



Accuracy of digital surface models generated from UAV images

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The interest in unmanned aerial vehicles (UAV) as a common survey and monitoring technology in geosciences is growing. Progress in digital photogrammetry and computer vision enables fast and precise creation of digital surface models (DSM). Measuring soil erosion with DSM derived from overlapping images is one potential application of UAV data. Therefore, the calculation of DSM with high resolution and accuracy is necessary. However, due to the chaotic characteristic of natural surfaces measuring the accuracy of a UAV-DSM is a difficult task. A first comparison of a field plot captured by UAV and terrestrial laser scanning (TLS) allows for qualitative conclusions, but probable errors within the TLS-DSM (e.g. due to low incidence angles) impede comprised quantitative accuracy information. Thus, a millimetre accurate reference field with the size of 35 m² is designed and measured with a total station. DSM of the test area are generated with different cameras – single-lens reflex camera, compact system camera and compact camera – to account for different camera geometries and their performance at automatic image matching and orientation. Furthermore, different software is tested which on the one hand uses structure from motion and on the other hand a combination of methods from photogrammetry and computer vision. Results show accuracies within few millimetres for a simulated flying height of four metres.