Satellite Enhanced Snowmelt Flood Predictions in the Red River of the North Basin (RRB)

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NASA Water Resources PI Meeting
June 26-28, 2018
Problem Statement & Opportunity

- **Problem:** Challenges forecasting snowmelt floods. 2013 forecasted peak flows were 74% higher than the observed flows at Fargo, ND.

- **Opportunity:** Enhance snowmelt flood prediction in the RRB using remote sensing estimates of snow and soil moisture states.

![Graph showing observed and simulated flows at Fargo in 2013.](Courtesy of M. DeWeese, NCRFC)
Why does it matter?

- **RRB** is highly prone to spring snowmelt flooding
- Flood damages of $3.5 billion in 1997 flood alone

**Terrain**
- Flat terrain (1-2 feet/mile)
- River flow is south-to-north (ice jams)

**Land Cover**
- Agriculture (croplands) is the region’s largest industry

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Project Title: Satellite Enhanced Snowmelt Flood Predictions in the Red River of the North

http://fmdam.org/
How can satellite remote sensing data improve flood predictions?

Snowmelt Flood Forecast:

- Currently, flood and seasonal snowpack forecast relies on model simulations (e.g. SNOW-17) and sparse ground observations.
- Daily **Satellite Remote Sensing** observations of snow give a new, and improved representation of the amount and condition of snow in the RRB.
- Spaceborne snow observations will likely produce improved snowmelt flood forecasts.
How can satellite remote sensing data improve flood predictions? (cont.)

- Snow Satellite Remote Sensing (e.g. SWE) gives a new and improved representation of the amount and condition of snow in the RRB.
Impacts (achieved and anticipated)

Impacts achieved:
- Mature North Central River Forecast Center (NCRFC) and UNH ASP partnership developed over four winter seasons
- Weekly and daily quality controlled NRT-satellite SWE maps (SSM/I) to the NCRFC for use during operational forecasting
- Daily satellite snow status maps produced and delivered to the NCRFC
- Expanded data products accessible by the NCRFC forecasters i.e. satellite observations

Impacts anticipated:
- Application system completed and qualified in 2019 (ARL 8)
- Operational use of daily satellite SWE data at NCRFC
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Publications


- Cho, E., Tuttle, S., & Jacobs, J. Comparison between AMSR2 and AMSR-E Snow Water Equivalent using SSM/I over the North Central U.S. Poster presented at 73rd Eastern Snow Conference, 14-16 June 2016, Columbus, OH.


Publications (cont.)


- Cho E, J.M. Jacobs, S.E. Tuttle, C. Olheiser Improvement of airborne gamma radiation snow water equivalent (SWE) estimations with spaceborne soil moisture observations Oral presentation at 75th Eastern Snow Conference 5-8 June, 2018, Greenbelt, MD.

We gratefully acknowledge funding from NASA ASP under grant NNX15AC47G.

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