# CZO Metadata Worksheet

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| Data File Name | **SITE\_Soil Temperature\_YEAR\_Raw Compiled.dat** |
| Date Prepared | 3/11/2011 |
| Descriptive Title | Real Time Soil Temperature 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 Temperature is measured at between 4 and 5 depths at 13 sites. Soil Temperature is measured with 229 probes manufactured by Campbell Scientific, and by 5TE probes manufactured by Decagon. At 2 sites (15 and 51) soil temperature is measured with 2 loggers, which have different time stamps. |
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| Data Value Descriptions | A4\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-5, Units = oC, TimeSupport = 10 min, Offset = -5 cm * COL4: label = SoilTemperature-20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL5: label = SoilTemperature-36, Units = oC, TimeSupport = 10 min, Offset = -36 cm   3\_SoilTemperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-10, Units = oC, TimeSupport = 10 min, Offset = -10 cm * COL4: label = SoilTemperature-20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL5: label = SoilTemperature-30, Units = oC, TimeSupport = 10 min, Offset = -30 cm * COL6: label = SoilTemperature-40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL7: label = SoilTemperature-50, Units = oC, TimeSupport = 10 min, Offset = -50 cm   6\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-60, Units = oC, TimeSupport = 10 min, Offset = -60 cm * COL4: label = SoilTemperature-40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL5: label = SoilTemperature-30, Units = oC, TimeSupport = 10 min, Offset = -30 cm * COL6: label = SoilTemperature-20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL7: label = SoilTemperature-10, Units = oC, TimeSupport = 10 min, Offset = -10 cm   8\_SoilTemperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-10, Units = oC, TimeSupport = 10 min, Offset = -10 cm * COL4: label = SoilTemperature-20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL5: label = SoilTemperature-30, Units = oC, TimeSupport = 10 min, Offset = -30 cm * COL6: label = SoilTemperature-40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL7: label = SoilTemperature-50, Units = oC, TimeSupport = 10 min, Offset = -50 cm   11\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature5TE-11, Units = oC, TimeSupport = 10 min, Offset = -11cm * COL4: label = SoilTemperature5TE -36, Units = oC, TimeSupport = 10 min, Offset = -36cm * COL5: label = SoilTemperature5TE-66, Units = oC, TimeSupport = 10 min, Offset = -66cm * COL6: label = SoilTemperatureHP-11, Units = oC, TimeSupport = 10 min, Offset = -11 cm * COL7: label = SoilTemperatureHP-24, Units = oC, TimeSupport = 10 min, Offset = -24 cm * COL8: label = SoilTemperatureHP-36, Units = oC, TimeSupport = 10 min, Offset = -36cm * COL9: label = SoilTemperatureHP-51, Units = oC, TimeSupport = 10 min, Offset = -51cm   12\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature5TE-10, Units = oC, TimeSupport = 10 min, Offset = -10cm * COL4: label = SoilTemperature5TE -48, Units = oC, TimeSupport = 10 min, Offset = -48cm * COL5: label = SoilTemperature5TE-81, Units = oC, TimeSupport = 10 min, Offset = -81cm * COL6: label = SoilTemperatureHP-11, Units = oC, TimeSupport = 10 min, Offset = -11 cm * COL7: label = SoilTemperatureHP-27, Units = oC, TimeSupport = 10 min, Offset = -27 cm * COL8: label = SoilTemperatureHP-48, Units = oC, TimeSupport = 10 min, Offset = -48cm * COL9: label = SoilTemperatureHP-64, Units = oC, TimeSupport = 10 min, Offset = -64cm   15\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature229-12, Units = oC, TimeSupport = 10 min, Offset = -12 cm * COL4: label = SoilTemperature229-20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL5: label = SoilTemperature229-36, Units = oC, TimeSupport = 10 min, Offset = -36 cm * COL6: label = SoilTemperature229-52, Units = oC, TimeSupport = 10 min, Offset = -52 cm * COL7: label = SoilTemperature229-74, Units = oC, TimeSupport = 10 min, Offset = -74 cm * COL8: label = SoilTemperature229-85, Units = oC, TimeSupport = 10 min, Offset = -85 cm * COL9: label = SoilTemperature229-91, Units = oC, TimeSupport = 10 min, Offset = -91 cm * COL10: label = SoilTemperature229-105, Units = oC, TimeSupport = 10 min, Offset = -105 cm * COL11: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL12: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL13: label = SoilTemperature5TE-5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL14: label = SoilTemperature5TE -13, Units = oC, TimeSupport = 10 min, Offset = -13cm * COL15: label = SoilTemperature5TE -20, Units = oC, TimeSupport = 10 min, Offset = -20cm * COL16: label = SoilTemperature5TE -41L, Units = oC, TimeSupport = 10 min, Offset = -41cm * COL17: label = SoilTemperature5TE -41R, Units = oC, 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 = SoilTemperature5TE -52, Units = oC, TimeSupport = 10 min, Offset = -52cm * COL21: label = SoilTemperature5TE -73L, Units = oC, TimeSupport = 10 min, Offset = -73cm * COL22: label = SoilTemperature5TE -73R, Units = oC, TimeSupport = 10 min, Offset = -73cm   51\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-L8, Units = oC, TimeSupport = 10 min, Offset = -8 cm * COL4: label = SoilTemperature-L18, Units = oC, TimeSupport = 10 min, Offset = -18 cm * COL5: label = SoilTemperature-L40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL6: label = SoilTemperature-L114, Units = oC, TimeSupport = 10 min, Offset = -114 cm * COL7: label = SoilTemperature-L157, Units = oC, TimeSupport = 10 min, Offset = -157 cm * COL8: label = SoilTemperature-C5, Units = oC, TimeSupport = 10 min, Offset = -5 cm * COL9: label = SoilTemperature-C8, Units = oC, TimeSupport = 10 min, Offset = -8 cm * COL10: label = SoilTemperature-C12, Units = oC, TimeSupport = 10 min, Offset = -12 cm * COL11: label = SoilTemperature-C18, Units = oC, TimeSupport = 10 min, Offset = -18 cm * COL12: label = SoilTemperature-C25, Units = oC, TimeSupport = 10 min, Offset = -25 cm * COL13: label = SoilTemperature-C40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL14: label = SoilTemperature-C71, Units = oC, TimeSupport = 10 min, Offset = -71 cm * COL15: label = SoilTemperature-C98, Units = oC, TimeSupport = 10 min, Offset = -98 cm * COL16: label = SoilTemperature-C123, Units = oC, TimeSupport = 10 min, Offset = -123 cm * COL17: label = SoilTemperature-C162, Units = oC, TimeSupport = 10 min, Offset = -162 cm   53\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-L5, Units = oC, TimeSupport = 10 min, Offset = -5 cm * COL4: label = SoilTemperature-L10, Units = oC, TimeSupport = 10 min, Offset = -10 cm * COL5: label = SoilTemperature-L40, Units = oC, TimeSupport = 10 min, Offset = -40 cm * COL6: label = SoilTemperature-L94, Units = oC, TimeSupport = 10 min, Offset = -94 cm * COL7: label = SoilTemperature-L110, Units = oC, TimeSupport = 10 min, Offset = - 110cm * COL8: label = SoilTemperature-C10, Units = oC, TimeSupport = 10 min, Offset = -10cm * COL9: label = SoilTemperature-C18, Units = oC, TimeSupport = 10 min, Offset = -18cm * COL10: label = SoilTemperature-C40, Units = oC, TimeSupport = 10 min, Offset = -40cm * COL11: label = SoilTemperature-C69, Units = oC, TimeSupport = 10 min, Offset = -69cm * COL12: label = SoilTemperature-C121, Units = oC, TimeSupport = 10 min, Offset = -121cm * COL13: label = SoilTemperature-R5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL14: label = SoilTemperature-R10, Units = oC, TimeSupport = 10 min, Offset = -10cm * COL15: label = SoilTemperature-R40, Units = oC, TimeSupport = 10 min, Offset = -40cm * COL16: label = SoilTemperature-R86, Units = oC, TimeSupport = 