# SSHCZO Metadata Worksheet

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| Data File Name | **COSMOS\_GR.txt** |
| Date Prepared | 10/12/2015 |
| Descriptive Title | Garner Run COSMOS Level 1 data |
| Update Frequency | Hourly |
| Abstract | Hydroinnova Cosmic-Ray Soil Moisture/Snow Sensing System (COSMOS), Model CRS-1000/B, non-invasively measures moderated neutron count among an averaged area (around 700 meters in diameter (Franz et al., 2013)), which can indirectly represent soil moisture in the top 50 cm of soil. This file includes level 1 data measured directly from COSMOS. The neutron count can be affected various elements in surroundings, where hydrogen is often the dominant one (Zreda et al., 2012). The neutron rate counted by the MOD column of COSMOS therefore can be used to determine soil moisture after a standard correction and point calibration, the results of which are COSMOS Level 2 and Level 3 data.  |
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| Data Value Descriptions | Level 1* COL1: label = TmStamp; Time zone=UTC, neutron count interval.
* COL2: label = RecordNum; Number of recorded data.
* COL3: label = P1\_mb; Unit = mb, the atmospheric pressure inside the logger.
* COL4: label = T1\_C; Unit = degree centigrade, the temperature inside the logger.
* COL5: label = RH1; Unit = %, the relative humidity inside the logger.
* COL6: label = Vbat; Unit = V, the battery voltage.
* COL7: label = N1Cts\_MOD; the neutron count in MOD column, used to calculate soil moisture.
* COL8: label = N2Cts\_BARE; the neutron count in BARE column, for reference.
* COL9: label = N1ET\_sec; Unit = sec, the second number of the count interval for MOD column.
* COL10: label = N2ET\_sec; Unit = sec, the second number of the count interval for Bare column.
* COL11: label = N1T\_C; Unit = degree centigrade, the temperature in MOD column.
* COL12: label = N1RH; Unit = %, the relative humidity in MOD column.
* COL13: label = N2T\_C; Unit = degree centigrade, the temperature in BARE column.
* COL14: label = N2RH; Unit = %, the relative humidity in BARE column.
* COL15: label = MOD; neutron counts per hour (N1Cts(MOD)/N1ET\_sec\*3600).

Level 2 and 3* COL1: label = Date; Time zone=UTC, the end date of the neutron count interval.
* COL2: label = N1Cts(MOD); fast neutron count over the preceding time interval, quality controlled to be 60 +/- 1 minutes since the previous count
* COL3: label = Probe; scaling factor to account for differences in size/composition of the probe from the San Pedro baseline probe.
* COL4: label = PRESS; scaling factor to account for changes in pressure at probe site; changes cosmic ray intensity.
* COL5: label = SCALE; factor to account for differences in cosmic ray intensity as result of elevation/cutoff rigidity of probe site (Desilets, D., and M. Zreda [2003]).
* COL6: label = SANPE; scaling factor at Sane Pedro probe to account for differences in cosmic ray intensity
* COL7: label = INTEN; scaling factor to account for temporal changes in cosmic ray intensity as a function of time.
* COL8: label = OTHER; additional corrections placeholder (none seen at this time)
* COL9: label = CORR; probe count rate corrected for all scaling factors (CORR = FAST\*PRESS/SCALE\*SANPE/INTEN)
* COL10: label = SM; Unit = %; estimated soil moisture in % volumetric
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| Keywords | COSMOS, Soil Moisture |
| Methods | Data collected using Hydroinnova Cosmic-Ray Soil Moisture/Snow Sensing System. Prepared to be corrected and be used to determine soil moisture.

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| Calibration |   |   |   |   |
| SM | a0 | a1 | a2 | N | N0 |
| 0.1771 | 0.0808 | 0.372 | 0.115 | 1963.23 | 3026.79 |

Pressure correction parameterL = 133PO = 956Equation to calculate soil moisture based on neutron counts: |
| Sites | COSMOS GR: WGS84, Lat 40.695831; Lon -77.920969 |
| Publications | The data has not yet been published. Please embargo public access.  |
| Citation | The following acknowledgment should accompany any publication or citation of these data: Logistical support and/or data were provided by the NSF-supported Susquehanna Shale Hills Critical Zone Observatory. |
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