

# Patterns and Controls on Trace Gas Fluxes of CO<sub>2</sub> and/or CH<sub>4</sub> in Marine and Terrestrial Habitats from Barrow, Alaska to Pago Pago, American Samoa

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Studies (C2S2)  
San Diego State University

May 21, 2019

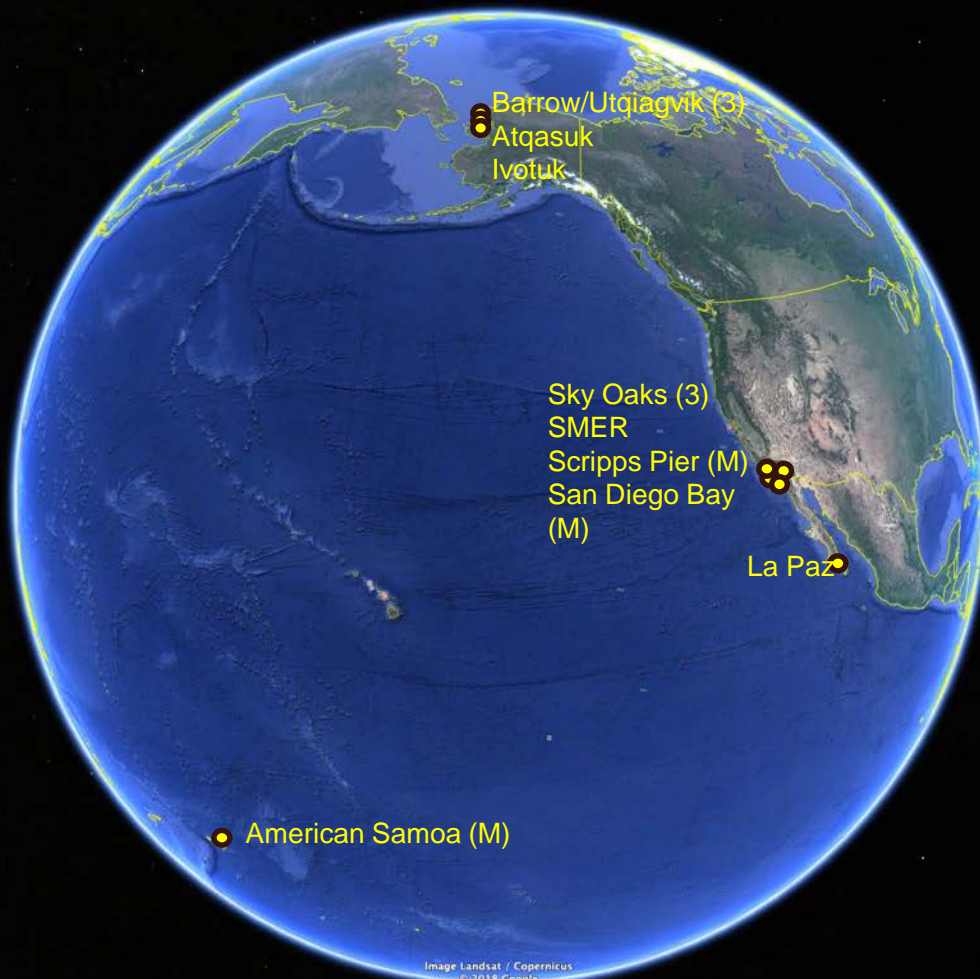


# Educational Partnership Program with Minority-Serving Institutions

- The EPP/MSI is a Federal STEM education and NOAA mission future workforce program with focus on:
  - supporting the training and graduation of students and increasing participation of students from traditionally underrepresented minority communities;
  - developing eligible candidates in support of a diverse future workforce for NOAA and NOAA mission-related enterprises; and,
  - post-secondary education and research capacity development in atmospheric, oceanic, and environmental sciences and remote sensing technology at MSIs supported through competitive awards.
- SDSU research and graduate education of URM students