10 min, Offset = -86cm * COL17: label = SoilTemperature-R101, Units = oC, TimeSupport = 10 min, Offset = -101cm   55\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-C7, Units = oC, TimeSupport = 10 min, Offset = -7cm * COL4: label = SoilTemperature-C14, Units = oC, TimeSupport = 10 min, Offset = -14cm * COL5: label = SoilTemperature-C44, Units = oC, TimeSupport = 10 min, Offset = -44cm * COL6: label = SoilTemperature-C75, Units = oC, TimeSupport = 10 min, Offset = -75cm * COL7: label = SoilTemperature-C102, Units = oC, TimeSupport = 10 min, Offset = -102cm * COL8: label = SoilTemperature-R5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL9: label = SoilTemperature-R7, Units = oC, TimeSupport = 10 min, Offset = -7cm * COL10: label = SoilTemperature-R84, Units = oC, TimeSupport = 10 min, Offset = -84cm * COL11: label = SoilTemperature-R141, Units = oC, TimeSupport = 10 min, Offset = -141cm * COL12: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL13: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL14: label = SoilTemperature-5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL15: label = SoilTemperature-8, Units = oC, TimeSupport = 10 min, Offset = -8cm * COL16: label = SoilTemperature-L14, Units = oC, TimeSupport = 10 min, Offset = -14cm * COL17: label = SoilTemperature-R14, Units = oC, TimeSupport = 10 min, Offset = -14cm * COL18: label = SoilTemperature-R30, Units = oC, TimeSupport = 10 min, Offset = -30cm   60\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-U5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL4: label = SoilTemperature-U8, Units = oC, TimeSupport = 10 min, Offset = -8cm * COL5: label = SoilTemperature-U29, Units = oC, TimeSupport = 10 min, Offset = -29cm * COL6: label = SoilTemperature-U38, Units = oC, TimeSupport = 10 min, Offset = -38cm * COL7: label = SoilTemperature-D24Root, Units = oC, TimeSupport = 10 min, Offset = -24cm * COL8: label = SoilTemperature-D5, Units = oC, TimeSupport = 10 min, Offset = -5cm * COL9: label = SoilTemperature-D11, Units = oC, TimeSupport = 10 min, Offset = -11cm * COL10: label = SoilTemperature-D20, Units = oC, TimeSupport = 10 min, Offset = -20cm * COL11: label = SoilTemperature-D27, Units = oC, TimeSupport = 10 min, Offset = -27cm * COL12: label = SoilTemperature-D31, Units = oC, TimeSupport = 10 min, Offset = -31cm   61\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-10, Units = oC, TimeSupport = 10 min, Offset = -10 cm * COL4: label = SoilTemperature -20, Units = oC, TimeSupport = 10 min, Offset = -20 cm * COL5: label = SoilTemperature -36, Units = oC, TimeSupport = 10 min, Offset = -36 cm * COL6: label = SoilTemperature -67, Units = oC, TimeSupport = 10 min, Offset = -67 cm * COL7: label = SoilTemperature -87, Units = oC, TimeSupport = 10 min, Offset = -87 cm * COL8: label = SoilTemperature -97, Units = oC, TimeSupport = 10 min, Offset = -97 cm * COL9: label = SoilTemperature -127, Units = oC, TimeSupport = 10 min, Offset = -127 cm   74\_Soil Temperature\_YEAR\_RawCompiled   * COL1: label = Day of year, UTCOffset=-4, TimeZone=EST. * COL2: label = Decimal time of day, UTCOffset=-4, TimeZone=EST. * COL3: label = SoilTemperature-5, Units = oC, TimeSupport = 10 min, Offset = -5 cm * COL4: label = SoilTemperature -8, Units = oC, TimeSupport = 10 min, Offset = -8 cm * COL5: label = SoilTemperature -9, Units = oC, TimeSupport = 10 min, Offset = -9 cm * COL6: label = SoilTemperature -23, Units = oC, TimeSupport = 10 min, Offset = -23 cm * COL7: label = SoilTemperature -40, Units = oC, TimeSupport = 10 min, Offset = - 40cm |
| Keywords | Soil, water, hydrology, hydropedology, soil science, soil temperature |
| Methods | Soil temperature is measured with Campbell Scientific 229 probes campbellsci.com  Soil temperature is measured with Decagon 5TE probes decagon.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. |