EOS MISR and MODIS Multiangle Data in Desert Grassland Community Type Mapping: First Results

Mark Chopping[1], Lihong Su[1], John V. Martonchik[2], Albert Rango[3] and Debra Peters[3]

1. Earth &Environmental Studies, Montclair State University, Montclair, NJ 07043 2. NASA JPL, Pasadena, CA 91109 3. USDA, ARS Jornada Experimental Range, New Mexico State University, Las Cruces, NM 88003

Goal: To improve estimates of above- and belowground C pools in desert grasslands by providing improved maps of plant community type, canopy structural parameters, soil/shrub/grass fractional cover. World-wide increase in woody plant abundance in grasslands since C19th, e.g changes in C pools and cycling in the SW US. The ability to model biogeochemical processes depends on knowledge of cover and community type, as well as other parameters. Moderate resolution Earth Observation is the only technology which provides a means to map changes in community type and structure over large areas.

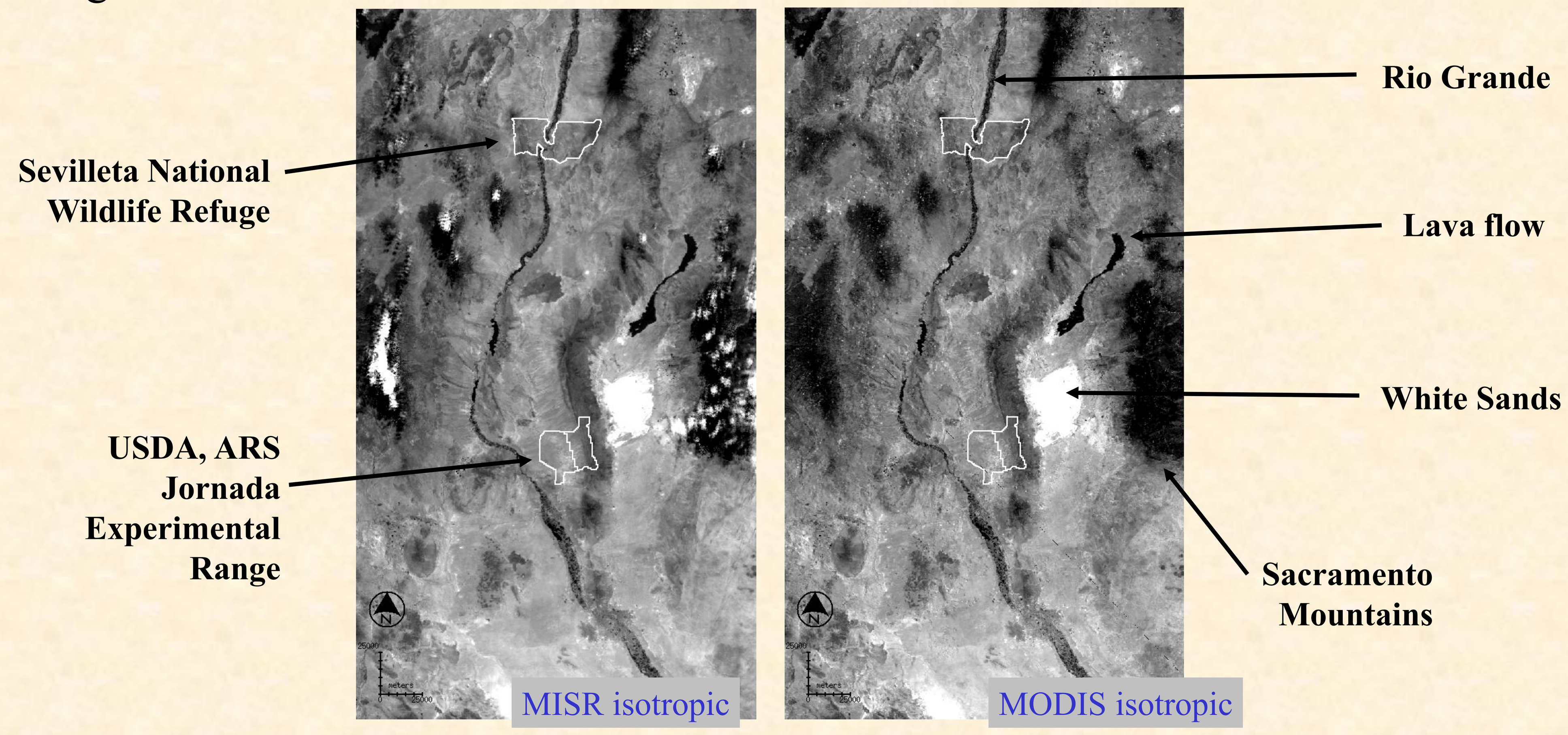

Figure 1. LiSparse-RossThin model isotropic kernel weight images

Method: The approach is to exploit the unique information content of multi-angle remotely-sensed data from MISR and MODIS on NASA EOS satellites. **Data**: MISR Product Level 1B2 Terrain Data (MI1B2T) at 275 m; MOD09 (250 m). Period: May 15 - June 15, 2002 (end of dry season). **Models:** Kernel-driven and MPRV BRDF models (both 3-parameter) were inverted against MISR, MODIS and MISR+MODIS data sets using the red band data only. MISR 275 m data were mapped to the MODIS 250 m grid. Transformed divergence was calculated for all class pairs and distributions were plotted using probability density functions.

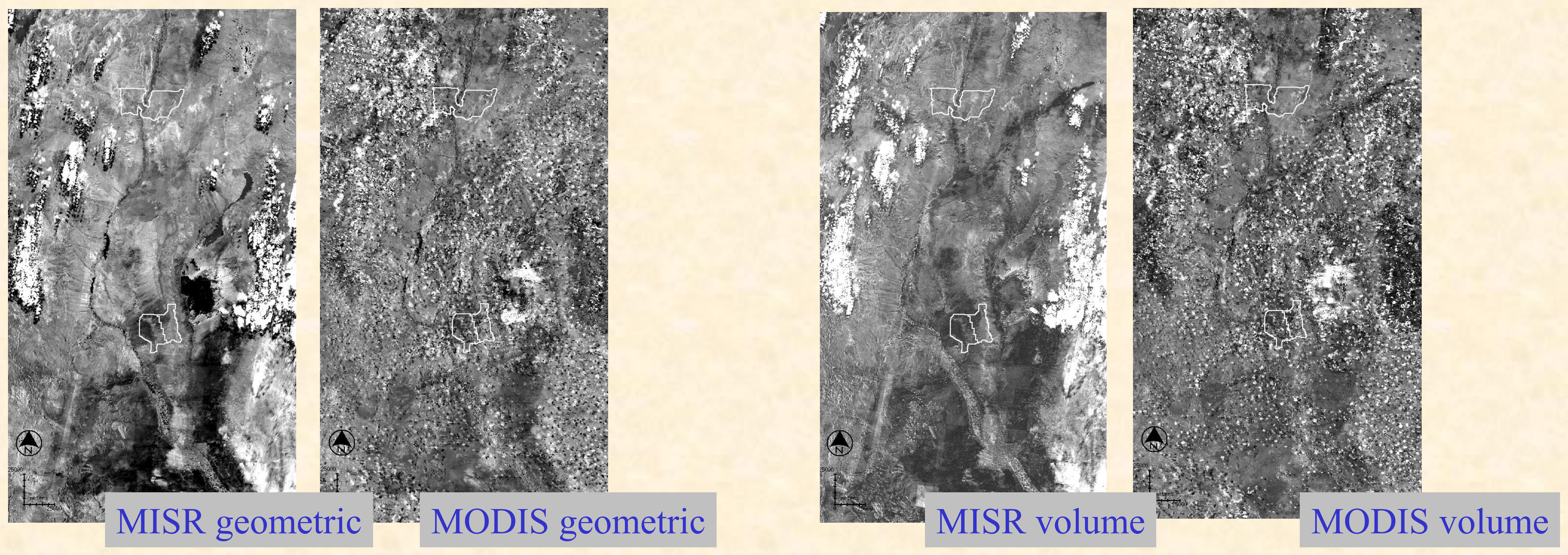

Figure 2. LiSparse-RossThin model anisotropic kernel weight images.

