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The Belgian coal tips: geomorphic and pedogenetic research with community service and educational aspects

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Coal tips are composed of various materials, essentially sterile rock but also waste such as mine wood, scrap metal as well as scoria from surface facilities. Rocks composing Belgian coal tips belong to the Westfalian and Namurian (approx. 320 Ma) and include psammites, schists and coal residues. Currently, these coal tips are increasingly regarded as socio-cultural heritage.
Worldwide, several studies have focused on the factors controlling the magnitude of geomorphic processes, such as nature of slope material, vegetation type and cover, the role of self-ignition and combustion, time and slope gradient.
In the international literature, research gaps concern particular processes, such as causes and consequences of the widespread tree toppling and root throw, rock fragment movement at the surface, or gully control by check dams. Especially spatially distributed erosion rates by the various processes active on coal tips, neither sediment budgets seem ever to have been established. The same holds for regional (subcontinental) variability in slope processes on coal tips.
The many Belgian coal tips that have not been levelled provide a unique opportunity for geomorphological and pedogenetical studies, which have so far demonstrated the existence of:
- correlations between the intensity of observed geomorphic processes and a broad range of bio-physical explanatory factors;
- strong and reciprocal influences between the vegetation of coal tips and the morphology of the colonised slopes;
- absence of strong relations between gully activity and slope angle, resulting from the narrow range of slope gradients on coal tips;
- possibilities to locate landslide risk zones through combined use of Digital Elevation Models and thermographic imagery;
- presence of neoformed minerals on burning/burned coal tips, which impact the soil forming processes as well as soil quality.