A new approach to obtain spectral properties of surface albedo over vegetated areas

It is based on
the Canopy Spectral Invariant Relationship

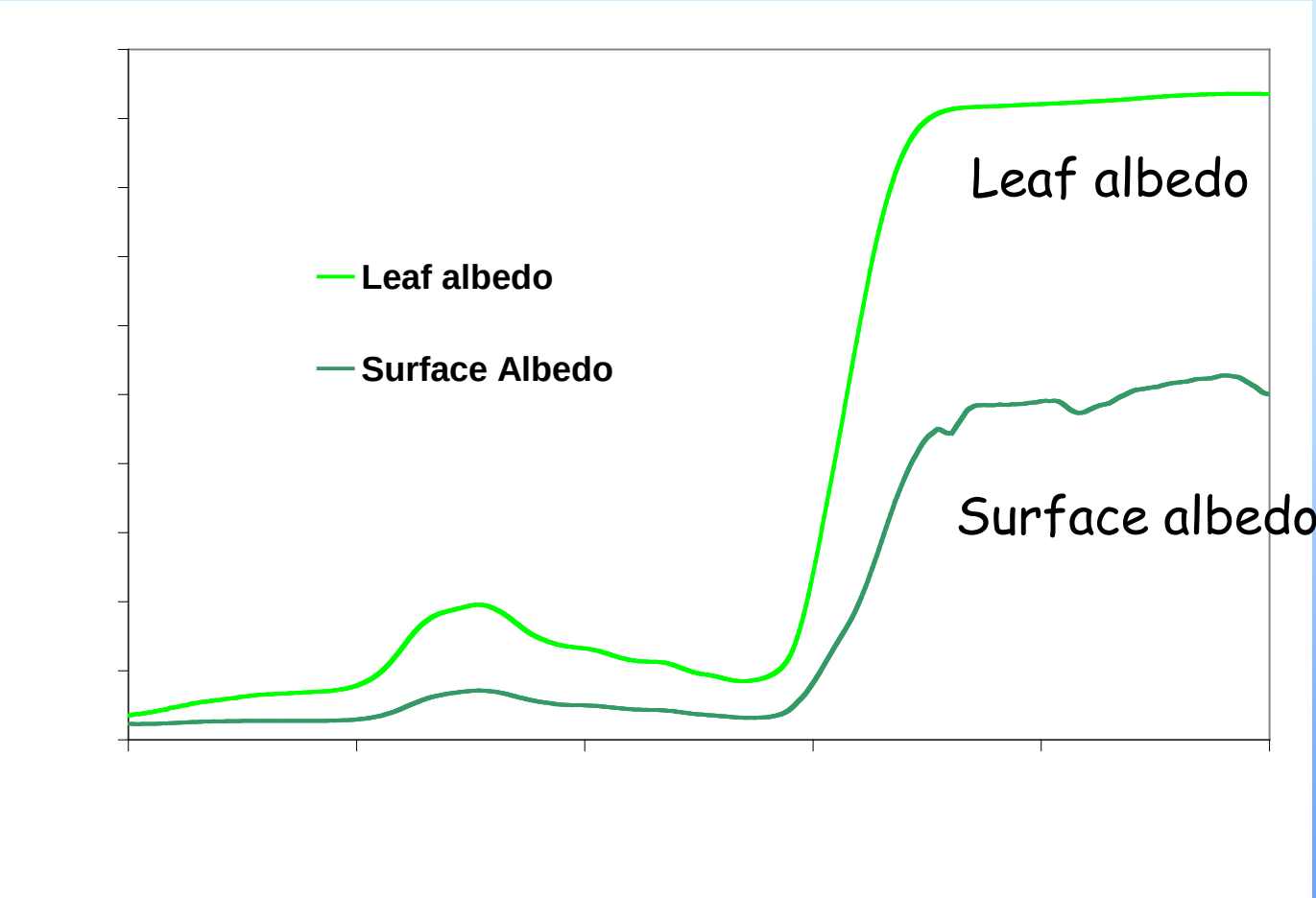
$$\langle \lfloor / \rceil \rfloor = p \langle \lfloor + r$$