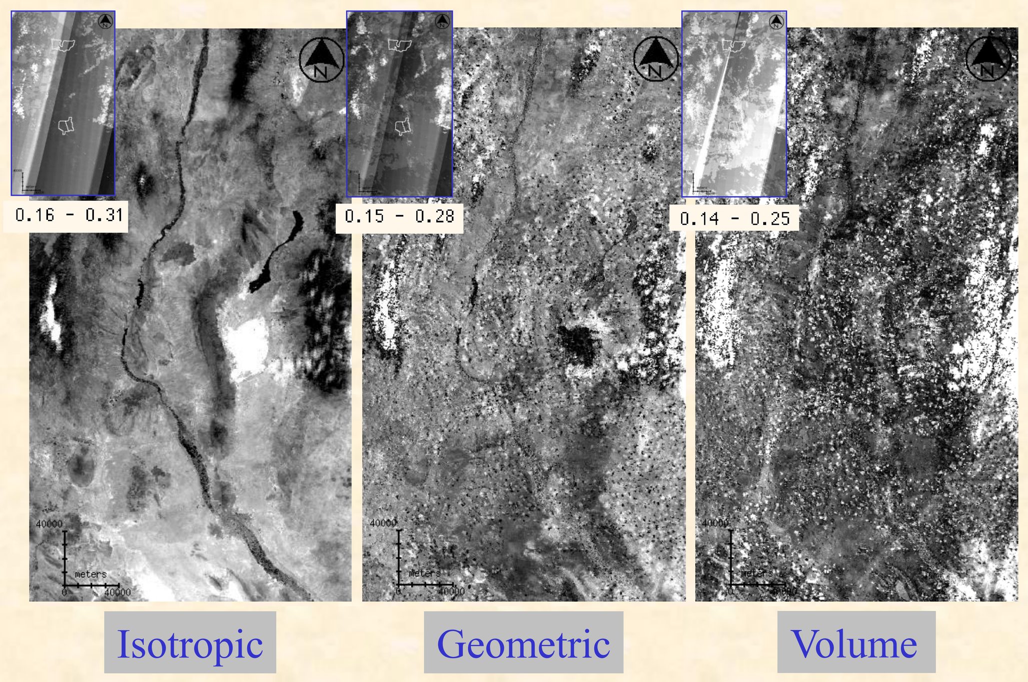

Figure 3. LiSparse-RossThin model kernel weight images (MISR+MODIS). Insets: weight of determination images (values > 1.0 indicate noise inflation)

