# CZO Metadata Worksheet

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| Data File Name | **SITE\_Soil Moisture\_YEAR\_Raw Compiled.dat** |
| Date Prepared | 3/11/2011 |
| Descriptive Title | Real Time Soil Moisture Data |
| Update Frequency | Monthly |
| Abstract | The Real-Time Soil Moisture Monitoring Network provides integrated observation of water, energy and temperature in the soils of the Shale Hills Susquehanna Critical Zone Observatory watershed. Soil moisture is measured at between 3 and 13 depths at 12 sites. Soil moisture is measured with 3 types of probes: ECH2O 10 cm probes and 5TE probes, both made by Decagon.  |
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| Data Value Descriptions | A4\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-5, Units = m3/m3, TimeSupport = 10 min, Offset = -5 cm
* COL4: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20 cm
* COL5: label = SoilMoisture-36, Units = m3/m3, TimeSupport = 10 min, Offset = -36 cm

3\_SoilMoisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL4: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20 cm
* COL5: label = SoilMoisture-30, Units = m3/m3, TimeSupport = 10 min, Offset = -30 cm
* COL6: label = SoilMoisture-40, Units = m3/m3, TimeSupport = 10 min, Offset = -40 cm
* COL7: label = SoilMoisture-50, Units = m3/m3, TimeSupport = 10 min, Offset = -50 cm

6\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-60, Units = m3/m3, TimeSupport = 10 min, Offset = -60 cm
* COL4: label = SoilMoisture-40, Units = m3/m3, TimeSupport = 10 min, Offset = -40 cm
* COL5: label = SoilMoisture-30, Units = m3/m3, TimeSupport = 10 min, Offset = -30 cm
* COL6: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20 cm
* COL7: label = SoilMoisture-10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm

8\_SoilMoisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL4: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20 cm
* COL5: label = SoilMoisture-30, Units = m3/m3, TimeSupport = 10 min, Offset = -30 cm
* COL6: label = SoilMoisture-40, Units = m3/m3, TimeSupport = 10 min, Offset = -40 cm
* COL7: label = SoilMoisture-50, Units = m3/m3, TimeSupport = 10 min, Offset = -50 cm

11\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture5TE -11, Units = m3/m3, TimeSupport = 10 min, Offset = -11 cm
* COL4: label = SoilMoisture5TE -36, Units = m3/m3, TimeSupport = 10 min, Offset = -36 cm
* COL5: label = SoilMoisture5TE-66, Units = m3/m3, TimeSupport = 10 min, Offset = -66 cm
* COL6: label = SoilMoistureHP-11, Units = m3/m3, TimeSupport = 10 min, Offset = -11cm
* COL7: label = SoilMoistureHP-24, Units = m3/m3, TimeSupport = 10 min, Offset = -24cm
* COL8: label = SoilMoistureHP -36, Units = m3/m3, TimeSupport = 10 min, Offset = -36cm
* COL9: label = SoilMoistureHP-51, Units = m3/m3, TimeSupport = 10 min, Offset = -51cm

12\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture5TE -10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL4: label = SoilMoisture5TE -48, Units = m3/m3, TimeSupport = 10 min, Offset = -48 cm
* COL5: label = SoilMoisture5TE-81, Units = m3/m3, TimeSupport = 10 min, Offset = -81 cm
* COL6: label = SoilMoistureHP-11, Units = m3/m3, TimeSupport = 10 min, Offset = -11cm
* COL7: label = SoilMoistureHP-27, Units = m3/m3, TimeSupport = 10 min, Offset = -27cm
* COL8: label = SoilMoistureHP -48, Units = m3/m3, TimeSupport = 10 min, Offset = -48cm
* COL9: label = SoilMoistureHP-64, Units = m3/m3, TimeSupport = 10 min, Offset = -64cm

