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Polymer tensiometers in a saline environment.

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It is estimated that 20% of all cultivated land and nearly half of the irrigated land is salt-affected, which pose major economic and environmental problems. Salinity may be the result of two processes; dryland and irrigation salinity. Dryland salinity is caused by a rise in the groundwater table, which occurs as a result of the replacement of deep-rooted, perennial native vegetation by shallow-rooted annual species meant for production. Irrigation salinity may occur as a result of poor water quality, poor drainage, or inefficient use of water.
Consequently, new strategies to enhance crop yield stability on saline soils represent a major research priority (Botella et al. 2005). At the same time, native vegetation is capable of thriving under saline and/or dry conditions. The plant physiology of such vegetation has been investigated thoroughly, but the relation with in situ soil properties (soil moisture and salinity) may be more difficult to unravel as soil moisture sensors are less sensitive in dry soil, and the signal of most soil moisture content sensors is strongly attenuated by soil salinity.
Recently, polymer tensiometer were developed that are able to measure matric potentials (closely related to a soil's moisture status) in dry soils. Polymer tensiometers consist of a solid ceramic, a stainless steel cup and a pressure transducer. The ceramic consist of a support layer and a membrane with 2 nm pore-size to prevent polymer leakage. Between the ceramic membrane and the pressure transducer a tiny chamber is located, which contains the polymer solution. The polymer's osmotic potential strongly reduces the total water potential inside the polymer tensiometer, which causes build-up of osmotic pressure.
Polymer tensiometers would thus be an ideal instrument to measure in dry soil, if the polymer inside the tensiometer is not affected by the salts in the soil solution. We will address some key issues regarding the use of POTs in saline environments by showing results from a field experiment conducted in a very saline soil.

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