Landslides in Central Italy identified from Sentinel 2 multispectral imaging time series analysis with Google Earth Engine

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1. Introduction

- Aim of the study: individuate the areas affected by landslides triggered by the October 30 2016 earthquake
- Study area: Visso/MG, Central Italy
- Multispectral satellite images (Sentinel 2) analysis carried out in Google Earth Engine
- Distinguish anthropogenic changes in the land-use (e.g. construction of buildings, clear cut) in the time period from landslide areas

2. Methods

- Multispectral images analysis:
  - Selection of the images avoiding clouds and the seasonal shadowing effect of the hills due to steep terrain, guaranteeing the same solar elevation (July 11, 2015 and July 10, 2017)
  - Correction of the images displacement
  - Analysis of 7 bands on always illuminated by the Sun, always in shadow and reference areas
  - Calculation of the ratio between the two images selected
- ArcGIS software
  - Creating a slope map from DEM
  - Combine radiance coefficient to slope angle to distinguish anthropogenic changes in the land-use

3. Images selection

4. Bands analysis

5. Ratio

6. Combining band ratio and slope angle

7. Results

8. Conclusion

References

The aim of the study was to define the sensitivity of the sentinel-2 multispectral images in detecting landslides that followed the devastating earthquake of October 30, 2016, in Central Italy.

The results are valid for any vegetated area with brecciated geology. The geology analysis of the soil allows to define the spectral contrast of the reflecting area and after treatment with ArcGIS, on previous blue chips (1986, 2018), yellow chips, 100,000 pixel by pixel, it is noted that the red band is particularly responsive.

Since landslide is typical for mountainous areas, the shaking of topography as an effect that must be assessed for. We find that due to the seasonal variation of shaking, comparison of images taken at the same date of the year, also if distant one or two years, is optimal for distinguishing landslides.

The geology being a local factor, for hazard purposes it is recommendable that the spectral images are analyzed systematically for the entire mountainous territory, to define the most significant spectral bands characteristic for distinguishing exposed areas from vegetation.