# Main Research Areas for NOAA CREST EPP Students at SDSU

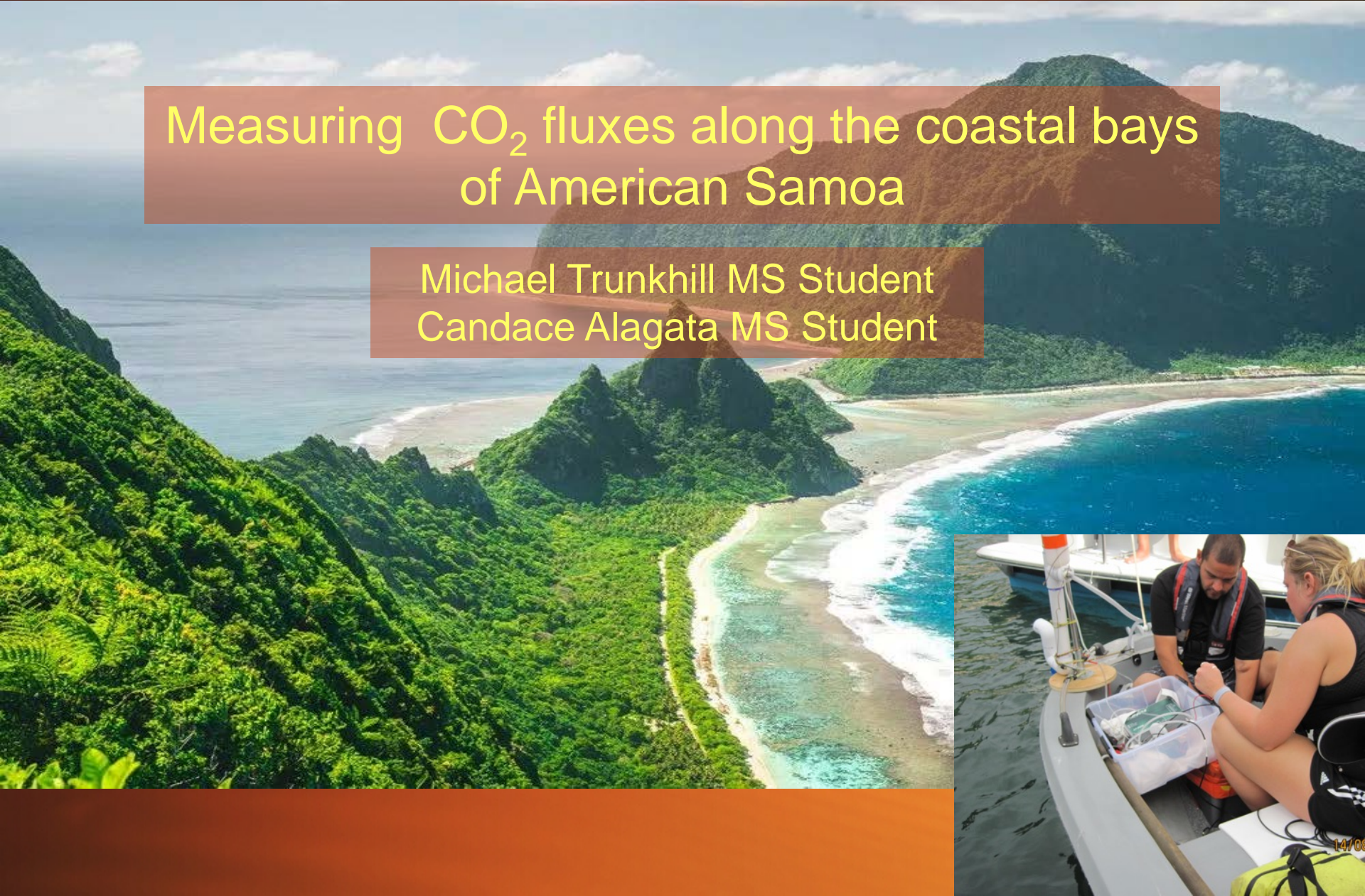
Image Landsat / Copernicus  
©2018 Google  
US Dept of State Geographer  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

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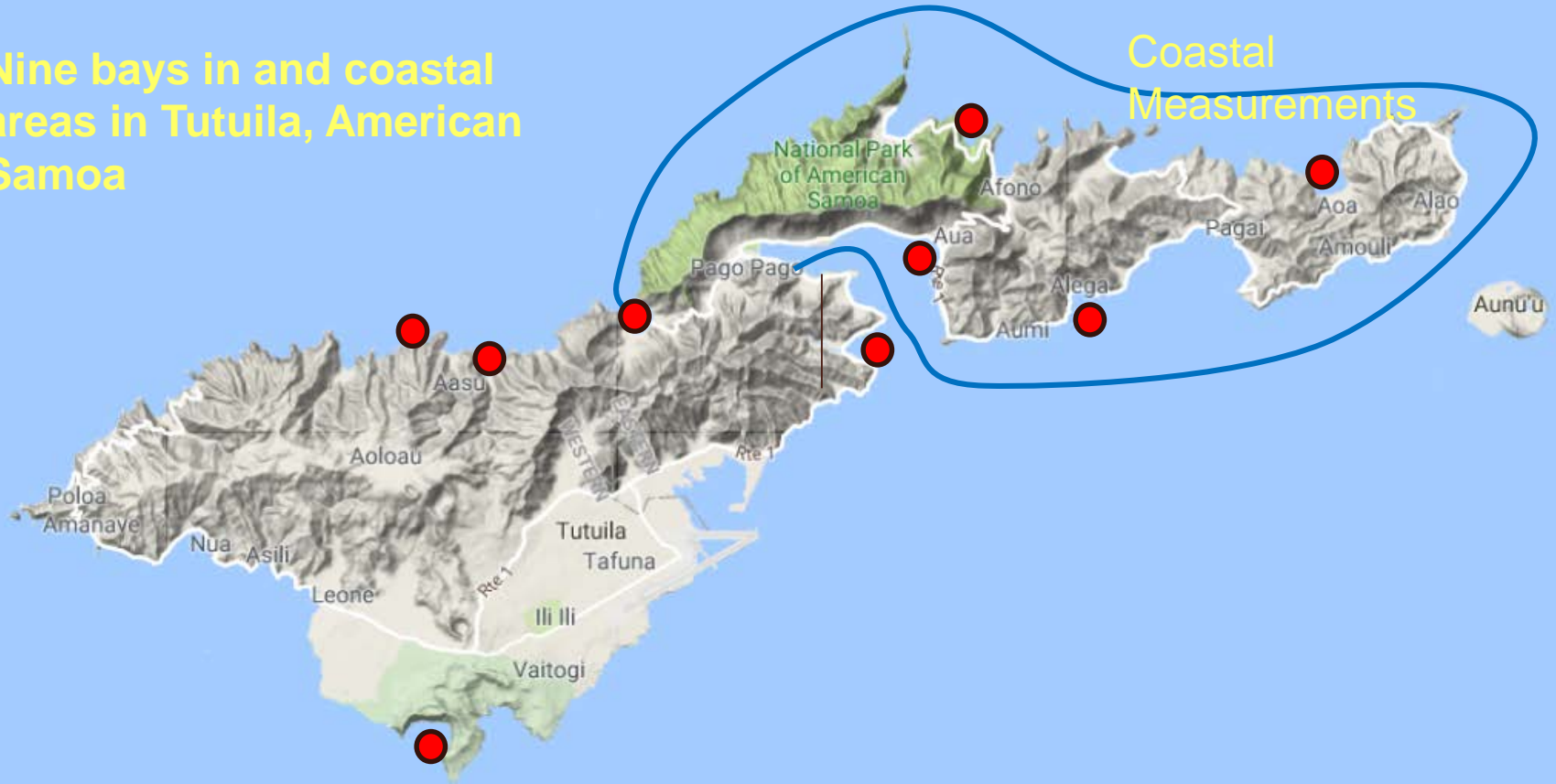
# Measuring CO<sub>2</sub> fluxes along the coastal bays of American Samoa

