A piping erosion susceptibility map of Europe

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Soil erosion represents a crucial environmental issue worldwide that threatens land, freshwater, and oceans. Subsurface erosion by soil piping occurs in almost all climatic zones of the world and in various soil types. Its occurrence changes the conditions for controlling measures to reduce soil degradation. However, it remains one of the most overlooked soil erosion processes, and its global and regional recognition is poorly documented. This project aims to construct a piping erosion susceptibility map of Europe in order to identify locations affected by this process, and where specific erosion control measures should be taken. Firstly, we compiled a database of soil piping-related features, i.e. pipe roof collapses (PCs) and pipe outlets in the European Union and the UK that consists of 6841 locations having piping-related features (6171 PCs and 670 outlets), among which the location of 88% features is known at a resolution of 25 m. Then, this database is used to model the susceptibility of soils to piping erosion at the European scale. We applied the logistic regression model using the scikit-learn library in Python. The following environmental factors are tested: topography (such as slope and height difference), pedology (content of silt, clay, sand, and coarse fragments), land use and land cover, and climate (such as effective precipitation). Our preliminary result clearly shows that it is feasible to accurately identify the European hotspots susceptible to piping erosion, based on a combination of land use, topographic and soil variables (AUC >0.75). The presented map is an important step towards incorporating subsurface soil erosion into regional and global soil erosion models.