GENERAL COMMENTS

This study makes use of a coupled atmospheric-vegetation radiative transfer model to simulate the effects of (homogeneous) clouds on three vegetation índices computed from drone imagery. To do so, the authors simulate a single canopy scenario with the optical radiative transfer model of SCOPE, and different illumination conditions (based on different combinations of sun zenith angle and cloud optical thickness). They present how the reflectance factors and the derived spectral índices are affected by these conditions and by changes in illumination between the measurement of reference panels and targets.

Despite the potential complexity of coupling two RTMs, which is part of another work under review, I fear I do not see any scientific added value in this work. I have the impresión that the results presented can be directly inferred from already known theory, and that the problem stated for the "drone" world has been dealt with for a long time in the area of field spectroradiometry. In fact, many of the statements referenced as findings from a former manuscript by the author (Wolf et al., 2024) are well-established in atmospheric radiative transfer and BRDF theory (e.g., "Therefore, $\rho(\lambda)$ is also sensitive to θ (see Wolf et al., 2024), Appendix D)" is already known in BRDF theory; also, the comments on the dependence of albedo on the fraction of direct/diffuse incoming irradiance are described, for example, by Pinty et al., 2005). Any novelty brought by this manuscript does not stand out from older theoretical knowledge, as presented.

At the same time, the range of simulated scenarios is so narrow (i.e., only one canopy) that the results presented cannot be generalized or used to provide any recommendations. In fact, the results could be different for canopies or surfaces of varying properties (e.g., see the effect of a bowl- or bell-shaped BRDF in Pinty et al., 2005). Since no generalizable knowledge can be obtained, the "cautions" arising from this work offer no added value to the knowledge already generated by the proximal sensing community. Additionally, the authors do not provide a drone-specific correction method, which, on the other hand, would already be known from field spectroscopy: continuous monitoring of irradiance and BRDF characterization, or just avoiding unstable conditions. For some of the scenarios described, proximal sensing would just discard the measurements due to changes in illumination. Maybe drone operators should do the same. Moreover, drone-specific issues, such as the distance between the target and the sensor, where this modeling could offer something new (although this is also a long-known issue for airborne imagers), are often overlooked.

While the authors acknowledge the limitations of the simulations, the justification provided - "Nevertheless, we argue that the presented study can be used as a first approximation for the transition between cloud-free and cloudy regions"- is insufficient a scientific publication; particularly when no new knowledge is generated, and the claimed sunny to cloudy transition (characterized by heterogeneous cloud cover as these develop or arrive from the horizon) is not represented by the simulation of homogeneous clouds they perform.

I have the feeling that the authors have invested time in building a tool (Wolf et al., 2024), but they have not yet found a way to make a significant contribution with it, at least in this case. I recommend stepping back, reviewing former works on this topic, and identifying a problem that this tool can genuinely contribute to solving or alleviating.

References.

* Pinty, B., Lattanzio, A., Martonchik, J. V., Verstraete, M. M., Gobron, N., Taberner, M., Widlowski, J.-L., Dickinson, R. E., and Govaerts, Y.: Coupling Diffuse Sky Radiation and Surface Albedo, Journal of the Atmospheric Sciences, 62, 2580-2591, https://doi.org/10.1175/JAS3479.1, 2005.

* Wolf, K., Jäkel, E., Ehrlich, A., Schäfer, M., Feilhauer, H., Huth, A., Weigelt, A., and Wendisch, M.: Impact of clouds on vegetation albedo quantified by coupling an atmosphere and a vegetation radiative transfer model, EGUsphere, 2024, 1–30, https://doi.org/10.5194/egusphere-2024-3614, 2024.

SPECIFIC COMMENTS

Reflectivity: The term reflectivity is misused (it is rather an intrinsic property of the matter, whereas the reflectance and related terms are sample-specific), and for sure, SCOPE does not simulate reflectivity. The right term to be used in this work is “reflectance factor” (see Schaepman-Strub et al., 2006 for a definition).

* Schaepman-Strub, G., Schaepman, M. E., Painter, T. H., Dangel, S., and Martonchik, J. V.: Reflectance quantities in optical remote sensing—definitions and case studies, Remote Sensing of Environment, 103, 27-42, https://doi.org/10.1016/j.rse.2006.03.002, 2006.

Equation 1: The term “sr” is not defined, “τ” is not defined in the subsequent paragraphs. Overall, make sure all terms are defined the first time they are introduced in the text.

Lines 39-40: What reference supports this statement? Reflectance factors can be larger than one, but reflectance (the ratio of the total reflected to total incoming radiance) cannot (see again Schaepman-Strub et al., 2006). If so, are “broken clouds” what make reflectance factors go beyond one? If that has been proven, it must be referenced (and also other causes).

Lines 41: Remote sensing does not retrieve vegetation índices. It retrieves reflectance factors, from which vegetation índices can be computed.

Equation 4: Misses the scaling factor of the integration time or gains set for the sensor and ignores the dark current that must be subtracted from the recorded digital signal.

Lines 69-74: This explanation is nuclear. There are several ways to prepare for a drone flight. Sometimes, the operator holds the camera above a reference panel (by the way, usually grey, and the darker the less Lambertian, assuming in the best case situation Spectralon® is used) to optimize the integration time and get a cross-calibration between the up-welling and the down-welling channels of the sensing sistema if the second exists, which is not always the case. The alternative is to place large reference panels in the study area and fly above them in one of the overpasses, using them as a reference. It is not clear what procedure the authors describe.

Lines 153-154: The fact that libRadtran simulates down-welling irradiance at 40 m above ground means that no differences between the irradiance level at the drone and at the target height are considered. This should be clarified, justified, and the potential impact on the results discussed.

Lines 212-213: "While direct radiation is reflected into a narrow solid angle, diffuse radiation is scattered over a wider solid angle (Schaepman-Strub et al., 2006)." This statement is false. Direct radiation is reflected in all directions (e.g., a Lambertian diffuser). A different thing is that a Bi-directional reflectance factor is defined as the ratio between the incoming and outgoing radiance in infinitesimal solid angles.