Michael Trunkhill MS Student  
Candace Alagata MS Student



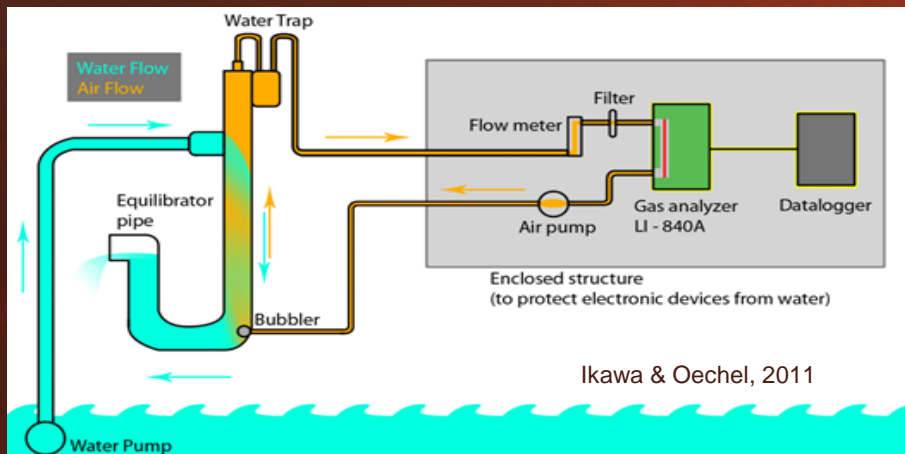
# Nine bays in and coastal areas in Tutuila, American Samoa

