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Optimization of soil-CO_2 monitoring networks - concept, set-up and first results

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In the last decades trace gas emission for soils is intensively investigated due to the great impact on climate change. Nevertheless, our knowledge is fragmentary and further investigations are necessary to improve our understanding of trace gas fluxes. We present a new cost-effective method for soil-gas monitoring using tubular membrane networks. The method was successfully tested in a lysimeter at lab-scale. To optimize the technology for soil investigations a 3D experimental set-up was developed. Using 4 x 4 adjacent plexiglas chambers, the temporal and spatial variation of gas concentrations could be controlled. Thus, the individual chambers could be flushed from bottom to top by gases of different compositions. Moreover, the set-up contains two super-imposed membrane networks for the gas measurement. Each membrane tube of these orthogonal networks crosses 4 adjacent chambers. Taken into account the integral measure which is obtained by this individual membrane tubes an inversion problem has to be solved to generate the spatial gas distribution. The question of interest is how accurate the derived concentrations represent the actual distribution of concentrations within the experimental set-up. We present the concept, the experimental set-up and first results using different CO_2-contents in dry air.