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## Estimation of aboveground plant water storage using Sentinel-2 images in a semi-arid area

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Aboveground plant water storage (APWS), the total of water storing in aboveground parts of plant, has the function of sustaining the balance between water loss by transpiration and water gain of root uptake. APWS is also essential for plants and hydrological cycle, particularly for semi-arid areas, where water availability is limited. However, APWS varies spatially due to the heterogeneity of natural areas that are composed of a large variety of vegetation types, and studies on the spatial variability of APWS are quite limited in semi-arid areas. To fill this knowledge gap, we established 55 inventory plots with 36 plots in forests and 19 plots in shrubs to detect the spatial variability of APWS using a Random Forest (RF) algorithm and Sentinel-2 images in Mao County, China. Field observations indicated that APWS varied significantly with ecosystems, with the highest APWS in forests. Regardless of ecosystem type, mean APWS in Mao County was 117.63 Mg ha<sup>-1</sup>. 10-fold cross-validation suggested that the RF model could reasonably predict APWS (model efficiency = 0.68, root mean square error = 54 Mg ha<sup>-1</sup>), enabling to capture the spatial variability of APWS. A robust spatial variability of APWS was observed with the highest APWS in forests located high altitude areas, while the lowest APWS was found in shrubs located in low altitude areas. Total APWS was 3.39×10<sup>7</sup> Mg across the whole study area, which could be used as a valuable natural resource for the semi-arid area. Our study successfully explored the spatial variability of APWS, suggesting the capability of detecting APWS using Sentinel-2 and providing essential data evidence for environmental protection for semi-arid areas.