## Coastal Measurements





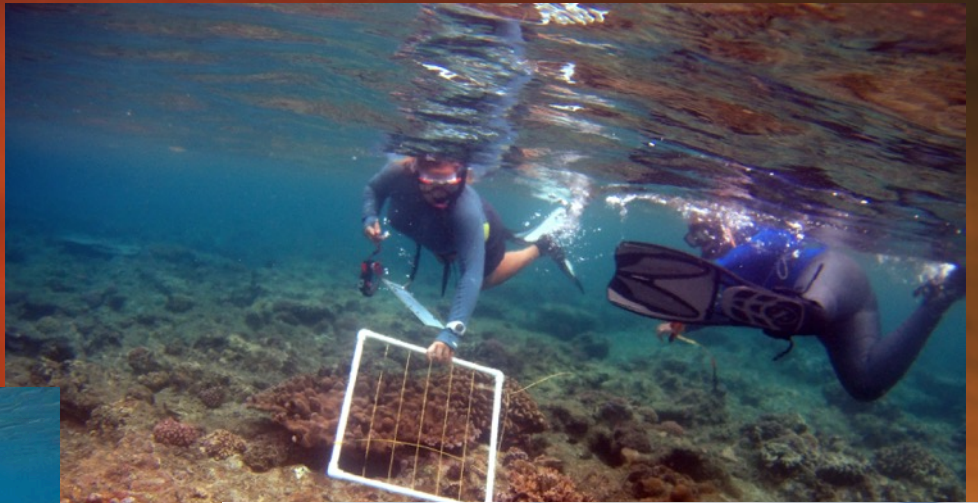
# Headspace equilibrator



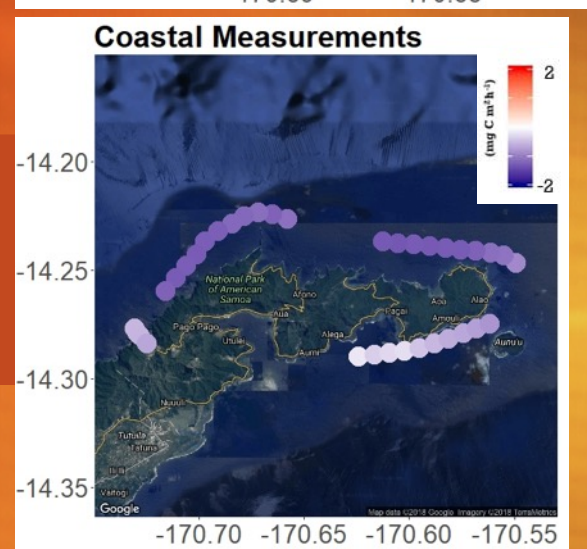
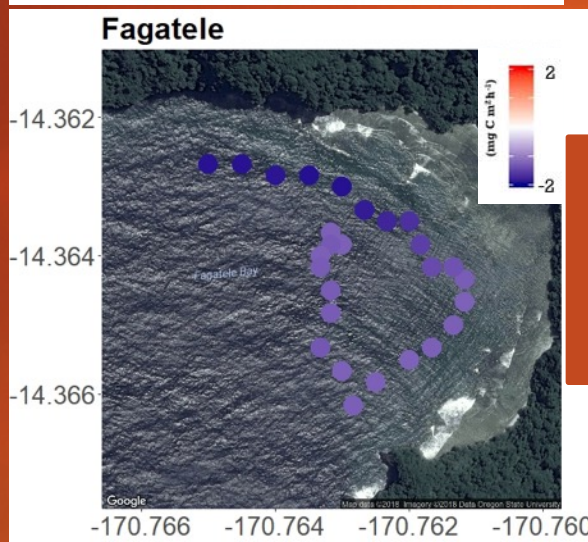
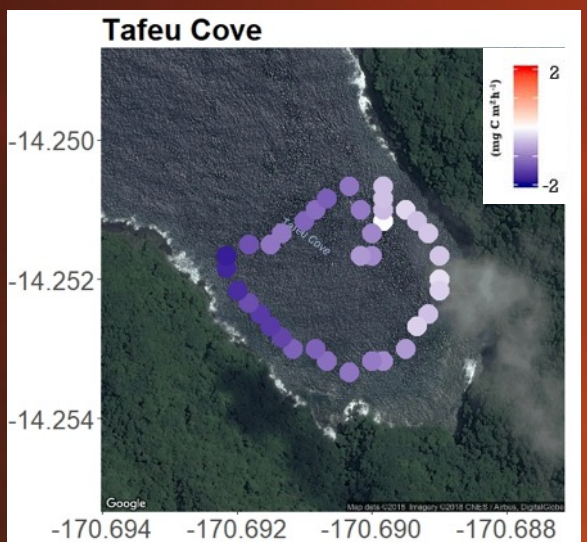
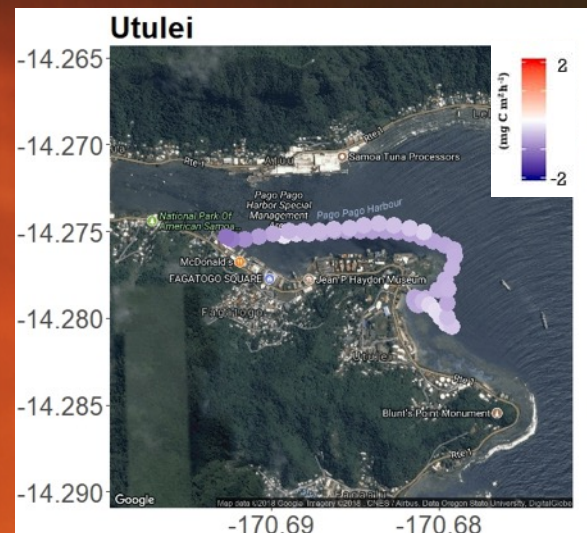
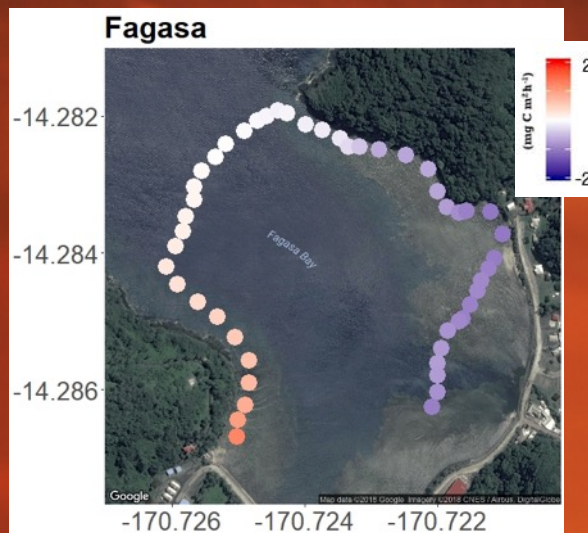
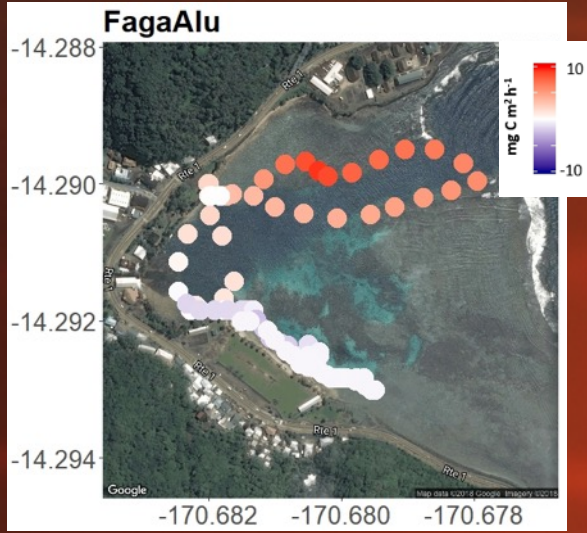
# Boat Based Eddy Covariance













