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Detection of Gas permeable Strike-Slip Faults by means of Bio-indicators (Hill-building Forest Ants) and Gas Analyses in the Volcanic West- and Hocheifel (Germany)

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Nests of hill-building forest ants (*Formica rufa*, *Formica polyctena*, *Formica pratensis*) are a suitable tool for the detection of neogen tectonic structures in areas with less geological outcrops, e.g. the Volcanic West- and Hocheifel (Germany). Their linear allocation trace obviously active fracture zones. Correlations between formicines and geological factors were already discussed in the 1930's and 1960's. Schreiber et. al. (2009) showed that formicines nests can provide valuable information for mapping fault pattern [1].

Area-wide studies in the Volcanic West- and Hocheifel covering approx. 1,200 km² have the objective to establish this mapping approach as a geological tool. More than 2,200 ant nests were recorded by GPS and mapped on fault zones in 2008/2009. In-line allocations allow to trace strike-slip faults over km-distances. Cluster of more than 0 ant nests picture the main stress directions.

Three main structure systems (NNE-SSW, NW-SE and WNW-ESE) indicated by recent NW-SE stress field, are the dominant fracture zones in the Western-Eifel. Secondly N-S fracture zones appear, corresponding to the "Eifel Nord-Süd-Zone". Only a few faults are accompanied by idiomorphic postvariscian quartz and ore mineralization. Slickensides can be measured sporadically.

Additional to mapping area-wide gas analyses (CO₂, He and Rn) of mineral springs and soil gas (1m depth) were performed. CO₂ was detected by a mobile Dräger gas detection system. Concentrations vary from 62 to 84 Vol%. Radon gives not a consistent picture (1 – 145 Bq/l). Helium-samples were analysed by a portable mass spectrometer. Helium concentrations exceed the atmospheric concentration (5,220 ppb_(v)) up to more than 2,000-fold and vary from 6,000 ppb_(v) to 10,000,000 ppb_(v) (e.g. mineral spring Strotzbüschler Mühle) above deep reaching fracture zones.

References

Schreiber U, Brennholt N, Simon J (2009): Gas permeable deep reaching fracture zones encourage site selection of ants. ecological indicators 9: 508 to 517