15\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-13, Units = m3/m3, TimeSupport = 10 min, Offset = -13cm
* COL4: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20cm
* COL5: label = SoilMoisture-41, Units = m3/m3, TimeSupport = 10 min, Offset = -41cm
* COL6: label = SoilMoisture-52, Units = m3/m3, TimeSupport = 10 min, Offset = -52cm
* COL7: label = SoilMoisture-73, Units = m3/m3, TimeSupport = 10 min, Offset = -73cm
* COL8: label = SoilMoisture-85, Units = m3/m3, TimeSupport = 10 min, Offset = -85cm
* COL9: label = SoilMoisture-91, Units = m3/m3, TimeSupport = 10 min, Offset = -91cm
* COL10: label = SoilMoisture-109, Units = m3/m3, TimeSupport = 10 min, Offset = -109cm
* COL11: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL12: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL13: label = SoilMoisture-5, Units = m3/m3, TimeSupport = 10 min, Offset = -5cm
* COL14: label = SoilMoisture-13, Units = m3/m3, TimeSupport = 10 min, Offset = -13cm
* COL15: label = SoilMoisture-20, Units = m3/m3, TimeSupport = 10 min, Offset = -20cm
* COL16: label = SoilMoisture-41L, Units = m3/m3, TimeSupport = 10 min, Offset = -41cm
* COL17: label = SoilMoisture-41R, Units = m3/m3, TimeSupport = 10 min, Offset = -41cm
* COL18: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL19: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL20: label = SoilMoisture-52, Units = m3/m3, TimeSupport = 10 min, Offset = -52cm
* COL21: label = SoilMoisture-73L, Units = m3/m3, TimeSupport = 10 min, Offset = -73cm
* COL22: label = SoilMoisture-73R, Units = m3/m3, TimeSupport = 10 min, Offset = -73cm

51\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-L8, Units = m3/m3, TimeSupport = 10 min, Offset = -8cm
* COL4: label = SoilMoisture-L18, Units = m3/m3, TimeSupport = 10 min, Offset = -18cm
* COL5: label = SoilMoisture-L40, Units = m3/m3, TimeSupport = 10 min, Offset = -40cm
* COL6: label = SoilMoisture-L114, Units = m3/m3, TimeSupport = 10 min, Offset = -114cm
* COL7: label = SoilMoisture-L157, Units = m3/m3, TimeSupport = 10 min, Offset = -157cm
* COL8: label = SoilMoisture-C5, Units = m3/m3, TimeSupport = 10 min, Offset = -5cm
* COL9: label = SoilMoisture-C8, Units = m3/m3, TimeSupport = 10 min, Offset = -8cm
* COL10: label = SoilMoisture-C12, Units = m3/m3, TimeSupport = 10 min, Offset = -12cm
* COL11: label = SoilMoisture-C18, Units = m3/m3, TimeSupport = 10 min, Offset = -18cm
* COL12: label = SoilMoisture-C25, Units = m3/m3, TimeSupport = 10 min, Offset = -25cm
* COL13: label = SoilMoisture-C40, Units = m3/m3, TimeSupport = 10 min, Offset = -40cm
* COL14: label = SoilMoisture-C71, Units = m3/m3, TimeSupport = 10 min, Offset = -71cm
* COL15: label = SoilMoisture-C98, Units = m3/m3, TimeSupport = 10 min, Offset = -98cm
* COL16: label = SoilMoisture-C123, Units = m3/m3, TimeSupport = 10 min, Offset = -123cm
* COL17: label = SoilMoisture-C162, Units = m3/m3, TimeSupport = 10 min, Offset = -162cm
* COL18: label = SoilMoisture-CR1, Units = m3/m3, TimeSupport = 10 min, Offset = -20cm
* COL19: label = SoilMoisture-CR2, Units = m3/m3, TimeSupport = 10 min, Offset = -20cm

53\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-L5, Units = m3/m3, TimeSupport = 10 min, Offset = - 5cm
* COL4: label = SoilMoisture-L10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL5: label = SoilMoisture-L40, Units = m3/m3, TimeSupport = 10 min, Offset = -40 cm
* COL6: label = SoilMoisture-L97, Units = m3/m3, TimeSupport = 10 min, Offset = -97 cm
* COL7: label = SoilMoisture-L112, Units = m3/m3, TimeSupport = 10 min, Offset = -112 cm
* COL8: label = SoilMoisture-C10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL9: label = SoilMoisture-C22, Units = m3/m3, TimeSupport = 10 min, Offset = -22 cm
* COL10: label = SoilMoisture-C44, Units = m3/m3, TimeSupport = 10 min, Offset = -44 cm
* COL11: label = SoilMoisture-C73, Units = m3/m3, TimeSupport = 10 min, Offset = -73 cm
* COL12: label = SoilMoisture-C123, Units = m3/m3, TimeSupport = 10 min, Offset = -123 cm
* COL13: label = SoilMoisture-R5, Units = m3/m3, TimeSupport = 10 min, Offset = -5 cm
* COL14: label = SoilMoisture-R10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL15: label = SoilMoisture-R40, Units = m3/m3, TimeSupport = 10 min, Offset = -40 cm
* COL16: label = SoilMoisture-R88, Units = m3/m3, TimeSupport = 10 min, Offset = -88 cm
* COL17: label = SoilMoisture-R103, Units = m3/m3, TimeSupport = 10 min, Offset = -103 cm

