Editorial

This special issue of *Zeitschrift für Geomorphologie* concentrates on laser scanning in geomorphology. Its contributions are drawn from the European Geosciences Union session *GM1.2 Airborne and terrestrial laser scanning and geomorphology: possibilities, problems, and solutions* and the technical session *FS 62 Möglichkeiten und Grenzen von Laserscanning in der Geomorphologie (Possibilities and limits of laser scanning in geomorphology)* at the Deutscher Geographentag, both held in Vienna in 2009.

Laser scanning is a relatively young technology and the first operational airborne campaigns were conducted around 1995. This field is characterized by ongoing technological development, exploration and consolidation of methods, as well as understanding the benefits and limitations of laser scanning for geomorphology. The latest developments, e.g., the exploitation of the full-waveform measurements, remain to be evaluated, while the full potential of high-resolution and high-accuracy topographic data has not yet been fully utilized for applications in geomorphology.

The first paper in this collection by Höfle et al. gives an overview on the sensor and system developments from a geomorphological perspective, providing an assessment of the research intensity in the field of laser scanning for geomorphology. The method may be subject of debate, as also noted by the authors, but it quantitatively substantiates the claim that laser scanning for geomorphology is a growing field. The other five papers either concentrate on fluvial processes or on Alpine regions, respectively.

Alho et al. study different static and dynamic laser scanning systems, from land and boat platforms, and compare their suitability for derivation of digital terrain models of the water course and for change detection in fluvial environments. Vetter et al. have their focus on methods for fusion of airborne laser scanning and river cross-profiles for obtaining a water course surface model of an alpine gravel-bed torrent. Bimböse et al. use terrestrial laser scanning systems in order to analyse sediment dynamics in alluvial deposits. They conclude that it is possible to compare intra- and interannual sediment dynamics from slopes to the river channel using terrestrial laser scanning.

Bollmann et al. investigate the usability of airborne laser scanning for characterizing geomorphologic processes, with elevation as the primary observable. They identify permafrost processes as those which are most difficult to assess, requiring observations spanning at least a few years. Fritzmann et al. study the observed intensity, i.e. a measure of the received echo energy, for the separation of vegetation, rock, snow, ice, water, and firn in high mountain environments.

Summing up, the papers demonstrate that there is a huge potential for using laser scanning in geomorphology, and also that it can become a standard tool. Current restrictions include instrument weight and range envelope for terrestrial scanning, costs in the case of airborne laser scanning and last but not least suitable software for processing and presenting laser scanning data in order to exploit the point cloud content fully. Nevertheless, laser scanning, be it terrestrial or airborne, paves the way (i) for new area-wide recognition and mapping of land forms even in environments of low accessibility and, what is of even higher merit in future-oriented research, (ii) for the quantification of geomorphological process dynamics. Although results can now be achieved in a quality never before experienced, laser scanning cannot make field work redundant. However,

it provides a new absolute basis for field investigations. Thus, the application of laser scanning opens a new era in geomorphological research.

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