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Microtopography: What does it reveal about landscape structure, organization and processes?

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High resolution Lidar topography and Airborne Visible/Infrared Imaging Sprectrometer (AVIRIS) remote sensing data are becoming increasingly available over large regions of the Earth's surface. These data sets can be linked to reveal processes and landscape features that cannot be detected at lower resolutions. In May 2011, the Bird's Point New Madrid Floodway in southeastern Missouri was intentionally breached during extreme Mississippi and Ohio River flooding. Pre- and post-flood Lidar and post-flood AVIRIS data enable study of flood geomorphic impacts and the biogeochemical state of the floodplain. Differential Lidar quantifies erosion and deposition, while empirical, statistical and data mining techniques are employed to investigate soil properties from AVIRIS. Vegetation, soil properties, and flood exposure are linked to observed geomorphic impacts to indicate landscape vulnerability to flood events. Additionally, we develop an approach to characterize and link the spatial distribution of microtopographic depressions using the same high resolution Lidar data sets. Topographical floodplain legacies such as former meander scar ridges correlate to soil characteristics and vegetation within the floodplain, and also dictate much of the geomorphic impacts of the levee breach and subsequent inundation. At the location of one extremely eroded meander scar ridge, AVIRIS data shows a high clay content, increased iron concentration and decreased soil organic matter, all in accordance with the erosion of silty and sandy topsoil. This study highlights approaches in which high-resolution data sets can be linked to reveal important landscape properties and analyze impacts of extreme events and long-term legacy effects.