Supplement to HazMapper: A global open-source natural hazard mapping application in Google Earth Engine

Corey M. Scheip[1,2] and Karl W. Wegmann[1,3]

[1]Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University, Raleigh, NC, 27695, USA
[2]North Carolina Geological Survey, Swannanoa NC, 28778, USA
[3]Center for Geospatial Analytics, North Carolina State University, Raleigh, NC, 27695, USA

Correspondence: Corey M. Scheip (cmscheip@ncsu.edu)

1 Curated Example of a HazMapper-generated Mass Wasting Map for a portion of the 23 November, 2019 rainfall event in West Pokot County, Kenya

Appendix 1 File: *HazMapper_Mass_Wasting_Kenya_2019_Example.kmz*

The kmz file is an example of a mass wasting inventory map generated from the Kenya HazMapper example described in more detail in Section 4.1.1 of the main text. The initial HazMapper parameters used to generate this map include Sentinel-2 data (10-meter pixel date) with an event date of 23 November 2019, a pre-event window of 2 months, a post-event window of 0.5 months, and a maximum cloud cover threshold of 30%. The $rdNDVI$ results were downloaded to a local PC as a GeoTIFF image file, which was then imported to ESRI ArcMap v. 10.6.1. The imported GeoTIFF image file was cropped to the area of interest (main text Figure 3D) using the **Extract by Mask** command in the Spatial Analyst extension of ArcMap. In the GeoTIFF file exported from HazMapper, the rdNDVI values ranged from -94.16 to 34.45. Following a brief (~5 minute) point-and-click analysis of $rdNDVI$ values that likely did and did not constitute locations of mass wasting, an $rdNDVI$ value of $\leq$ -12 was chosen as the threshold value to represent possible mass wasting pixels. All pixels with $rdNDVI$ values > -12 were modified to “no data” using the **Setnull** command in the Raster Calculator function within the Spatial Analyst extension of ArcMap. The resulting output file was specified as an ESRI Grid raster dataset. Again, the Raster Calculator was used with a conditional statement (**Con**) to convert the newly created ESRI Grid raster file into a binary raster containing cells with values equal to 1 where the $rdNDVI$ value was $\leq$ -12, with all other cells containing NoData values. The **Raster to Polygon** conversion tool was used to convert this binary raster to an ESRI shapefile and the output shapefile was projected from geographic (WGS84) coordinate system to UTM Zone 36 North, appropriate for western Kenya. The shapefile attribute table was modified by adding a confidence code to allow for discrimination between (1) high-confidence and (2) moderate-confidence mass wasting area delineations. Polygons from landscape positions unlikely to be associated with mass wasting from the 23 November Rain event, for example agricultural fields that had been harvested during the pre-to-post analysis window, were removed from the inventory. The modified shapefile was then exported to a Google Earth .kmz file using the **Layer to KML** conversion tool in ArcMap.

The resulting curated inventory contains a qualitative assessment of locations likely to have experienced mass-wasting associated impacts from the 23 November precipitation event. Across the area of interest used in this example, we identify 72 individual mass wasting polygons ranging in size from $1.1x10^3$ to $1.46x10^5$ m^2 of either high or moderate identification confidence; however, we recognize this number is in part based upon the threshold applied to the $rdNDVI$ data to distinguish areas potentially impacted by mass wasting. Removal of false positives (e.g. harvested fields) results in an area of 2.2 km^2 out of the 17.65 km^2 example analysis area, or 12%, that was impacted by mass wasting during the 23 November, 2019 event. It is also important to note that this particular analysis could have been completed as early as ~two weeks after the fatal debris flows, potentially aiding emergency response efforts.