EGU22-12374, updated on 26 May 2022
https://doi.org/10.5194/egusphere-egu22-12374
EGU General Assembly 2022

Eco-hydro-geomorphic evolution of the Sandal Divlit cinder cone, Kula, Turkey

Omer Yetemen[1], Aydogan Avcioglu[1], Yavuz Selim Celik[2], Ibrahim Simsek[1], Mesut Kolbuken[1], In-Young Yeo[3], Kwok Pan Chun[4], Tolga Gorum[1], and Omer Lutfi Sen

[1]Eurasia Institute of Earth Sciences, Istanbul Technical University, İstanbul, Turkey
[2]Department of Geomatics Engineering, Istanbul Technical University, İstanbul, Turkey
[3]University of Newcastle, School of Engineering, Newcastle, Australia
[4]Department of Geography and Environmental Management, The University of the West England, Bristol, UK

In semi-arid ecosystems, microclimatic variations may lead to topographic asymmetry over geologic time scale due to uneven distribution of incoming solar radiation as a function of slope aspect. This phenomenon has long been recognized in geomorphology and mostly studied in catchments where may have a wide range of spatial heterogeneity in climate forcing and underlying lithology. The formation age and the size of the catchments add another level of complexity and uncertainty due to the fluctuations in prevailing climate and lithological differences in the studied catchments. However, cinder cones are natural laboratories to better understand the eco-hydro-geomorphic evolution resulted from the nonlinear interactions between vegetation, climate, and soil due to their small size, uniform lithology, well-constrained initial morphology, and relatively young age. The Sandal Divlit cinder cone located in the Kula volcanic field, western Turkey, is an inactive volcano and formed in the last stage of volcanism in the region. The climax vegetation in the primary succession following the volcanic eruption is observed on the north-facing slopes which host trees. The north-facing slopes have relatively deeper soils than south-facing slopes where host sparsely herbaceous plants and shrubs associated with thin and weakly developed soils. Airborne-LiDAR surveys and the digital elevation models having 5 m and 12.5 m spatial resolution were used to analyze the geomorphic descriptors and canopy structure of the cone as a function of aspect. The results show that north-facing slopes are steeper than south-facing ones due to better erosion protection as a result of denser vegetation. Despite its young age (<30 ka), the cone has developed topographic asymmetry and is imprinted with the signature of aspect-related vegetation difference. This finding is further evaluated and with the results of landscape evolution models to assess the role of microclimate due to vegetation on the development of asymmetric geomorphological features.

This study has been produced benefiting from the 2232 International Fellowship for Outstanding Researchers Program of the Scientific and Technological Research Council of Turkey (TUBITAK) through grant 118C329. The financial support received from TUBITAK does not indicate that the content of the publication is approved in a scientific sense by TUBITAK.