$\langle$ is surface albedo

$\lfloor$ is single-scat. leaf albedo

p & r are spectrally-invariant parameters

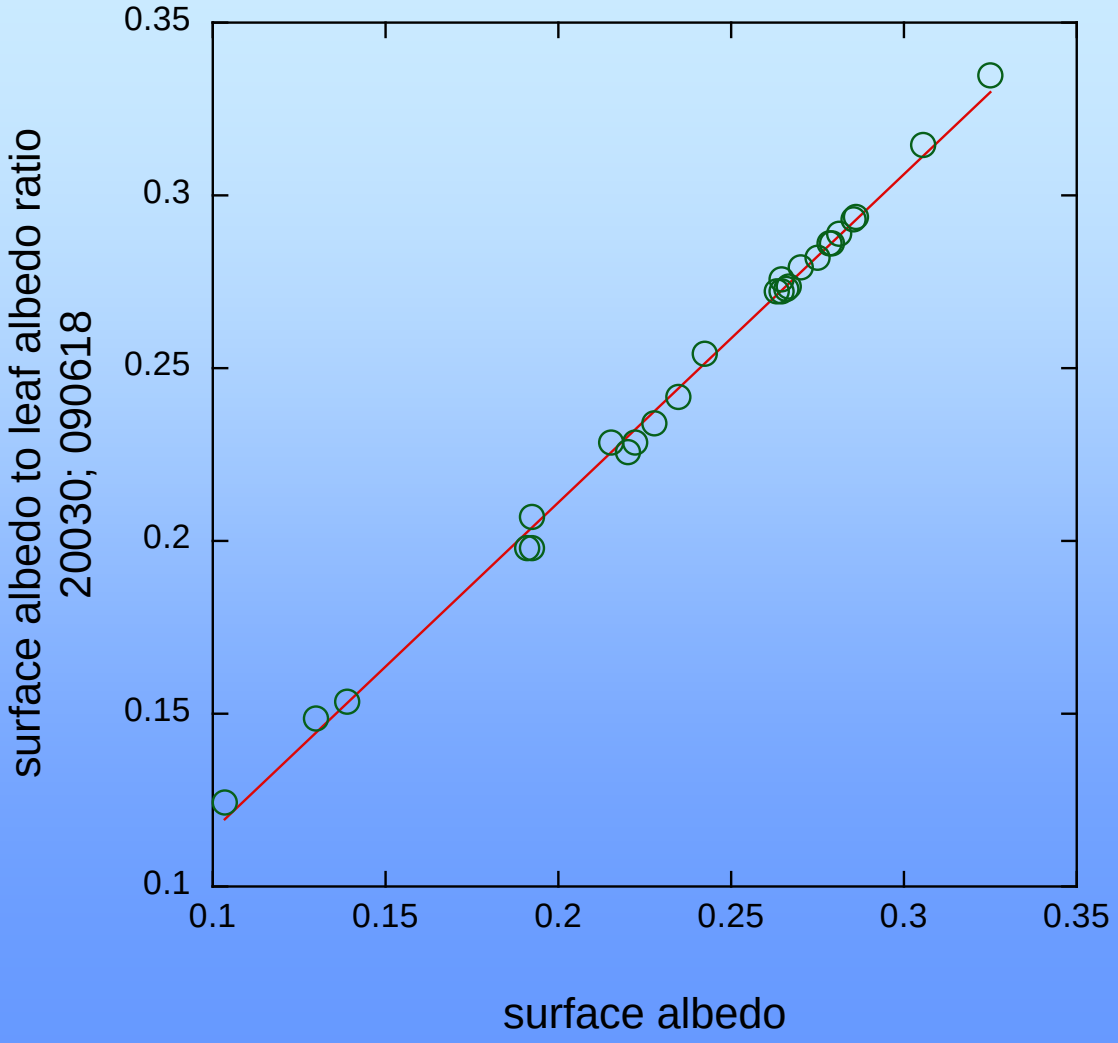
Surface and leaf albedo



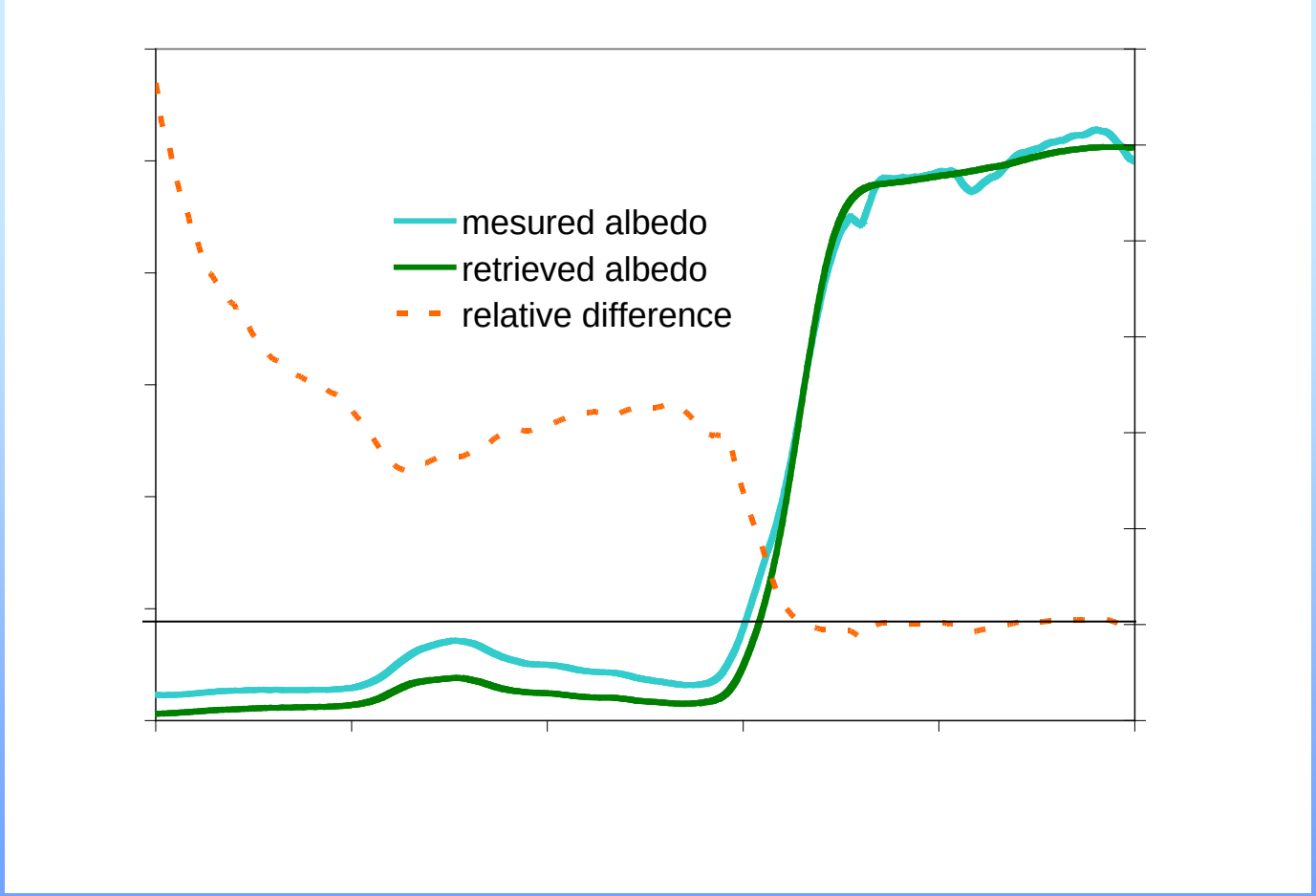
The spectral albedo of a green healthy leaf is quite stable

RACORO data: 090618

$$\langle \rho / \rho \rangle = p \langle \rho \rangle + r \qquad (700\ \text{nm} < \lambda < 850\ \text{nm})$$

