Mapping Forest and Shrub Canopies in the Southwestern U.S. with MISR

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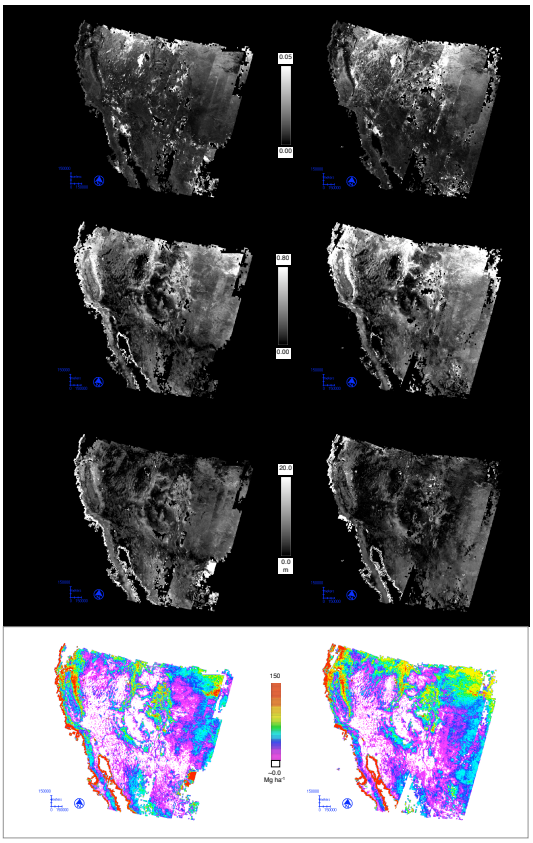
We used MISR red band BRFs from May 15 - June 15 for 2000 and 2009 to invert kernel-driven bidirectional reflectance distribution function (BRDF) and geometric-optical (GO) models, obtaining maps of kernel weights, fractional crown cover, mean canopy height, and woody biomass on a 250 m grid, for the entire Southwestern United States and part of Mexico.

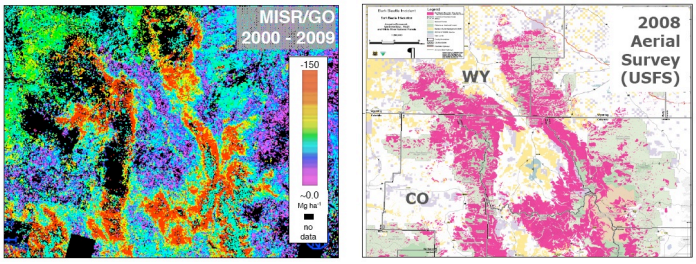
RMSE (model fit), 2000 and 2009

Fractional Crown Cover 2000 and 2009

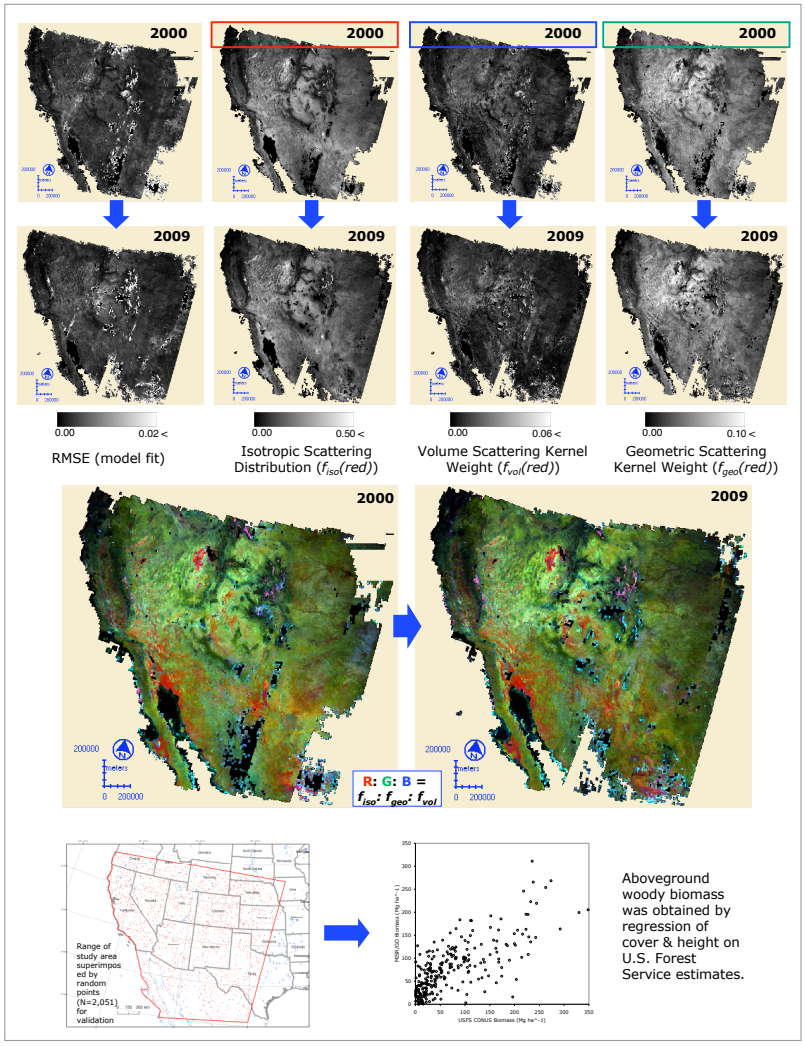
Mean crown center height (m) 2000 and 2009

Aboveground Live Biomass (Mg ha^{-1}) 2000 and 2009. Aboveground woody biomass was obtained by regression of cover & height on U.S. Forest Service estimates.





Above: The model considers only live, green trees or shrubs; dead plants with non-photosynthesizing leaves are treated as absent. The decrease in aboveground live biomass in 2009 over 2000 - seen above for parts of Wyoming and Colorado - thus reflects tree mortality from beetle infestation.



The inversion of the geometric-optical (GO) model for fractional cover, mean canopy height, and aboveground biomass (via regression) depends heavily on prediction of the background contribution, obtained via the red band kernel weights that also contain useful information on the surface (see figures above). Observations impacted by cloud/cloud shadows and contrails can be isolated by their high model fitting RMSEs: > 0.05 vs < 0.04 for valid inversions. Compositing of multiple paths takes this into account. We have shown that mapping large areas using MISR data resampled to a 250 m grid is feasible, although there are clearly anomalies in these results that require further investigation using site-specific data. Remaining gaps will be filled using MISR data from other dates to make wall-to-wall maps.

Publications

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More: http://csam.montclair.edu/~chopping/CANAPI http://csam.montclair.edu/~chopping/wood