# CO<sub>2</sub> flux of San Diego Bay

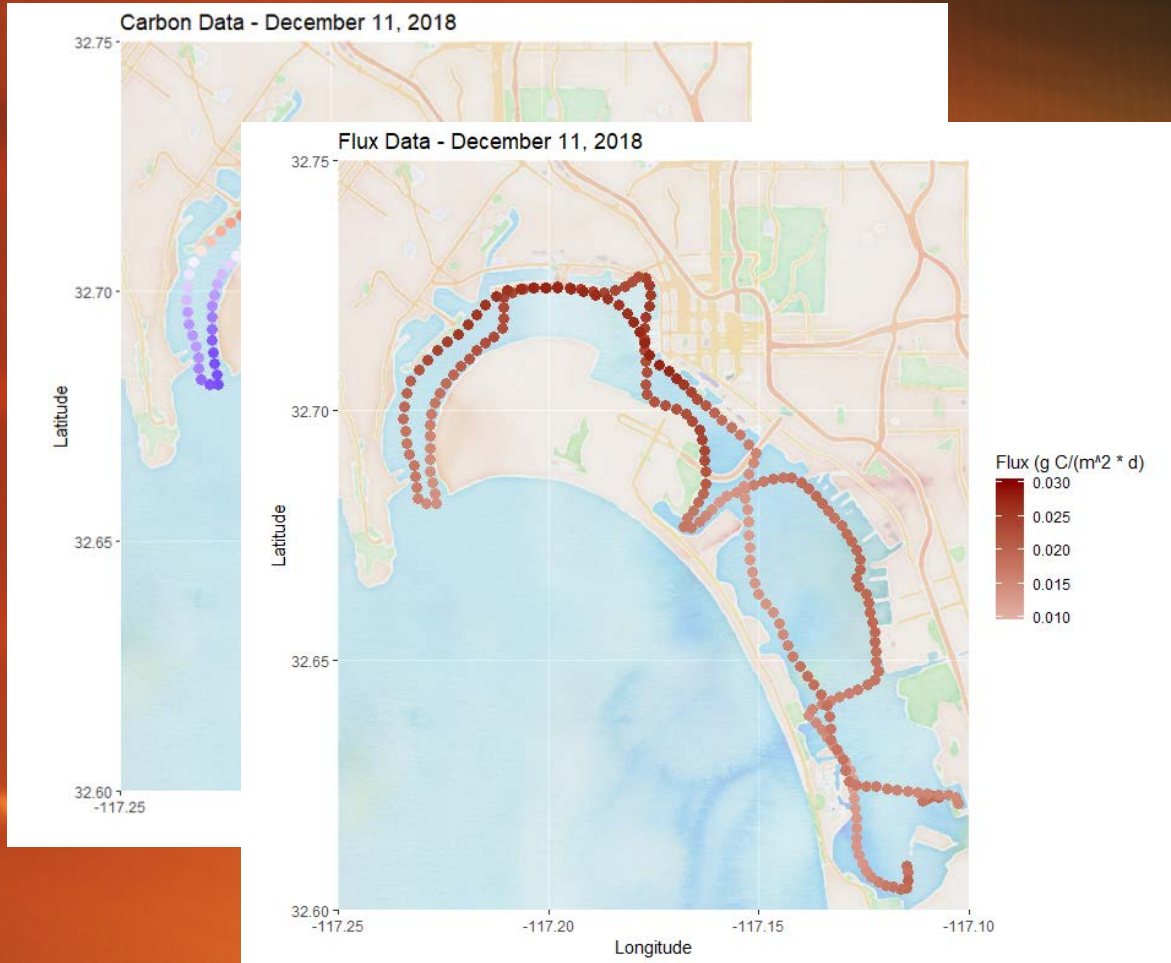
Alexander Carsh, Ph.D. Student  
Candace Alagata, MS Student



# Initial Results – December 2018 survey

## Key points:

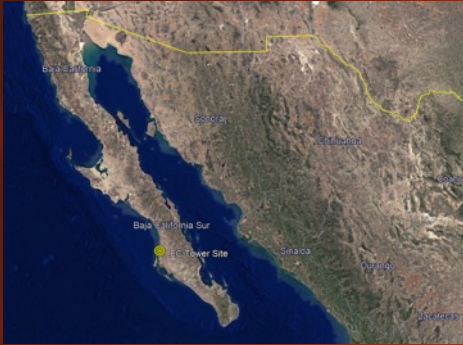
- Clear spatial variation between the north section of San Diego Bay, the central-to-south section, and the bay mouth
  - May be due to difference seagrass density, relative levels of human activity, tidal flushing effects, etc.
- All points measured along the bay were sources of carbon to the air
  - Potentially due to winter season inhibiting photosynthetic activity





