sensing technologies from satellites using radar and lidar to measure ice cover properties from space will be described and shown how they give information over longer time and space scales and coordinated with the ship-based measurements.

Educational Resources:
PolarTREC: https://www.polartrec.com/resources
AntarcticGlaciers.org: http://www.antarcticglaciers.org/