55\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-C8, Units = m3/m3, TimeSupport = 10 min, Offset = -8 cm
* COL4: label = SoilMoisture-C14, Units = m3/m3, TimeSupport = 10 min, Offset = -14 cm
* COL5: label = SoilMoisture-C41, Units = m3/m3, TimeSupport = 10 min, Offset = -41 cm
* COL6: label = SoilMoisture-C86, Units = m3/m3, TimeSupport = 10 min, Offset = -86 cm
* COL7: label = SoilMoisture-C90, Units = m3/m3, TimeSupport = 10 min, Offset = -90 cm
* COL8: label = SoilMoisture-C111, Units = m3/m3, TimeSupport = 10 min, Offset = -111 cm
* COL9: label = SoilMoisture-R5, Units = m3/m3, TimeSupport = 10 min, Offset = -5 cm
* COL10: label = SoilMoisture-R7, Units = m3/m3, TimeSupport = 10 min, Offset = -7 cm
* COL11: label = SoilMoisture-R84, Units = m3/m3, TimeSupport = 10 min, Offset = -84 cm
* COL12: label = SoilMoisture-R141, Units = m3/m3, TimeSupport = 10 min, Offset = -141 cm
* COL13: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL14: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL15: label = SoilMoisture-5, Units = m3/m3, TimeSupport = 10 min, Offset = -5 cm
* COL16: label = SoilMoisture-8, Units = m3/m3, TimeSupport = 10 min, Offset = -8 cm
* COL17: label = SoilMoisture-14, Units = m3/m3, TimeSupport = 10 min, Offset = -14 cm
* COL18: label = SoilMoisture-R14, Units = m3/m3, TimeSupport = 10 min, Offset = -14 cm
* COL19: label = SoilMoisture-R30, Units = m3/m3, TimeSupport = 10 min, Offset = -30 cm

60\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-U5, Units = m3/m3, TimeSupport = 10 min, Offset = -5cm
* COL4: label = SoilMoisture-U8, Units = m3/m3, TimeSupport = 10 min, Offset = -8cm
* COL5: label = SoilMoisture-U21, Units = m3/m3, TimeSupport = 10 min, Offset = -21cm
* COL6: label = SoilMoisture-U31, Units = m3/m3, TimeSupport = 10 min, Offset = -31cm
* COL7: label = SoilMoisture-U39, Units = m3/m3, TimeSupport = 10 min, Offset = -39cm
* COL8: label = SoilMoisture-D5, Units = m3/m3, TimeSupport = 10 min, Offset = -5cm
* COL9: label = SoilMoisture-D8, Units = m3/m3, TimeSupport = 10 min, Offset = -8cm
* COL10: label = SoilMoisture-D15, Units = m3/m3, TimeSupport = 10 min, Offset = -15cm
* COL11: label = SoilMoisture-D28, Units = m3/m3, TimeSupport = 10 min, Offset = -28cm
* COL12: label = SoilMoisture-D38, Units = m3/m3, TimeSupport = 10 min, Offset = -38cm

61\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-13, Units = m3/m3, TimeSupport = 10 min, Offset = -13cm
* COL4: label = SoilMoisture -20, Units = m3/m3, TimeSupport = 10 min, Offset = -20cm
* COL5: label = SoilMoisture -35, Units = m3/m3, TimeSupport = 10 min, Offset = -35cm
* COL6: label = SoilMoisture -66, Units = m3/m3, TimeSupport = 10 min, Offset = -66cm
* COL7: label = SoilMoisture -86, Units = m3/m3, TimeSupport = 10 min, Offset = -86cm
* COL8: label = SoilMoisture -95, Units = m3/m3, TimeSupport = 10 min, Offset = -95cm
* COL9: label = SoilMoisture -129, Units = m3/m3, TimeSupport = 10 min, Offset = -129cm