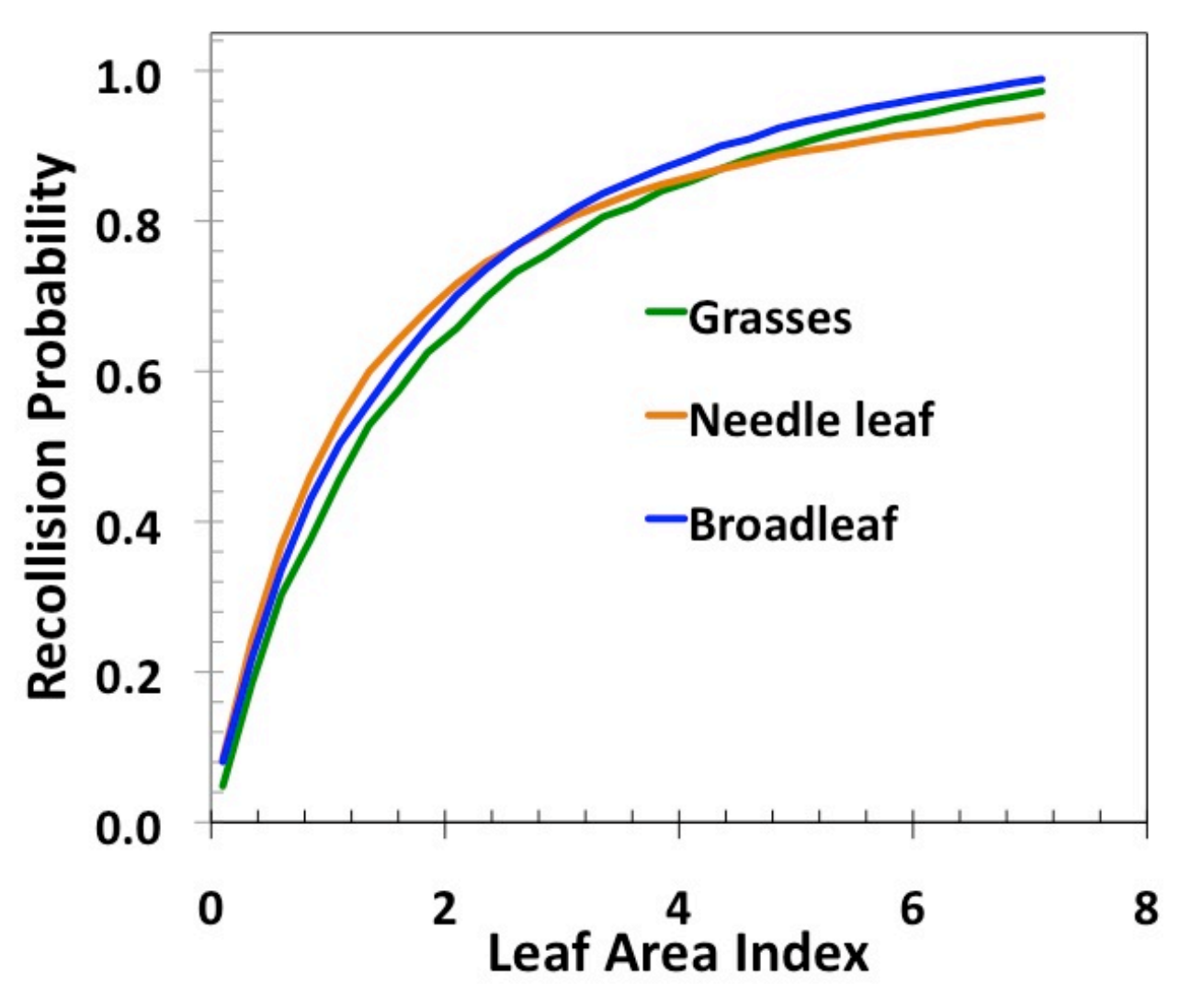


Difference between measured and retrieved surface albedo



The difference between measured and retrieved surface albedo is also a function of aerosol properties

