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# Blowing in the wind: a review of wind and air- pressure-related effects on soil gas transport

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Gas transport in the soil is dominated by molecular diffusion in the air-filled pore network. A study in the 1970s could show that Radon emissions from soil increased during the passage of a low-pressure system which temporarily enhanced soil gas transport rates (Clements & Wilkening, 1974). Enhanced wind speed near the soil surface was also found to speed up gas transport rates in the soil (Kimball & Lemon, 1971). Further studies followed confirming the observations that wind and substantial atmospheric pressure changes have the potential to affect soil gas transport, including studies conducted in snow and firn, deserts, forest soil, arid systems, and soils near water saturation. Especially during recent years, wind and air- pressure-related effects on soil gas transport received increasing attention, with diverse concepts and methodologies, and also a wider ecological relevance.

While the slow (hours) and relatively large atmospheric pressure changes (up to 50 hPa) reported in Clements & Wilkening (1974) cause a kind of steady piston flow in the soil, the effect in Kimball & Lemon, (1971) was explained as the result of dynamic wind-induced pressure fluctuations, which are much smaller in amplitude (2-20 Pa) and occur at higher frequencies (0.1-1.0 Hz). Although the effect of wind-induced pressure fluctuations on gas transport in the soil has been confirmed by a few studies, there is still only little knowledge about the underlying processes. Additional effects between the pure “static piston flow “and the dynamic pressure fluctuations certainly occur. Different approaches and methodologies were used to derive estimates for the impact (if quantified) of air pressure fluctuations on soil gas transport, which makes inter-study comparisons complicated and limits further progress.

We overview relevant studies, their methods, concepts and explanations to identify research gaps and develop a plan for further research concepts.

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