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Difficulties of biomass estimation over natural grassland

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Estimation of biomass amount in grasslands using remote sensing is a challenge due to the high diversity and different phenologies of the constituting plant species. The aim of this study was to estimate the biomass amount (dry weight per area) during the vegetation period of a diverse semi-natural grassland with remote sensing. A multispectral camera (Tetracam Mini-MCA 6) was used with 3 cm ground resolution. The pre-processing method includes noise reduction, the correction for the vignetting effect and the calculation of the reflectance using an Incident Light Sensor (ILS). Calibration was made with ASD spectrophotometer as reference. To estimate biomass Partial Least Squares Regression (PLSR) statistical method was used with 5 bands and NDVI as input variables. Above ground biomass was cut in 15 quadrats (50×50 cm) as reference. The best prediction was attained in spring (r^2=0.94, RMSE: 26.37 g m^{-2}). The average biomass amount was 167 g m^{-2}. The variability of the biomass is mainly determined by the relief, which causes the high and low biomass patches to be stable. The reliability of biomass estimation was negatively affected by the appearance of flowers and by the senescent plant parts during the summer. To determine the effects of flower's presence on the biomass estimation, 20 dominant species with visually dominant flowers in the area were selected and cover of flowers (%) were estimated in permanent plots during measurement campaigns. If the cover of flowers was low (<25%), the biomass amount estimation was successful (r^2 >0,9), while at higher cover of flowers (>30%), the estimation failed (r^2 <0,2). This effect restricts the usage of the remote sensing method to the spring – early summer period in diverse grasslands.