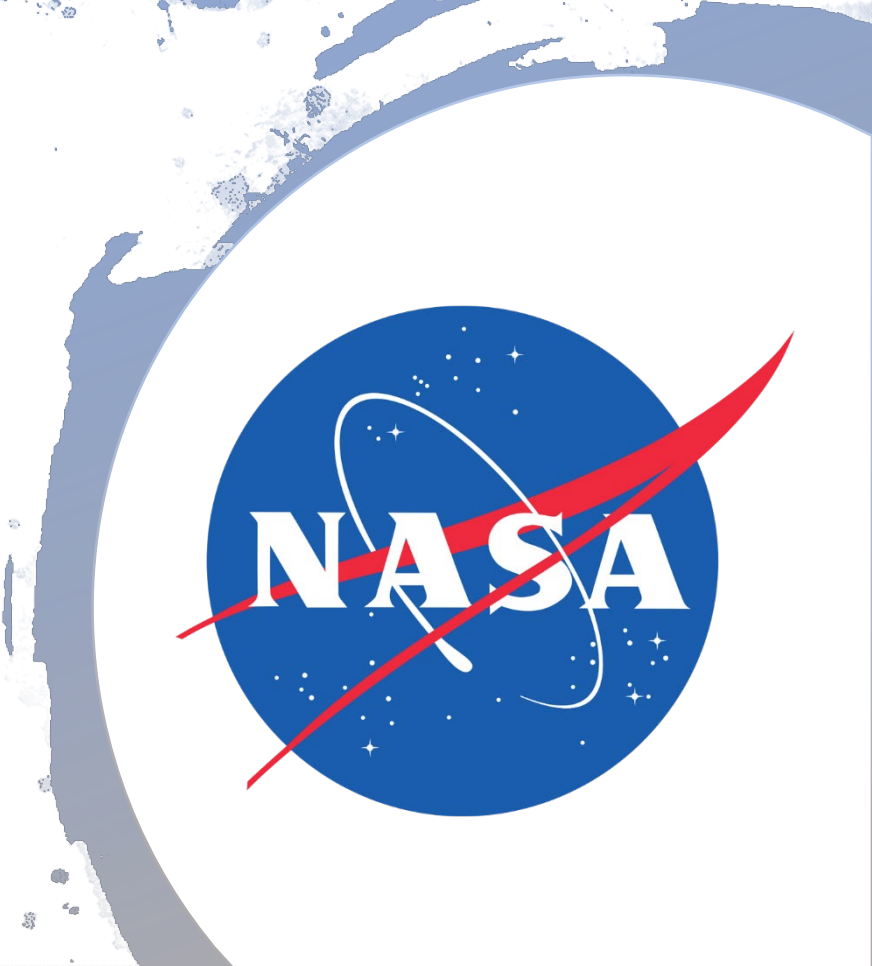


## **USFS – NASA Virtual Pitch Fest / June 2, 2020**

*Identifying & leveraging synergies with the remote sensing community to improve the next generation of the SNOTEL ground observation network & NRCS water supply forecasting system for the US West*

*S. Fleming, B. Domonkos, A. Goodbody, K. Wetlaufer, C. Brown, J. Lea*



# About Me

Dr. Sean Fleming

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Geophysical prediction, watershed hydrology, cryospheric science, climatology, mathematical and computational modeling, data science, machine learning

## Team members

Brian Domonkos, Colorado Snow Survey Supervisor, USDA-NRCS Colorado Snow Survey

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## The Idea



**Identifying and leveraging synergies with the remote sensing community to improve the next generation of the SNOTEL ground observation network and NRCS water supply forecasting system for the US West**

# The context

- USDA's Natural Resources Conservation Service (NRCS) operates SNOTEL, a long-term network of telemetered, high-frequency, near-real-time mountain snow and climate monitoring stations at over 800 sites in the western US & Alaska
- The annual value of these data is billions of dollars, mainly reflecting their use in predicting seasonal river runoff
- NRCS also operates the largest stand-alone water supply forecast (WSF) system in the US West
- Even marginal WSF improvements can offer over \$100 million in benefit every year for a single basin, motivating continued improvement in watershed hydrology models and input data

# The pitch

Assess capabilities, gaps, and opportunities for remote sensing (RS) as it relates to SNOTEL and WSF, centered around two themes:

## **(1) What can RS do for NRCS WSF?**

Satellite and airborne RS for snow water equivalent is tremendously promising, but theoretical and practical challenges remain in leveraging these data to improve operational WSF modeling skill

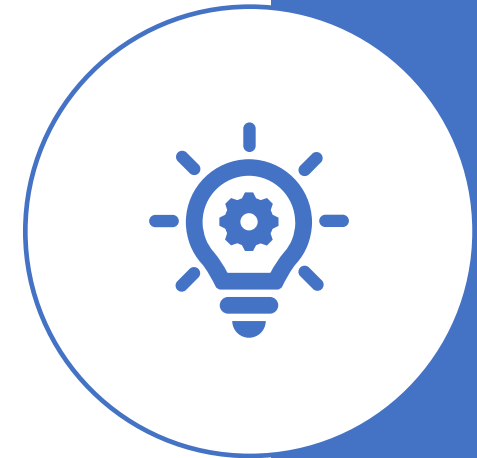
## **(2) What can SNOTEL do for the RS community?**

SNOTEL and related NRCS networks, like SCAN with its soil moisture observations, enable building and ground-truthing RS products, and there is opportunity to add or modify sensors to better meet the needs of the RS community.

# Issue(s) being addressed

- Wildfire hazard
- Fuel loading
- Wildfire impacts
- Forest health
- Water and aquatic resources
- Climate and drought
- Soil moisture
- Vegetation mapping
- Carbon emissions and flux
- Rangeland management
- Other
- Perhaps all the above: project has potential implications for any topic related to mountain climate, snow, and hydrology in the western US

## The Idea



Issues Addressed

## What EO data does your idea utilize?

- Landsat
- Sentinel-1
- Sentinel-2
- MODIS
- VIIRS
- ECOSTRESS
- SMAP
- ICESat-2
- GOES-R
- JPSS
- SRTM
- High spatial resolution R-G-B-NIR
- LiDAR
- Imaging Spectroscopy
- UAVSAR
- Uncertain - looking for guidance – several RS/data assimilation technologies relevant
- And: how can remotely sensed EO data utilize our ground networks & data?

## The Idea



# The Idea – Outcomes / Societal Benefits

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## **Our goals are broad but focused:**

- Learn where the RS community's efforts stand & what activities are ongoing or planned
- Identify how NRCS can capitalize on these outcomes (e.g., to support SNOTEL data QC, provide new WSF predictor datasets, etc.) & where NRCS can help fill in gaps and provide additional suggestions or capabilities (e.g., supporting the RS community through SNOTEL/SCAN site selection choices, SNOTEL/SCAN sensor changes/additions, etc.)

## **This can be expected to provide benefit to:**

- Design and operation choices around the SNOTEL network, improving its usefulness to the remote sensing community & its clients
- Management decisions around remote sensing data employed for snowmelt runoff and water supply forecasting across the western US, with implications to all users of these widely relevant prediction products



Thank You!

