



Fusion of MODIS, VIIRS, and Landsat snow cover data to create estimates of snow water equivalent (SWE)

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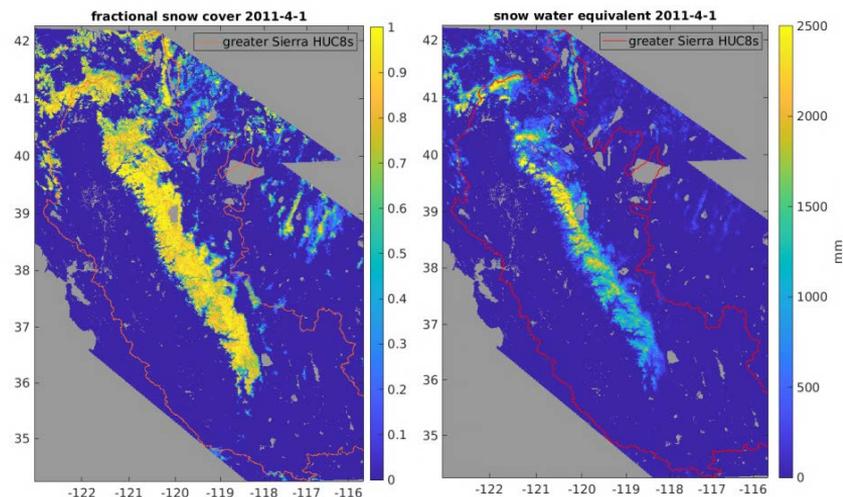
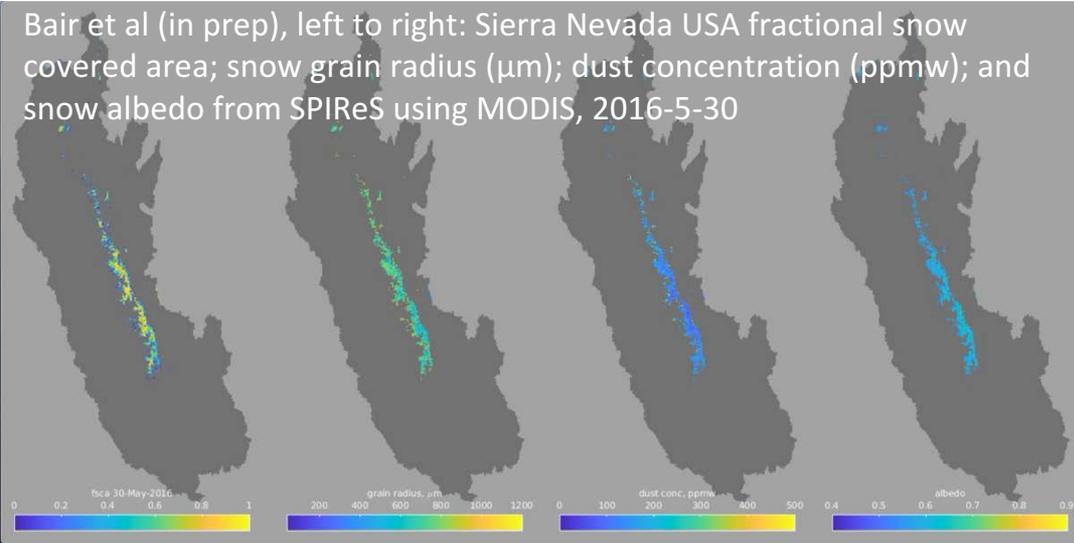
Results

- **Developing machine learning MODIS Landsat 8 fusion model for snow cover - drives SWE reconstruction**
- **Developing new spectral unmixing model for snow cover using two endmember approach - drives SWE reconstruction**
- **Adding COVID-19 supplement to detect if snowpack in upper Indus Basin is cleaner during India's lockdown**

Publications

Ahmad, A., Forman, B, Bair, E, and Kumar, S (in prep), Implementing brightness temperature assimilation to improve snow mass estimation in high mountain Asia.
 Bair, E, Stilling, S, and Dozier, J (in prep), Snow Property Inversion from Remote Sensing (SPIReS): A Generalized Multispectral Unmixing Approach with Examples from MODIS and Landsat 8.
 Rittger, K, Krock, M, Kleiber, W, Bair, E, Brodzik, J, Bormann, K., and Rajagopalan, B (in prep), Fusion of Landsat and MODIS for 30 m daily fractional snow cover.
 Rittger, K, Bormann, K, Bair, E, Dozier, J. and Painter, T (in prep), Evaluation of VIIRS and MODIS snow covered area in High Mountain Asia using Landsat 8.

Bair et al (in prep), left to right: Sierra Nevada USA fractional snow covered area; snow grain radius (μm); dust concentration (ppmw); and snow albedo from SPIReS using MODIS, 2016-5-30



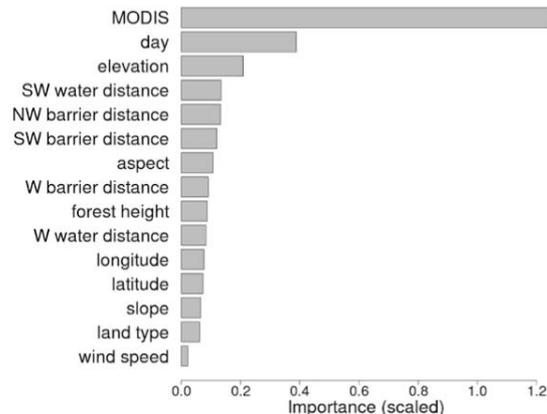


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Results

- Two stage random forest for downscaling 500 m MODIS fSCA to 30 m Landsat resolution
 - Improves over logistic regression and one stage random forest by 50% RMSE
- Utilizes features: MODIS fSCA, slope, aspect, elevation, land type, longitude, latitude, forest height, NW barrier dist, SW barrier dist, W barrier dist, SW water dist, W water dist, wind speed and day of year
- Stage 1: Classification (0, 1-99, 100)% decision. Stage 2: Regression (predict 1-99%)
- Classification uncertainty is a byproduct
- Good downscaling predictive ability (precision 87%, recall 69%, fScore 0.73, accuracy 97%, bias -0.1, RMSE 0.42)
- 2001 to 2020 Sierra Nevada products started on Research Computing at CUB
- Currently working on grain size, thereafter albedo



Rittger et al., in prep for RSE Terra 20 Special Issue