# Controls on CO<sub>2</sub> Fluxes in the Mangroves of Bahia Magdalena

Josediego Uribe-Horta, MS Student



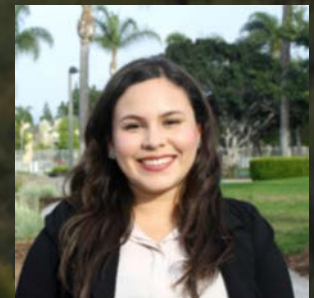
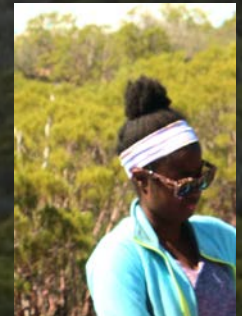
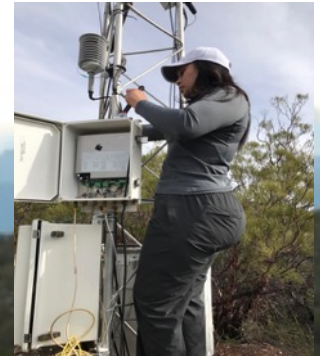
Mangroves: Under estimated for C storage;  
Water stress as high as desert vegetation

# Effects of drought conditions and fire on CO<sub>2</sub> flux in semi-arid chaparral ecosystems

Andrea N. Fenner  
*Ph.D. Student*

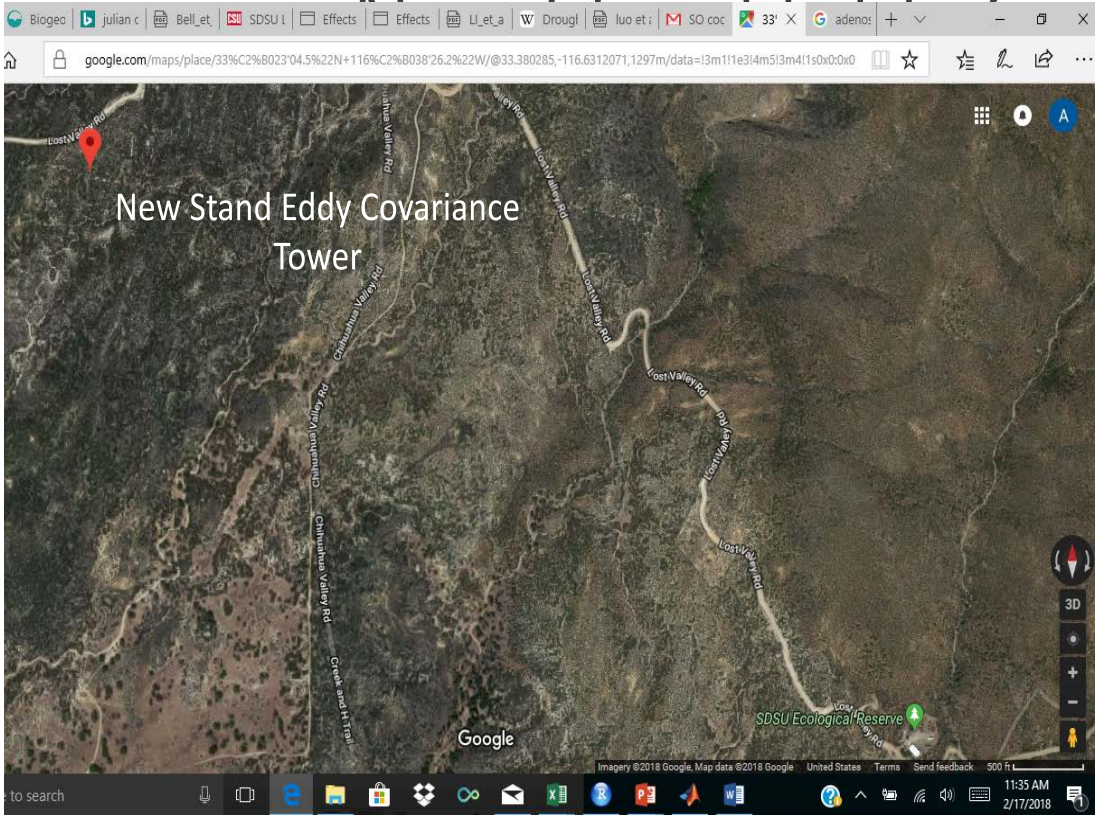
Breahna Gillespi  
*Ph.D. Student*

Jessica Montes  
*MS Student*



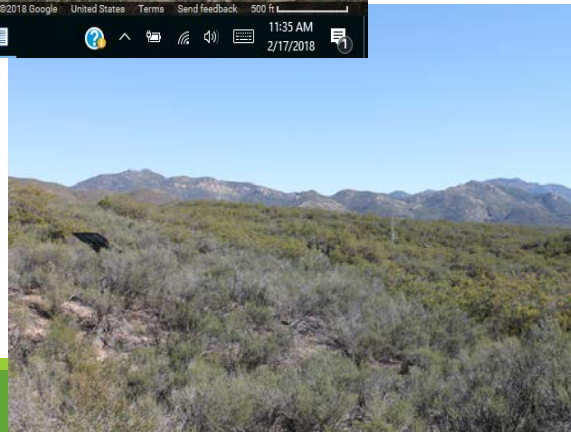


# Covariance Tower



## Stand HISTORY

- AmeriFlux: US-S04
- Chaparral stand is about 172 years old.



