Advancing mountainscape diversity, functioning, and disturbance dynamics studies with hyperspectral imaging requires a focus on plant traits, soil-rock attributes, and landsliding

Ana Kilgore 1, \* and Carla Restrepo 1

1 Department of Biology, University of Puerto Rico at Rio Piedras, San Juan, PR, 00931, US

Supplementary Material: **Table S1, Figure S1**

**Table S1**. Landslide studies characterizing Vegetation Recovery Rates (VRR) over time.

**Figure S1**. Functional and Spectral Traits in Landslide-Impacted areas in the Sierra de las Minas in Guatemala.

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| Table S1. Landslide studies characterizing Vegetation Recovery Rates (VRR) over time (T0 = year of image prior to triggering event , T1=year of first image, T2=year of last image) based on the Normalized Vegetation Index (NDVI). VRR = NDVI2 - NDV1 / NDVI0 - NDVI 1, where NDVI0 is the NDVI prior to a landslide triggering event, NDVI1 is the NDVI of sites affected by landslides immediately after the triggering event, and NDVI2 is like NDVI1 but after years of the triggering event. In () standard deviations if available. In [] revised value resulting from compound effect of a second triggering event after the original one. An alternative metric is the Landslide Restoration Rate (LRR), LRR = 1 - (LAt/Lt0), where LAt is the area than remains denuded at time t and LA0 is the landslide area at the time that it was triggered. |
| Country | Event | Site | Dominant ecosystems | Sensor | T0 (year) | T1 - T2 (year) | T2-T0 (years) | Overall method | ET Initial - Final NDVI | ET VRR (%) | ET VRR (%) yr-1 | RT Initial - Final NDVI | RT VRR (%) | RT VRR (%) yr-1 | Comment (elevation, slope) | Reference   |
| Taiwan | 1999 Chi-Chi Mw 7.3 Earthquake | Jou-Jou Mountains | Forests and Grasslands | SPOT (20 m) | 1999 | 1999 - 2001 | 1.5 | NDVI; Classification; Change detection | 0.40 (0.07) - 0.30 (0.11) [0.17 (0.10)] | 59 [36] | 39 [24] |   |   |   | VRR down to 36% after Typhoon Toraji; VRR by elevation, slope, and landscape position | 1 |
|  | 1999 Chi-Chi Mw 7.3 Earthquake | Jijiu Peaks | Forests and Grasslands | SPOT (20 m) | 1999 | 1999 - 2020 | 20 |   |   |   |   |   |   |   | Uses LRR: Slopes (93%) > Ridges (86% > Rivers (79%) | 2 |
|   | 2001 Toraji, 2004 Mindulle, 2008 Sinlaku, 2009 Morakot | Ta-Chia, Wu, and Chuo-Shuei catchments, Central Taiwan |   | SPOT (20 m; PAN ) | 2001 | 2001 - 2009 | 8 | NDVI; Classification, Change detection |   |   |   |   |   |   | Images before and after major typhoon events after the 1999 Chi-Chi Earthquake. Cumulative area of reactivated and newly formed landslides was 14,386 ha and 26,757 ha, respectively | 3 |
| China | 2008 Wenchuan Mw 7.9 Earthquake | All extent | Forests and Shrubs | Landsat TM (30 m), Airborne sensor ADS (0.3 - 0.7 m) | 1982 | 2008 - 2011 | 3 | FVC (NDVI); Classification, Extraction landslides |   | 73 | 24 |   |   |   |   | 4 |
|  | 2008 Wenchuan Mw 7.9 Earthquake | Baisha and Longxi watersheds |   | Landsat (30 m) | 1994 | 2008 - 2014 | 6 |   |   |   |   |   |   |   |   | 5 |
|  | 2008 Wenchuan Mw 7.9 Earthquake |   | Diverse vegetation types | MODIS (250 m) | 2005 | 2008 - 2013 | 5 | FVC (NDVI) |   | 41 | 8 |   |   |   |   | 6 |
|  | 2008 Wenchuan Mw 7.9 Earthquake | Epidentral area round Yingxiu |   | MODIS (250 m) | 2001 | 2008 - 2015 | 7 | NDVI | 0.84 - 0.69 |   |   |   |   |   |   | 7 |
|  | 2008 Wenchuan Mw 7.9 Earthquake | All extent |   | MODIS (250 m), Landsat (30 m) | 2000 | 2009 - 2018 | 9 | NDVI; Landslide inventory | 0.67 (0.13) - 0.60 (0.15) | 72 | 8 |   |   |   | Based on landslides that did not reactivate | 8 |
|  | 2008 Wenchuan Mw 7.9 Earthquake | Wenchuan region, Beichuan region, and Qingping region | Forest vegetation | Landsat (30 m) | 2006 | 2008 - 2018 | 10 | FVC(NDVI); Automatic identification landslides | 0.82 (0.01) - 0.75 (0.06) | 77 (12) | 8 |  |  |  |  | 9 |
|   | 2008 Wenchuan Mw 7.9 Earthquake |   |   | Landsat (30 m), HJ-1 (x m), Sentinel 2 (x m) | 2007 | 2008 - 2018 | 10 | NDVI; Landslide inventory | 0.65 (0.13) - 0.49 (0.09) | 67 | 6.7 |   |   |   | Elevation, aspect, slope | 10 |
| Japan | 2012 Storm and 2016 Kumamoto Mw 7.1 Earthquake | Aso Volcano | Semi-natural grassland vegetation | Rapid Eye (2010-2019; 5 m) and Planet Scope (2016-2020; 3 m), UAV |   |   |   | NDVI; Landslide inventory | 0.86 (0.03) - 0.67 (0.05) | 64 | 12 | 0.86 (0.03) -0.72 (0.05) | 69 | 23 |   | 11 |
|  | 2004 Chuetsu Mw 6.6 Earthquake |   | Forests and Grasslands | Landsat (30 m) | 2003 | 2004 - 2021 | 18 | NDVI; Landslide inventory | 0.41 - 0.47 | 154 | 10 |   |   |   |   | 12 |
|   | 2015 Sennindani Landslide |   |   | Landsat (30 m) SPOT (20 m), QuickBird (2.44), WorldView (1.8) |   |   |   |   |   |   |   |   |   |   | Single landslide; Restoration through air-seeding methods | 13 |
| Rusia |   | Central Yamal | Tundra (shrubs and grasslands) | Landsat (30 m), SPOT (20 m), QuickBird (2.44), WorldView (1.8) | 1988 | 1990 - 2017 | 27 | NDVI: Landslide inventory |   |   |   |   | 72 | 3 |   | 14 |
| Nepal | 2015 Gorkha Mw 7.8 Earthquake | Central Nepal |   | Sentinel 1C | 2015 | 2017 - 2019 | 4 | NDVI | 0.51-0.49 | 19 |   |   |   |   | VRR based on median values | 15 |
| Mexico | 2013 Hurricane Ingrid and Tropical Storm Daniel | Estado Guerrero |   | Landsat (30 m) |   | 1984 - 2021 | 34 | NDVI; Continuous Change Detection and Classification algorithm |   |   |   |   | 93 | 3 | Corresponds to one of 448 pixels | 16 |

**Figure S1.** Functional and Spectral Traits in Landslide-Impacted areas in the Sierra de las Minas in Guatemala**.** Three principal components (PCs) and three vegetation indices (normalized difference water index (NDWI), Anthocyanin Content Index (ACI), and Vogelman Index 2 (VOG) derived from PRISMA for two small regions of the SLM.



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