

Tethys

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Our Client: Dr. Kimberly Samuels-Crow

- Dr. Kimberly Samuels-Crow is a geochemist who is employed as an assistant research professor at the School of Informatics, Computing, and Cyber Systems here at NAU.
- She is currently the principal investigator in a NSF(National Science Foundation) funded study of evapotranspiration, which is the process of water moving from soil or plants into the atmosphere.



Project Description

- Our client's current research is in improving the understanding of the environmental drivers of evaporation and transpiration in six semi-arid ecosystems in New Mexico.
- Our client is interested in reading the different isotopic signatures of water vapor within the ecosystem in order to categorize that vapor as evaporation or transpiration.
- Currently our client has an instrument that makes real-time measurements of the isotopic composition of water vapor coupled with an inlet capable of switching between source elevations.
- Our project is to automate the aforementioned inlet so that measurements at different depths can be made remotely and at any time.



Requirements

- Automated – can read a text file for settings off a SD card or similar
- GUI remote via gsm/cellular OR aprs / lora
- Power from marine DC batteries
- Switch between three or more gas / tube sources
- Record exactly when the switch happens
- Characterize what the switch looks like, and how long the instrument memory is
- Characterize minimum signal duration for noise free measurements
- Matlab functions for data cutting
- Manual override
- Weatherproof
- Quick set up
- Remotely updatable settings for timing
- DIY instructions for the isotope community – must utilize a high number of “off the shelf ” components (ie: Arduino, Teensy, or Rasp. Pi)



What Will Success Look Like?

- By April, the product is ready to be deployed in real time and function without human intervention for at least one week
- The product attaches to the instrument with plug and play wiring and software that always works and has a GUI for setup.
- Works for the next four years
- Wireless communication provides updates on data collection and status
- The plans allow other researchers to repeat the fabrication of the instrument



Conclusion

- We are Tethys. We will be aiding Dr. Kimberly Samuels-Crow in her research in understanding the environmental drivers of evaporation and transpiration in six semi-arid ecosystems in New Mexico
- Automating her current instrument so that it can:
 - function without physical human intervention for at least one week
 - make accurate measurements and communicate them wirelessly
 - be updated wirelessly at any time