



Orientation patterns of stone pavements as a result of modern geomorphologic processes

Michael Dietze and Arno Kleber

Technische Universität Dresden, Physical Geography of Central Europe, Dresden, Germany
(micha.dietze@mailbox.tu-dresden.de)

Stone pavements are typical surface features of climate-sensitive, arid environments. They form a tightly interlocking mosaic of clasts, covering virtually stone-free aeolian material. However, this mosaic does not generally exhibit random orientation of its constituents. Rather, there are systematic unimodal to bimodal distributions of stone length axes present. These orientation patterns may be the result of active geomorphologic processes, implying the unstable and fragile nature of this landform as well as a dominant lateral geomorphologic component, not considered in existing models of stone pavement formation. Responsible processes should be controlled by relief properties and may thus be described by topographic attributes.

From three study areas (Laguna Salada, Mexico, eastern Mojave Desert and southern Sevier Basin, USA) we present measurements of pavement stone orientations and their relationship to landscape parameters. From 1 by 1 m sized plots azimuthal digital images were taken, corrected, georeferenced and length as well as orientation angle of the a- and b-axes of at least 100 stones were digitised. Subsequently, statistical parameters of circular data were calculated. From a digital elevation model relief attributes were derived to test their influence on pavement patterns.

Three general types of orientation patterns were identified from all study areas: unimodal, bimodal and unoriented. These types are clustered together and may change within small lateral distance. The type of pattern is not influenced by stone dimensions or the formation character of the site (i.e. basalt flow vs. alluvial fan). Relief properties (e.g. slope length, specific catchment, inclination), controlling lateral geomorphologic processes appear to play a major role in generating orientation patterns in stone pavement surfaces. Hence, from pattern analysis the dynamic nature of these features can be drawn.