Vegetation effects on sub-pixel roughness measurements from NASA’s Terra/ASTER stereo images. A. Mushkin¹; A. Gillespie²; E. Abbott³; M. R. Smith²; J. Avila⁴; E. E. Brodsky⁴
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Background: Unresolved shadows cast by sub-pixel roughness elements result in a measurable deviation from Lambertian reflection, which can be utilized as an effective proxy for mapping sub-pixel roughness variations from orbit.

Rough surfaces appear lighter from the ‘down-sun’ view as shadows become progressively obscured by sunlit elements. The ratio between images acquired at such viewing geometries responds primarily to sub-pixel surface roughness.

ASTER® 15 m/pixel stereo images offer a readily accessible and efficient resource for ratio images that can map unresolved, sub-pixel roughness variations on Earth’s land surfaces.

Partialley vegetated surfaces

Recent fire scars on alluvial fans in semi-arid Owens Valley, CA present a natural laboratory to test the effects of vegetation % coverage on ASTER 3B/3N roughness images.

Fully vegetated surfaces

High-resolution airborne LiDAR data in the Cedar River watershed in western Washington provide a unique opportunity to test the ASTER 3B/3N ratio in a forested setting.

Conclusions

1. For bare surfaces ASTER 3B/3N ratios ~ sub-pixel surface roughness ~ age
2. For partially vegetated scrublands (> ~15% cover) vegetation dominates surface roughness and ASTER 3B/3N ratios ~ vegetation % cover
3. For fully vegetated surfaces canopy roughness explains most of 3B/3N the signal
4. In forests, ASTER 3B/3N ratios respond to structural stage / stand age