LAI vs. recollision probability, *p*



Summary

- Take spectral RACORO measurements of surface spectral albedo;

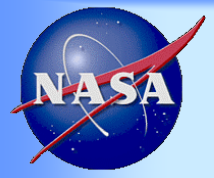
- Retrieve surface spectral albedo for *direct illumination only*;

- Extrapolate to the whole SW spectrum;

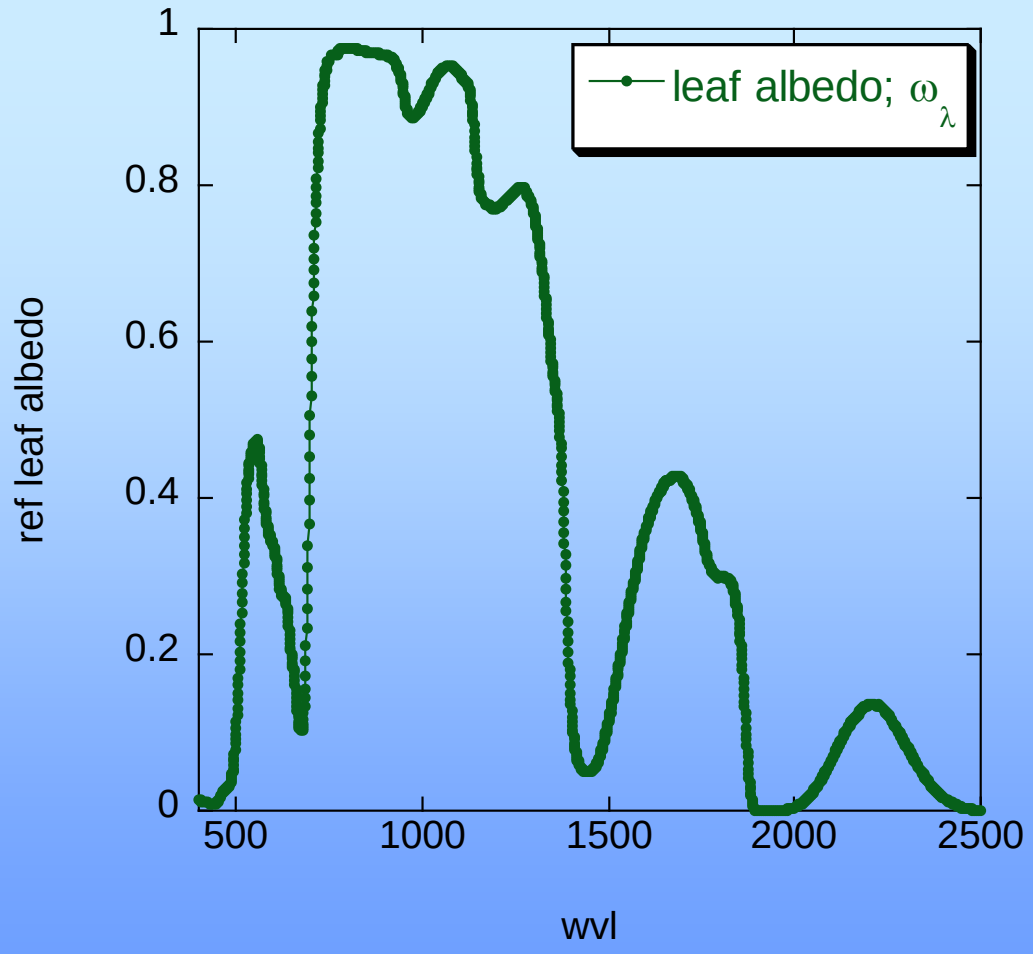
Limitations:

- only above vegetated surface;
- only under clear conditions.

