



## Statistical Correlation between Red Wood Ant Sites and Tectonically Active Fault Structures

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Recent research in the West Eifel (West Germany), at the Lake of Constance and in the Black Forest (both Southwest Germany) has demonstrated the relationship between the spatial distribution of red wood ant (RWA) mounds and tectonically active, gas-permeable faults (Berberich 2010, Ph.D. Thesis, University of Duisburg-Essen; Berberich et al. 2012, Proceedings of the EGU General Assembly, Vienna, Austria, 22–27 April 2012; Berberich et al. 2013, *Animals* 3: 63–84). For myrmecologists, the causes and stringency of such a linkage are paramount, since linear patterns have been mostly associated with edge effects of forest stands and/or roads (Klimetzek & Kaiser 1995, *Waldhygiene* 20: 243 – 254; Wellenstein 1990, *Waldbewohnende Ameisen, ihre Bedeutung, ihre Biologie, ihre Hege und ihr Schutz*. 2nd ed., Allgäuer Zeitungs-Verlag, Kempten, pp.47). Therefore, geostatistical techniques were applied to distribution data of a total of approx. 9,000 RWA mounds in the three study areas in correlation with known tectonic systems.

All study areas are located in areas with complex tectonic history. Commencing during the Neogene and persisting during the Quaternary, the uplift of both the western part of the Rhenish Massif (West Eifel) and the Black Forest, affects the dynamics of the study areas and reactivates and reorganises pre-existing Palaeozoic crustal discontinuities. The currently NVV-SE (West Eifel) and NNW-SSE (Lake of Constance, Black Forest) main stress directions open pathways for geogenic gases. Concurrently, a conjugate wrench fault system (in WNW-ESE direction representing the extensional regime of the recent compressional stress field and a conjugated shear system trending NNW-SSE) exists. The prominent large-scale active tectonic structure that encompasses the Black Forest and the Lake of Constance, is the NW-SE to WNW-ESE trending "Freiburg-Bonndorf-Hegau-Bodensee-Graben" that consists of several sub-trenches (Franzke et al. 2003, *Jh. Landesamt f. Geologie Rohstoffe und Bergbau Baden-Württemberg* 39: 25–54).

We tested the hypothesis that the alignment directions of RWA mounds agree with those of tectonically active faults (Berberich et al. 2012, Proceedings of the EGU General Assembly, Vienna, Austria, 22–27 April 2012). The Hough transform, a well-established algorithm for the automatic extraction of linear patterns from point clouds (Jähne 2005, *Digitale Bildverarbeitung*, 6th ed.; Springer: Berlin) was applied on the spatial distribution of RWA mounds. In all three cases 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 for these faults. This is especially useful when information about the active tectonic regime is incomplete or the resolution by technical means is insufficient.

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