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# Editorial: Applications of Light Detection and Ranging (LiDAR) in Geosciences

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Light Detection and Ranging (LiDAR, or laser altimetry) is an optical remote sensing technology that uses laser pulses from ground-based, airborne, or space borne platforms to measure the distances to objects. LiDAR has been extensively used for atmospheric research and mapping land surface features including topography, vegetation, and the built-up environment. This editorial provides a brief summary of the applications of airborne discrete-return LiDAR in geosciences.

Airborne discrete-return LiDAR can acquire (x, y, z) coordinates of ground objects with sub-meter level accuracy for generating high-resolution Digital Elevation Models (DEM). The major applications of discrete-return LiDAR in geosciences can be summarized in the following six fields. (1) Changes in geomorphic surfaces, including a) fundamental topographic signatures such as the formation of evenly spaced ridges and valleys [1]; b) alluvial fan formative processes and debris flow deposits [2,3]; c) volumetric changes of costal dunes and beach erosion [4,5]; d) changes in glaciers/ice sheets and glacial sediment redistribution [6,7]; and e) lava flow dynamics and rheology [8-10]. (2) Surface hydrology and flood models [11-15]. (3) Tectonic geomorphology [16-20]. (4) Lithological mapping [21,22]. (5) Rock mass structural analysis [23-25]. (6) Natural hazards, such as landslides, debris flows, and earthquake damage [26-31].

Data accessibility is a key issue for facilitating the wide application of LiDAR data in geosciences. Compared with other remote sensing technologies, LiDAR data acquisition is still relatively expensive, especially in the developing world. However, new facilities and tools are being developed to meet the needs of the scientific communities. For example, the National Science Foundation (NSF) Open Topography Facility (http://www.opentopography.org) is a portal to high-resolution LiDAR data and processing tools. A virtual globe (Crusta) was introduced for virtual geologic investigation based on high-resolution (sub-meter) topography data (including LiDAR) and other data on Earth [32]. It is expected that new exciting applications of LiDAR in geosciences will be reported in the near future.

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