•If spectral measurements are unavailable, get MODIS LAI and then spectral invariant parameters

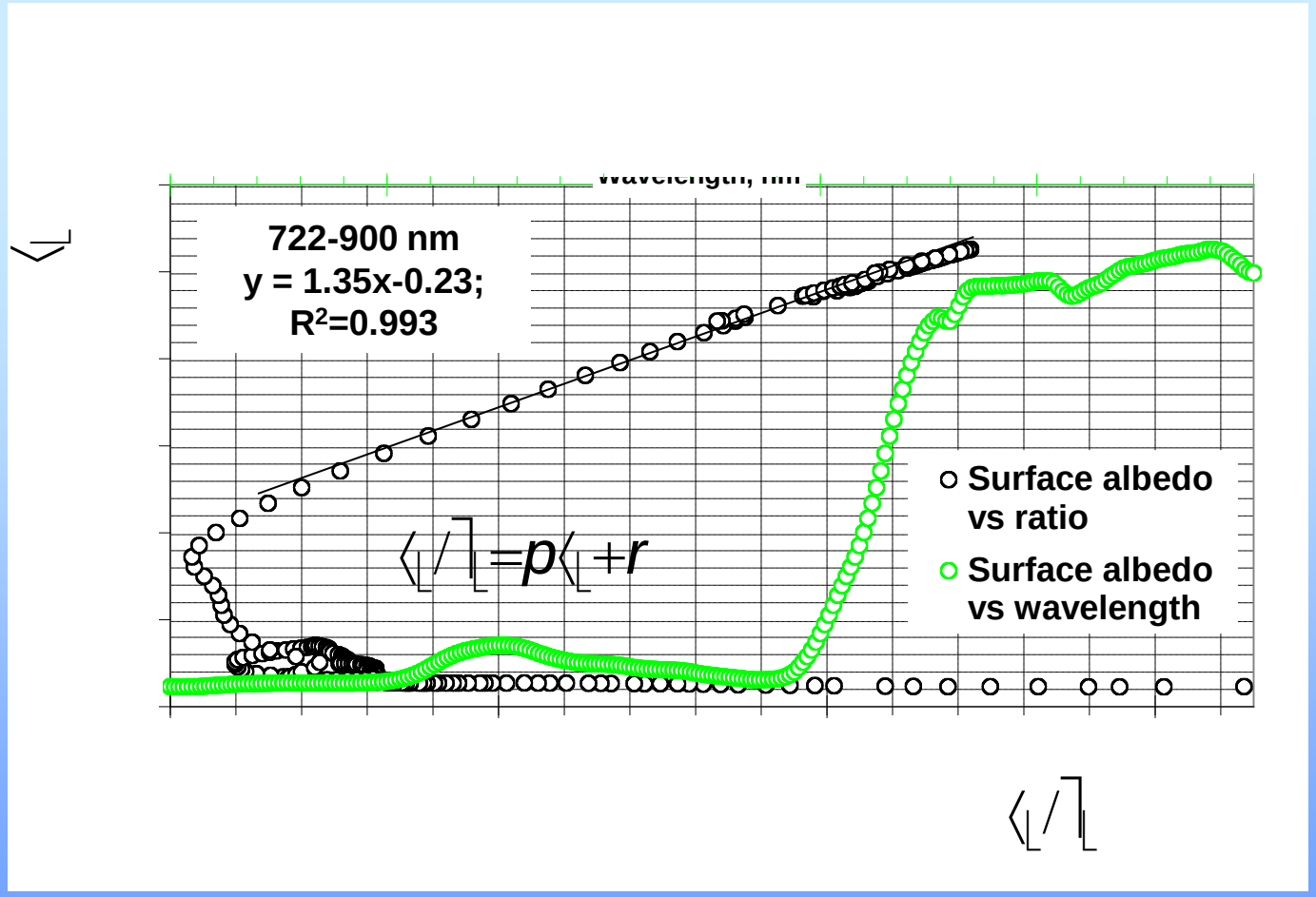

NASA

Leaf albedo



Reference leaf single scattering albedo

Retrieved surface albedo



• If the vegetated surface is illuminated by a parallel beam, the surface albedo can accurately be approx. by a linear function of the surface to leaf albedo ratio.

• Given slope and intercept, the spectral surface albedo for the condition of direct illumination can be obtained.