



ICG2022-411, updated on 21 Sep 2022

<https://doi.org/10.5194/icg2022-411>

10th International Conference on Geomorphology

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## Land Surface Temperature Controls Stability in Gentle Clay Slopes

**Marco Loche**<sup>1</sup>, Gianvito Scaringi<sup>1</sup>, and Luigi Lombardo<sup>2</sup>

<sup>1</sup>Charles University, Faculty of Science, Institute of Hydrogeology, Engineering Geology and Applied Geophysics, Czechia

<sup>2</sup>Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Enschede, Netherlands

The effect of temperature on the stability of slopes in temperate climates is poorly constrained. Experiments demonstrate a clear thermo-hydro-mechanical (THM) response in expansive soils, and evidence of thermally-induced activity exists for some landslides. However, building a representative thermal variable suitable for catchment or regional-scale studies is challenging, owing to heterogeneities in materials and stress histories and the complexity of THM processes. We performed a landslide susceptibility modelling of the portion of Italian territory featuring clay deposits. We utilised the geo-lithological map of Italy and the Italian National Inventory (IFFI), that differentiates among landslide types, and we focused on slow flows, often associated with creep movements. We relied, as one of the inputs, on a ten-year series of Land Surface Temperature (LST) data from MODIS, freely available in Google Earth Engine, and implemented a slope unit-based Generalized Additive Model (GAM) approach to account for nonlinearities in the possible temperature-slope stability relationship. We produced a susceptibility map for clay deposits over the entire Italian territory, and observed a positive dependence of landslide abundance on LST on warmer and gentle slopes, where creep phenomena are common. Higher temperatures are in fact associated with decreased soil and water viscosity and hence enhanced shear creep rates in clays.