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OpenTopography: Enabling Online Access to High-Resolution Lidar Topography Data and Processing Tools

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High-resolution topography data acquired with lidar (light detection and ranging) technology are revolutionizing the way we study the Earth's surface and overlying vegetation. These data, collected from airborne, tripod, or mobile-mounted scanners have emerged as a fundamental tool for research on topics ranging from earthquake hazards to hillslope processes. Lidar data provide a digital representation of the earth's surface at a resolution sufficient to appropriately capture the processes that contribute to landscape evolution.

The U.S. National Science Foundation-funded OpenTopography Facility (http://www.opentopography.org) is a web-based system designed to democratize access to earth science-oriented lidar topography data. OpenTopography provides free, online access to lidar data in a number of forms, including the raw point cloud and associated geospatial-processing tools for customized analysis. The point cloud data are co-located with on-demand processing tools to generate digital elevation models, and derived products and visualizations which allow users to quickly access data in a format appropriate for their scientific application. The OpenTopography system is built using a service-oriented architecture (SOA) that leverages cyberinfrastructure resources at the San Diego Supercomputer Center at the University of California San Diego to allow users, regardless of expertise level, to access these massive lidar datasets and derived products for use in research and teaching.

OpenTopography hosts over 500 billion lidar returns covering 85,000 km2. These data are all in the public domain and are provided by a variety of partners under joint agreements and memoranda of understanding with OpenTopography. Partners include national facilities such as the NSF-funded National Center for Airborne Lidar Mapping (NCALM), as well as non-governmental organizations and local, state, and federal agencies. OpenTopography has become a hub for high-resolution topography resources. Datasets hosted by other organizations, as well as lidar-specific software, can be registered into the OpenTopography catalog, providing users a "one-stop shop" for such information.

With several thousand active users, OpenTopography is an excellent example of a mature Spatial Data Infrastructure system that is enabling access to challenging data for research, education and outreach. Ongoing OpenTopography design and development work includes the archive and publication of datasets using digital object identifiers (DOIs); creation of a more flexible and scalable high-performance environment for processing of large datasets; expanded support for satellite and terrestrial lidar; and creation of a "pluggable" infrastructure for third-party programs and algorithms. OpenTopography has successfully created a facility for sharing lidar data. In the project's next phase, we are working to enable equally easy and successful sharing of services for processing and analysis of these data.