Carbon sequestration with stand age and fire cycle  
Effect of Drought on Carbon Sequestration



Controls on stand  
level CO<sub>2</sub> fluxes and  
water use

Breahna Gillespi,  
Ph.D. Student





" Soil Respiration Response to *Adenostoma sparsifolium* Microhabitats Among Seasons in Semiarid Shrubland "

By Jessica Montes, MS Student





# Effects of Elevated CO<sub>2</sub> and Climate Change on Wines and Vines

Molly Clemens, Ph.D. Student  
Alessandra Zuinga, Ph.D. Student



Experimental Vineyard at  
SDSU  
Field Station Temecula  
Molly Clemens, Ph.D. student  
9 varieties





# Experimental Vineyard in the Country of Georgia

## Adaptation of Wine Production to Climate Change

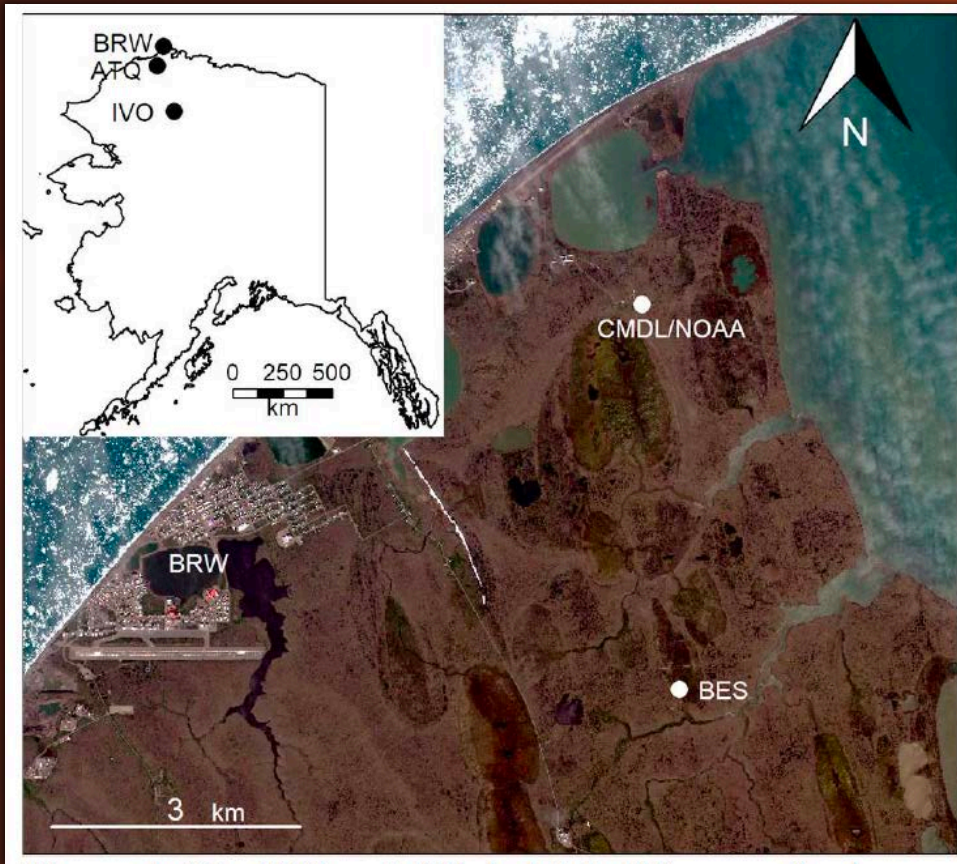
E.g. joint research on solutions to the impacts of global warming, increasing CO<sub>2</sub>, and changes in water availability on wines and vines in California and Georgia



