CPS: Medium: Dig, Sip, Breathe: Automated Monitoring of Carbon and Water Cycles in Agriculture

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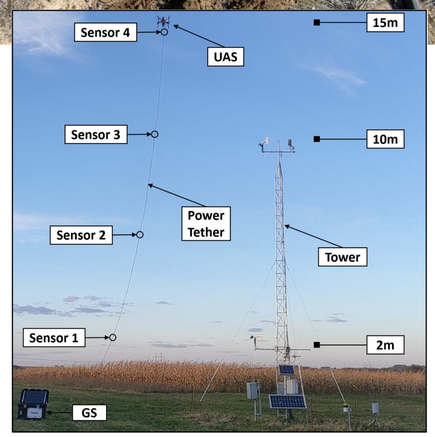
https://nimbus.unl.edu/projects

Challenge:

- Monitoring, reporting, and verification of soil water content (SWC) and soil organic content (SOC) is costly
- Automated monitoring requires breakthroughs in robotics, smart sampling, and the science of carbon sequestration

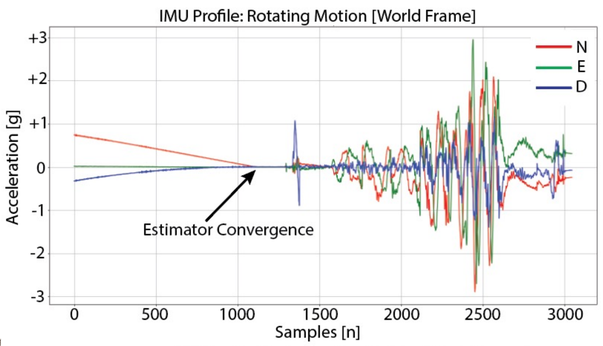
Solution:

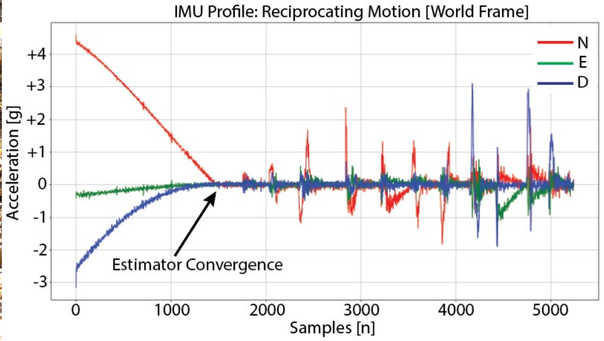
- UASs for soil water and carbon sampling, soil extraction, and tethered UAS for atmospheric monitoring
- Automated collection of high temporal and spatial resolution SWC and SOC data
- Smart sampling algorithms for use with multi-agent UAS system
- Smart sampling software to incorporate into existing USDA ESAP tool



Scientific Impact:

- Tethered UAS with localized in-line sensors for atmospheric monitoring
- Experiment using geochemical monitoring and modeling to estimate CO_2 sequestration
- Developed automated, UAS-based, soil extraction and collection system





Impact on Society:

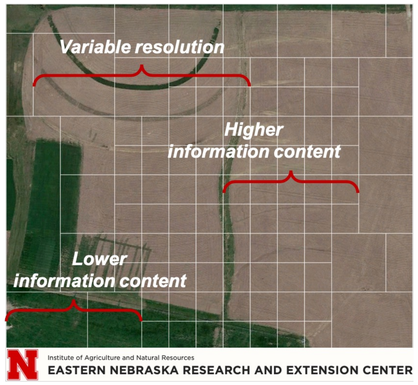
- Soil Sampling Optimization and Planning Tool (SSPOT) web application at USDA
- Automated SOC, SWC sensing, and soil extraction via UAS
- Smart sampling architecture to determine best sampling locations at runtime
- Contribute to scientific understanding of the effectiveness of carbon sequestration

Education and Outreach:

- Field day and demonstrations with farm management staff and local industry to showcase soil extraction UAS
- Partnered with Carbonista.Co to develop intelligent SOC prediction

Quantified Impact:

- Smart sampling improvements: Soil sampling collection time < 3 m



Award ID#: CNS-2217327