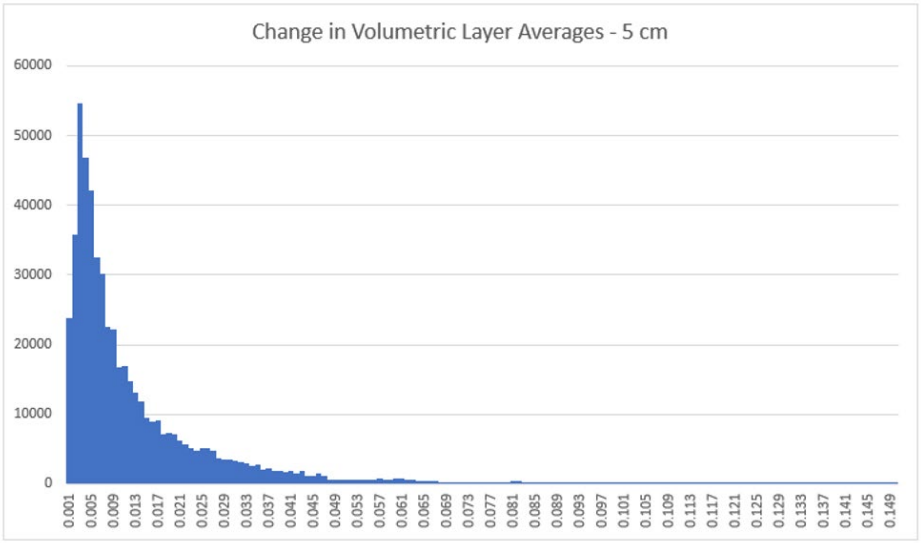
Correction to Process Converting Stevens HydraProbe Real Dielectric to Volumetric Soil Moisture

Since installing Stevens HydraProbe soil moisture instruments at U.S. Climate Reference Network stations in the conterminous U.S., a general calibration equation proposed by Seyfried et al. (2005) with slightly updated coefficients has been used to convert real dielectric measurements to volumetric soil moisture observations.

$$\text{Volumetric} = (0.109 * \text{SQRT}(\text{Dielectric})) - 0.179$$

One of the notable features of this equation is that when the dielectric is below 2.7, the volumetric conversion becomes negative, which is not possible. Normally, such measurements would be flagged and not used in constructing soil moisture layer averages from multiple probes. However, it was recently discovered that instead of flagging these values, they had been set to zero by the translation program, leading inadvertently to including zeros in layer averages in very dry situations. This was not intended, and so this issue has been corrected and the calculations of individual probe volumetric soil moisture values and layer average volumetric soil moisture values rerun for all stations and the period of record in our database. Following this, all Product files dependent on soil moisture observations were also rerun. All these corrections should be online by about October 20, 2022.

The correction to the program led to 1.23% of the individual volumetric soil moisture observations being changed from 0.000 to flagged "out of range" status. This caused a slight increase in volumetric layer averages overall, with just a few special cases where the change was noticeable due to other factors. For example, if cracks in soil led to air infiltration, a defective dielectric measurement between 0.0 and 2.7 may have yielded a 0.000 volumetric observation in soil that was moist. When the 0.000 value was averaged with a much higher soil water content reading, removing the 0.000 from the average in those case resulted in a larger shift in layer average, seen in the tail of the distribution below.



Seyfried, M.S., L.E. Grant, E. Du, and K. Humes, 2005: Dielectric loss and calibration of the Hydra Probe soil water sensor. *Vadose Zone Journal*, **4**, 1070–1079. doi:10.2136/vzj2004.0148