Goal: To provide improved maps of woody plant cover. Since the late C19th increases in woody plant abundance in grasslands have resulted in changes in C pools and cycling in the southwest United States (Figure 1). Woody plant cover could be provided by very high resolution imagery but moderate resolution Earth Observation is the only means to map changes over large areas inexpensively and on a regular basis. Here we show how data from MISR can be used to map woody plant cover in arid and semi-arid regions.

Method: A simple geometric-optical (GO) model, the Simple Geometric Model (SGM) was adjusted against MISR red band data (all 9 views) to retrieve fractional woody shrub cover. Shrub crown number density was fixed at 0.012 and mean radius was adjusted to fit the model. Data: MISR Level 1B2 Terrain Data from June 2002, atmospherically-corrected and mapped to a 250 m grid. Obtaining the Background: GO models cannot operate unless the large soil-understory contribution is adequately specified (Figure 2). The LiSparse-RossThin kernel-driven model was adjusted against the MISR red band data and the retrieved isotropic, geometric and volume scattering kernel weights were used together with the MISR An camera (nadir) green, blue, and NIR BRFs to estimate the background angular response in the MISR viewing plane a priori, via the Walthall model. Calibration of the relationship was effected using estimates of shrub cover obtained from IKONOS imagery in a transition zone in the Jornada Experimental Range.

Results: Retrieved woody plant cover at local (Figure 3 (a-c)) and larger scales shows a good relationship to that seen in IKONOS pan images, MODIS Vegetation Continuous Fields % Tree Cover, QuickBird-derived shrub maps, and orthophotography (Figure 4). MISR red band data in 9 view angles simulated using SGM and IKONOS-measured shrub crown statistics showed a good relationship to observed data (Figure 3 (d)).

Conclusions: Multi-angle data from MISR are sensitive to canopy structure and can be exploited to provide maps of woody plant cover over large areas using GO models. Kernel-driven models can provide a means of separating the contributions from the soil-understory background and the overstory. See: http://csam.montclair.edu/~chopping/woody/