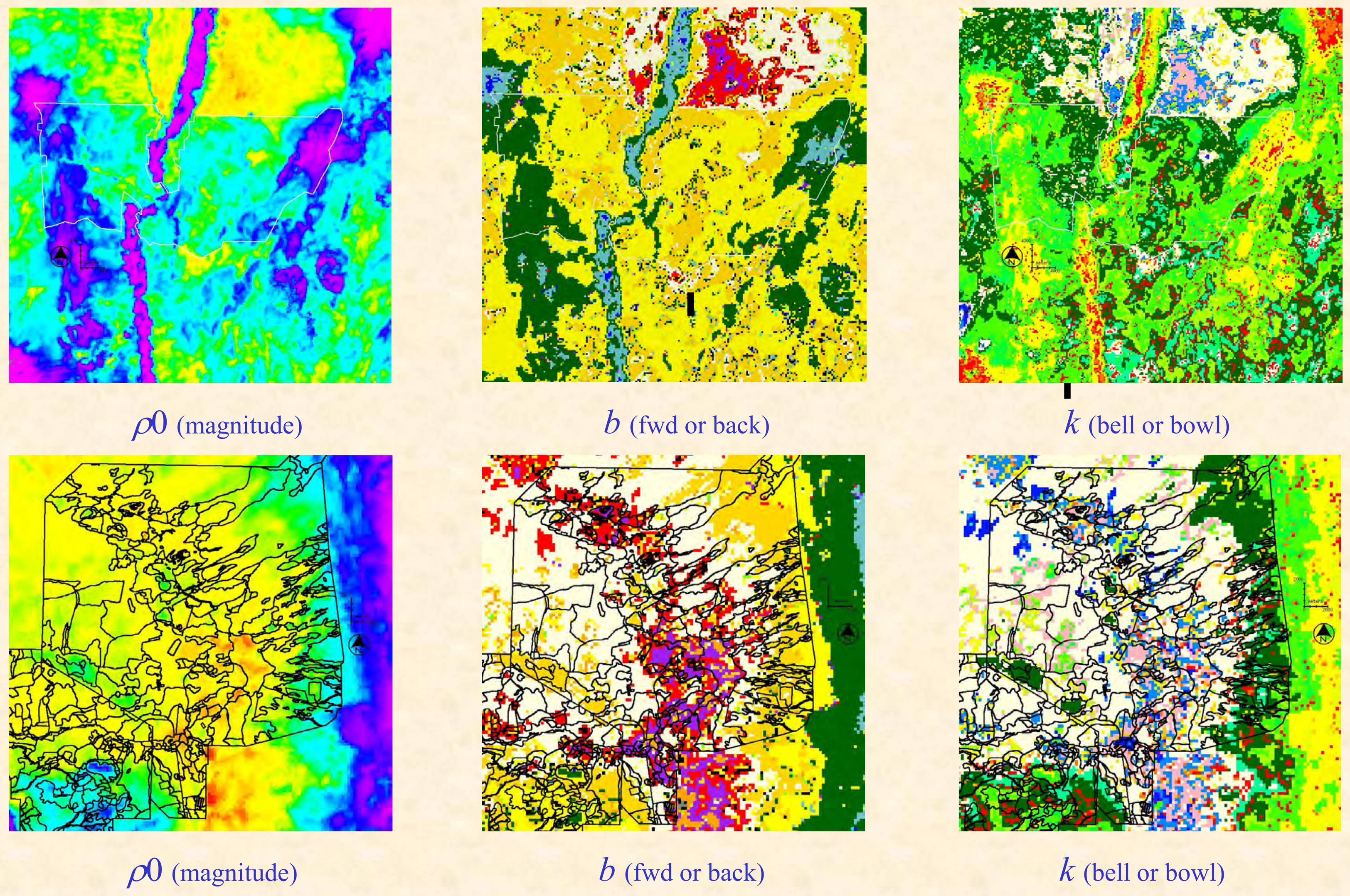

Figure 4. Retrieved MRPV model parameters (ROYGBIV scales).

Results.: MRPV model *b* and *k* parameters demonstrate distributions related to known cover types (Figure 4). LiSparse-RossThin model parameters show greater separation in their distributions than nadir-spectral data (Figure 5).

