5th CEWM

Central European Workshop of Myrmecology

Innsbruck 2013

Statistical correlation between red wood ant mounds (*Formica* spp.) and active fault structures in the West Eifel and the Freiburg-Bonndorfer-Grabenzone

Gabriele Berberich
Department of Geology, University of Duisburg-Essen, Germany; gabriele.berberich@uni-due.de
Martin Berberich
Erftstadt, Germany
Dietrich Klimetzek
Department of Biometry and Environmental System Analysis, University of Freiburg, Germany
Christian Wöhler
Faculty of Electrical Engineering and Information Technology, TU Dortmund, Germany
Arne Grumpe
Faculty of Electrical Engineering and Information Technology, TU Dortmund, Germany

In a GeoBioScience approach in the West Eifel and in the Freiburg-Bonndorfer-Grabenzone it was demonstrated that there is a relationship between the spatial distribution of red wood ant (RWA) mounds and tectonically active, gas-permeable faults. Such linear patterns have formerly been mostly associated by myrmecologists with edge effects of forest stands and / or roads. Geostatistical techniques were applied to the distribution data of a total of approx. 9500 RWA mounds in the study areas in correlation with known tectonic systems. The study areas underwent a complex tectonic history. The uplift of both the western part of the Rhenish Massif (West Eifel) and the Black Forest, that commenced during the Neogene and still persists during the Quaternary affects the dynamics of the study areas and reactivates and reorganises pre-existing Palaeozoic crustal discontinuities. The currently NW-SE (West Eifel) and the NW-SE / NNW-SSE (Black Forest) main stress direction opens pathways for upwardly migration of geogenic gases. Concurrently, a conjugate wrench fault system exists. The prominent large-scale active tectonic structure that encompasses the Black Forest study area, is the NW-SE to WNW-ESE trending "Freiburg-Bonndorfer-Grabenzone" that consists of several sub-trenches. We tested the hypothesis that the alignment directions of RWA mounds agree with those of tectonically active faults. The Hough transform, a well-established algorithm for the automatic extraction of linear patterns from point clouds, was applied to the spatial distribution of RWA mounds in the Westeifel (3000 RWA mounds) and the Black Forest (3500 RWA mounds). It could be clearly shown that the alignment directions of RWA are consistent with those of tectonically active, gas-permeable faults and that RWA mounds can be used as biological indicators of these faults. This is especially useful when information about the active tectonic regime is incomplete or the resolution by technical means is insufficient.