# Does Maxwell-Wagner dielectric relaxation influence TDR permittivity measurement in unsaturated porous media? (S01-wraith162603-Poster)

**Authors:**

- J.M.Wraith - *Montana State University*
- D.Or - *Utah State University*

## Abstract:

The Maxwell-Wagner formulation characterizes energy losses resulting from dielectric polarization and DC electrical conductivity (EC). Elevated temperature (T) increases the relaxation frequency of wetted porous media, as well as the static EC which reduces the maximum effective frequency of the TDR measurement. Direct energy loss from EC is inversely proportional to the measurement frequency. Combined influences of T on dielectric losses might influence the TDR relative permittivity measurement under elevated T, if the increasing relaxation frequency and the declining effective TDR measurement frequencies coincide. An experimental study evaluated the importance of dielectric relaxation over a range of porous media surface area and salinity. Sealed coaxial TDR cells that facilitated exchange of solution concentration without sample repacking were filled with glass beads of three size ranges. Tap water and KCl solutions were used to bring the cells to repeatable unsaturated water contents. Cells were immersed in a water bath, and T varied over a wide range while measuring the permittivity of bead-solution mixtures. Systematic reduction in measured dielectric constant with increased T, in excess of that for the temperature dependence of water, would indicate a potential measurement artifact resulting from Maxwell-Wagner dielectric relaxation.

**Corresponding Author Information:**

Jon Wraith
Montana State University
PO Box 173120
Bozeman, MT 59717-3120

phone: 406-994-1997
fax: 406-994-3933
e-mail: jwraith@montana.edu

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