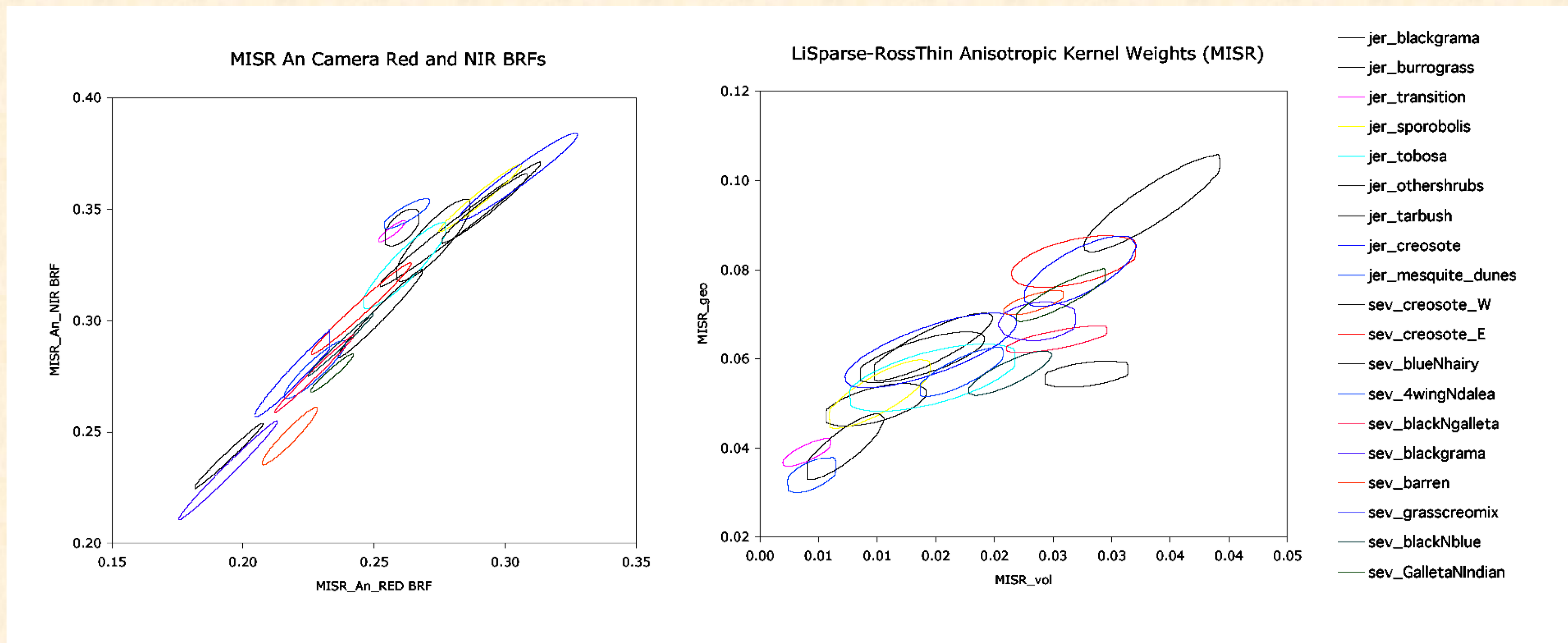

Figure 5. Probability density function ellipses for 19 cover and community types.

TABLE I: Separability Analysis Summary (Transformed Divergence)

Data Set	Mean TD	# TD<1000
MISR $MRPV_{red}+AN_{RGBNIR}$	1973	0
MISR AN (R, G, B, NIR)	1932	1
MISR iso, geo, vol	1867	7
MISR+MODIS iso, geo, vol	1839	8
MISR MRPV	1744	13
MODIS iso, geo, vol	1723	13
MODIS+MISR MRPV	1653	17
MODIS MRPV	1624	29

Conclusions: Both MRPV and LiSparse-RossThin model parameters show potential for improving cover and community type classifications in desert grasslands. The improvement obtained thus far is less than expected, possibly owing to the narrow range of solar zenith angles at which the input data were acquired: the models are not ideally constrained. Future work will incorporate the near infrared band data. Further work must be effected in order to reduce contamination from clouds and cloud shadows.

Acknowledgment: This work is supported by NASA grant NNG04GK91G to EOS project EOS/03-0183-0465 under EOS/LCLUC (program manager: Dr. Garik Gutman).