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Plant based detection of dry mofettes – an example from the volcanic Laacher See district, Germany

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Magmatic CO_2 exhalations as mofettes are common features in volcanic areas. However, they are difficult to detect if they are located outside open water. As natural CO_2 released from mofettes is not only of economic interest or exerts deleterious effects on the local fauna (and humans), but also contributes to the greenhouse effect, identification of dry mofettes and their volume flux are of vital importance. Several techniques have been used to detect mofettes in volcanic fields, however, use of vegetation is especially promising. The East Eifel Volcanic Field is one of the known European areas of mantle CO_2 exhalations. Several natural carbon dioxide springs outside of the Laacher See proper were recognized within the surrounding oak and beech forest by their azonal vegetation, consisting mainly of helophytes. These plants are equipped with mechanisms that allow facilitated oxygen transport from above-ground plant organs to below-ground roots and rhizomes, thus ensuring normal respiration within the rhizosphere. The mofette stand is species-poor. Two grasses are dominating within the highly degassing centre. Growth of *Carex acutiformis* occurred only at sites of high to extremely high (60- 95%) CO_2 concentrations within the upper soil layer (20-30 cm). The monospecific *Carex* stand was abruptly out competed by *Deschampsia caespitosa* when upper soil CO_2 dropped below 30%. Lower soil CO_2 concentrations were associated with growth of *Vinca minor* and/or *Symphoricarpus rivularis*. However, measurements in a depth of 80 cm indicated that the area of CO_2 saturation extended even further outward. Soil profiles differed from the surrounding forest soils in that the cover of organic matter increased from a few mm to thicknesses of 40 cm and consisted only of non to partially decomposed litter (raw humus to coarse moder). As

many mofettes within central Europe show similar features with a prevailing azonal, helophytic vegetation, dry carbon dioxide springs can be detected via vegetational changes.