In Georgia:  
437 Local Varietals  
350 International Varietals



# Arctic CO<sub>2</sub> and CH<sub>4</sub> Fluxes



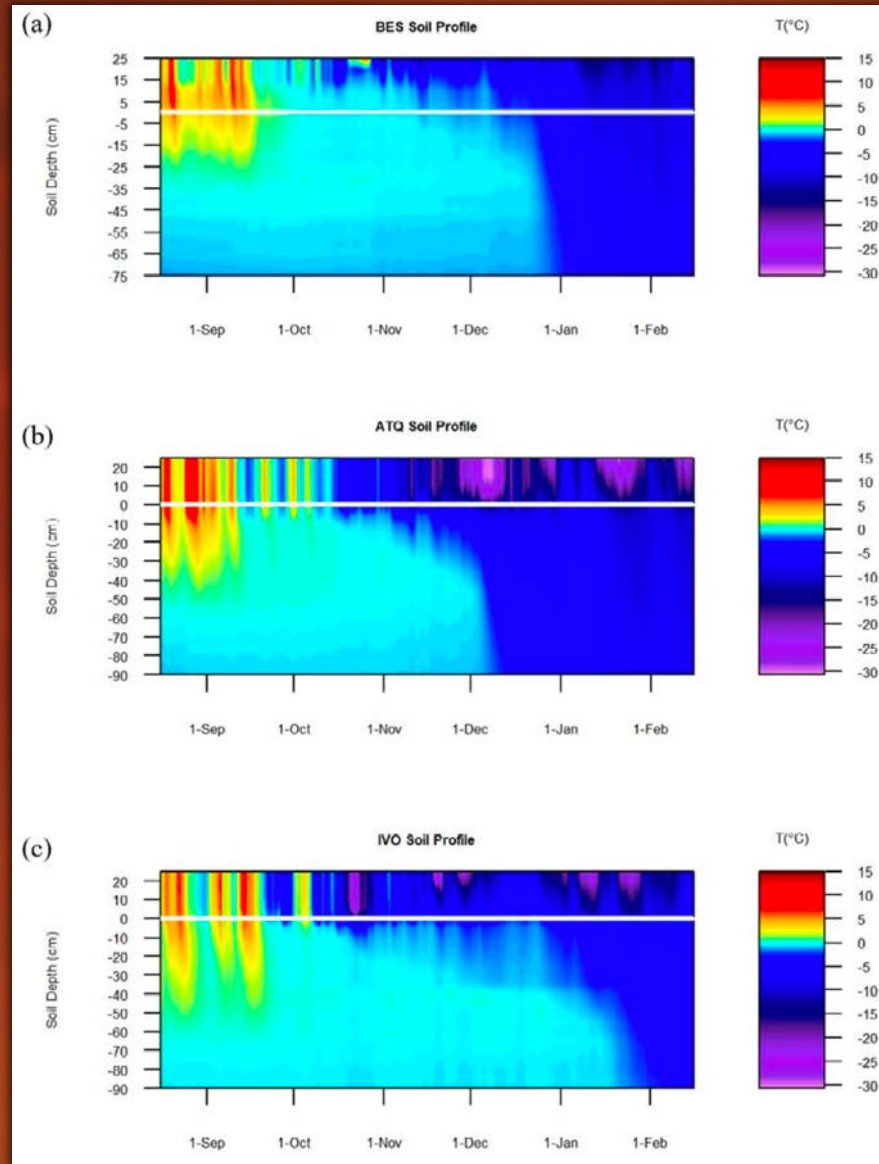
Kyle Ardnt  
Ph.D. Student



Josh Hashemi  
Ph.D. Student



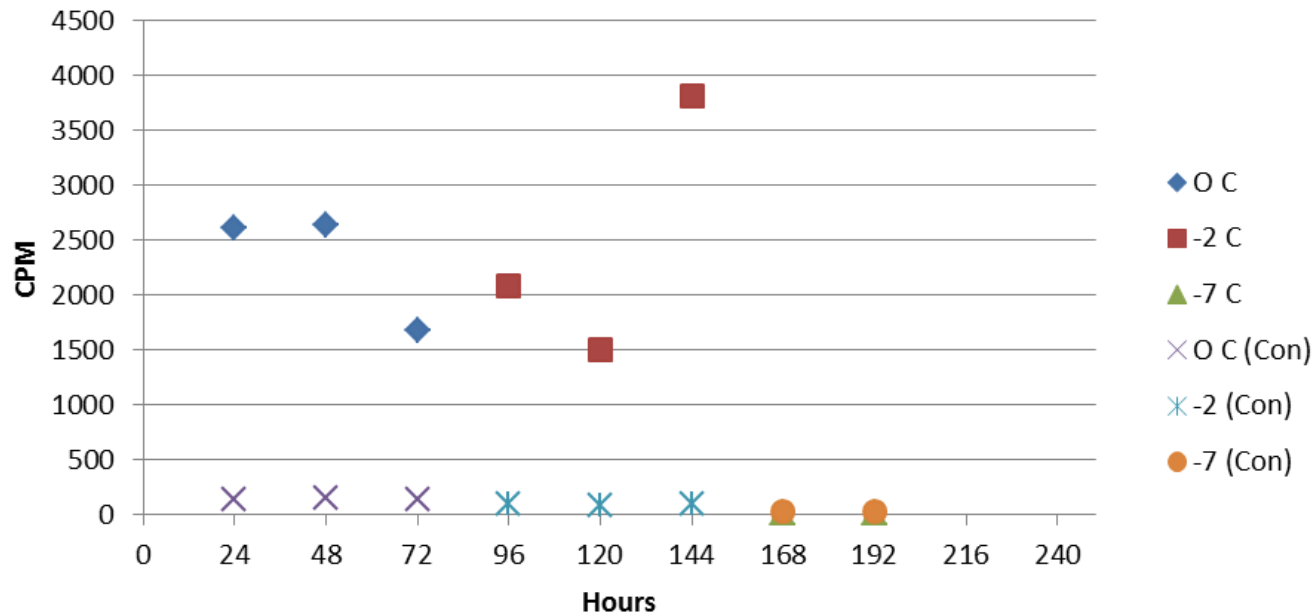
# Importance of the Zero Curtain for Fall Trace Gas Fluxes





# Methanol Oxidation at Zero and Subzero Temperatures

## C14-Methanol Cold SIR



Eric Wilkman  
Ph.D. Student



# Major Goals and Conclusions

- Patterns and controls on CO<sub>2</sub> (and CH<sub>4</sub>) fluxes in the Arctic, Chaparral, Mangrove, Desert, South Pacific, and Marine Ecosystems.
  - Zero curtain period very important for CO<sub>2</sub> and CH<sub>4</sub> production in Arctic
  - Old chaparral can be managed as a sink for C.
  - Coastal Marine can be managed as an increased Sink for C.
    - Seagrass revegetation
    - Watershed management, coral health
  - Mangroves a major sink of C.
    - Mangrove water stress as high as desert vegetation





# Thanks NOAA NERTO Mentors and Collaborators

- ESRL GMD
  - Russ Schnell-Boulder
  - Pieter Tans-Boulder
  - Bryan Thomas-Barrow
  - Ben Kaiser-American Samoa (Departed)
- Alex Tardy-NWS San Diego
- Marieke Sudek-NOAA NMSAM
- Lauren Jarlenski-NOAA NMSAM
- And many others.....!!!!

