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Unmanned Aerial Vehicles (UAVs) for Ground Truth Data Collection for Land Cover Change Estimation of Primate Habitats

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ABSTRACT:

High spatial resolution data is increasingly available, however its cost deferring its general use, particularly among conservation and biodiversity scientists. Thus, most researchers working on local, regional or global scale studies rely on lower resolution data, in most cases using the freely available Landsat database. Sumatra and Borneo are the last remaining islands where the orang-utan (*Pongo* spp.) species are distributed. To monitor the orang-utan's habitats, rapid and accurate remotely sensed information is needed. However, the available forest or land cover maps do not necessary satisfy such requirements, or when imagery was digitized, severely degraded areas were sporadically categorized as primary forests. Unmanned aerial vehicles (UAVs) are increasingly employed in biodiversity monitoring, assessing wildlife (i.e. counting eggs) or vegetation surveys. Their common benefits, compared to manned airplane operations, are: low risk and cost, multispectral imagery at variable spatial resolution (0.01-0.2 m), repeatability, independent operational hours, and can even land on water. There are some disadvantages too, but mainly in the legal, regulatory and export control rules on parts, the somewhat steep learning curve to operation them, as well as the actual data processing. Additionally, their limited flying paths is an important concern especially when larger areas are planned to me mapped. However, as the benefits mostly outweigh the limitations, UAVs may be an attractive option for map or survey hardly accessible areas, such as the primate's habitats in Indonesia or Malaysia. Depending on the collected ground data and the imagery, generated land cover maps can discriminate specific habitats. However, accuracy assessments of the final maps are necessary, and ground truth data are used for this task. Moreover, to fine-tune classifications not only sufficient but very accurate ground information is necessary. In this study, we tested the feasibility of a UAV based ground truth collection method for which can be used for regional or local scale studies and compared the achieved accuracy to a general regional land cover map. We also investigated the effects on the supervised classification when ground truth point collection (training data) was done either from single aerial photos or from an image mosaic. The achieved accuracies showed that UAV based ground truth collection data would improve the accuracy of a generated land cover map significantly, compared to a "general" regional land cover map, while the accuracies were very similar when single or mosaic based ground truth information was employed in the classification.