74\_Soil Moisture\_YEAR\_RawCompiled* COL1: label = Day of year, UTCOffset=-4, TimeZone=EST.
* COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST.
* COL3: label = SoilMoisture-5, Units = m3/m3, TimeSupport = 10 min, Offset = -5 cm
* COL4: label = SoilMoisture -8, Units = m3/m3, TimeSupport = 10 min, Offset = -8 cm
* COL5: label = SoilMoisture -10, Units = m3/m3, TimeSupport = 10 min, Offset = -10 cm
* COL6: label = SoilMoisture -17, Units = m3/m3, TimeSupport = 10 min, Offset = -17 cm
* COL7: label = SoilMoisture -37, Units = m3/m3, TimeSupport = 10 min, Offset = -37 cm
 |
| Keywords | Soil, water, hydrology, hydropedology, soil science, soil moisture |
| Methods | Soil moisture measured at sites 15, 51, 53, 55, 60, 61 and 74 with 10 cm Decagon ECH20 TDR probes www.decagon.comSoil moisture measured at sites A4, 3, 6, 8, 11, 12, 15 and 55 with Decagon 5TE probes www.decagon.comSoil moisture measured at sites 11 and 12 with Stevens Hydra Probes www.stevenswater.com |
| Citation | The following acknowledgment should accompany any publication or citation of these data: Logistical support and/or data were provided by the NSF-supported Shale Hills Susquehanna Critical Zone Observatory. |
| Publications | 1. Graham, C., and H.S. Lin. 2011. Controls and frequency of preferential flow occurrence at the Shale Hills Critical Zone Observatory: A 175 event analysis of soil moisture response to precipitation. Submitted to *Vadose Zone Journal*(in press).2.   Takagi, K. and H.S. Lin. 2011. Temporal Evolution of Soil Moisture Spatial Variability in the Shale Hills Catchment. Submitted to *Vadose Zone Journal*.3.   Takagi, K. and H.S. Lin. 2011. Soil-Terrain Attributes in Relation to Surface and Subsurface Soil Moisture in the Shale Hills Catchment. Submitted to *Geoderma*.4.   Andrews, D.M., H.S. Lin, Q. Zhu, L. Jin, and S.L. Brantley. 2011. Dissolved organic carbon export and soil carbon storage in the Shale Hills Critical Zone Observatory. Submitted to *Vadose Zone Journal.*5.   Jin, L., D. M. Andrews, G. H. Holmes, C. J. Duffy, H.S. Lin, and S. L. Brantley. 2011. Water chemistry reflects hydrological controls on weathering in the Shale Hills Critical Zone Observatory. Submitted to *Vadose Zone Journal.*6.   Zhang, J. H.S. Lin, and J. Doolittle. 2011. Subsurface Lateral Flow as Revealed by Combined Ground Penetrating Radar and Real-Time Soil Moisture Monitoring. Submitted to *Hydrological Processes*.7.   Zhu, Q., and H.S. Lin. 2010. Interpolation of soil properties based on combined information of spatial structure, sample size and auxiliary variables. *Pedosphere* 20:594-606.8.   Lin, H.S., and X.B. Zhou. 2008. Evidence of Subsurface Preferential Flow Using Soil Hydrologic Monitoring in the Shale Hills Catchment. *European J. of Soil Science*59:34–49.9.   Lin, H.S. 2006. Temporal stability of soil moisture spatial pattern and subsurface preferential flow pathways in the Shale Hills Catchment. *Vadose Zone Journal* 5:317-340.10. Lin, H.S., W. Kogelmann, C. Walker, and M.A. Bruns. 2006. Soil moisture patterns in a forested catchment: A hydropedological perspective. *Geoderma*131:345-368. |
| Data Use Notes | The user of Shale Hills Susquehanna CZO data agrees to provide proper acknowledgment with each usage of the data. Citation of the name(s) of the investigator(s) responsible for the data set, in addition to the generic statement above, constitutes proper acknowledgment. Author(s) (including Shale Hills Susquehanna CZO investigators) of published material that makes use of previously unpublished Shale Hills Susquehanna CZO data agree to provide the Shale Hills Susquehanna CZO data manager with four (4) copies (preferably reprints) of that material for binding as soon as it becomes available. The user of Shale Hills Susquehanna CZO data agrees not to resell or redistribute shared data. The user of these data should be aware that, while efforts have been taken to ensure that these data are of the highest quality, there is no guarantee of perfection for the data contained herein and the possibility of errors exists. These data are defined as either public or private, such that a password may be required for access. |