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Earthquake damage areas detection using landsat8 surface reflectance products

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It is well known that earthquake is one of the most lethal and hazardous nature disasters at the global scales. Timely and accurate information on earthquake-induced damage to urban infrastructure is of great importance to, and is urgently required by, rescue and relief efforts, and in disaster assessment. There are many studies using high-resolution satellite or airborne imagery to identify damaged buildings by earthquakes at large scales and determining the degree of damages. Because of its wider swath can depict the perspective view of wide-ranging disaster areas and its ample archive of previously acquired images can provide pre-event images for almost any location after a disaster, the middle-resolution satellite imagery for which the ground sampling interval is larger than 10 m should also be utilized for damage detection. A method based on the 30 m resolution Landsat-8 operational land imager (OLI) surface reflectance products is proposed to detect the earthquake damage areas. Firstly, the influences of cloud coverage, instrument saturation, and atmosphere aerosol scatting are eliminated in the surface reflectance products. Then, the mean and standard deviation (STD) of surface reflectance products collected during the three years before an earthquake is calculated. The differences between post-earthquake image and the mean image are taken to reflect the effects of earthquakes on surface reflectance. After that, the areas with the absolute value of the differences greater than 2 times the local STD are taken to be affected by the earthquake. As we mainly focus on the building damages in city or villages areas, only pixels with MODIS Land Cover Type data MCD12Q1 is labeled as ‘urban and built-up’ are take into account in this study. Finally, this method is applied to the 2015 Nepal M 7.8 earthquake. Compared with Prompt Assessment of Global Earthquakes for Response (PAGER) output for selected cities impacted by these earthquakes, the results show that this method can detect the earthquake impacted areas with earthquake intensity greater than VII.