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Rotary wing UAS based multiangular hyperspectral measurements over various vegetation

Andreas Burkart (1), Helge Aasen (2), Luis Alonso (3), Georg Bareth (2), and Uwe Rascher (1)

(1) Institute für Bio- und Geowissenschaften, IBG-2: Pflanzenwissenschaften, Forschungszentrum Jülich, 52425 Jülich, Germany, (2) Geographisches Institut, Universität zu Köln, 50923 Köln, Germany, (3) Departamento de Fisica de la Tierra y Termodinamica, Universidad de Valencia, Spain

Imaging sensors are influenced by angular effects, so-called bidirectional reflectance distribution functions (BRDF). Thus, knowledge about the angular characteristics of the investigated land cover, especially over vegetation, is critical for the analysis of data derived from satellite and airborne sensors. However, as vegetation largely changes its structure throughout the growing cycle angular effects may change within days. In the past, various efforts were conducted to characterize these effects on the ground. Common tools for this are ground based goniometers which usually have a diameter of up to 4 meters, and a measurement footprint of a few centimeters. Thus they are restricted to small vegetation cover such as pasture.
Unmanned aerial vehicles have the potential to bridge the gap between ground measurements and air- or spaceborne systems. They are cost efficient and ready to fly within minutes, and enable timely and flexible measurements.
Recently, big advances have been made in stability and positioning accuracy. Thus, UAVs now enable goniometric measurements with a diameter of up to 100 meters. Compared to ground based system, the UAV goniometer provides a larger footprint that corresponds well to the pixel size of air- or spaceborn sensors. In addition, they enable multiangular measurements over inaccessible canopies such as forest or wetland.
In this study we present the technical setup of the first rotary wing hyperspectral goniometer together with first results of multiangular measurements over pasture, wheat and forest.