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%  -- Niwot Ridge Subalpine Forest AmeriFlux Data (site ID:  US-NR1) --
% MST Time Period: 2024  01/01 00:00:00 - 2025  01/01 00:00:00, JD 1.000-367.000 (MST)
% UTC Time Period: 2024  01/01 07:00:00 - 2025  01/01 07:00:00, JD 1.292-367.292 (UTC)
% File Name: niwot_USNR1_radiation_2024.csv
% File Created by: Sean Burns (sean.burns@colorado.edu)
% File Created for: Mark Raleigh (raleigma@oregonstate.edu), Nicolas Tarasewicz (Nic.Tarasewicz@colorado.edu)
% Date: 28-Jan-2025
% --------
%
%   28-Jan-2026, Mistake noticed by Bella Kamplain (fixed description of SPN1
%                incoming radiation (col 34 is total radiation, direct + diffuse)).
%
%   Current Version: ver.2025.01.28
%
%    * added SPN1 total/diffuse data at 25.5m (sensor added in Fall 2024)
%
%    * details about the SPN1 installation are here:
%
%       https://urquell.colorado.edu/sean/emails_about_spn1_installation.txt
%
%   ------------------------------------------------------------
%   Previous Version: ver.2023.04.12
%
%   * The SP-610 outgoing shortwave radiation data was being clipped by the
%     software QA/QC.  This clipping was removed.  An example of the clipped data:
%
%   https://urquell.colorado.edu/data_ameriflux/plots/radiation_usnr1_compare_Rsw_in_2020.pdf
%
%   * Added data for years of 2020 (now full year), 2021, and 2022
%
%
%   ------------------------------------------------------------
%   Previous Version:  ver.2020.05.14 (Preliminary)
%
%   Notes:
%
%   * Plots of the radiation data are in:
%
%    https://urquell.colorado.edu/data_ameriflux/plots/
%
%   * Snow will accumulate on the up-looking sensors in the winter.  See photos on the site
%     calendar:    https://urquell.colorado.edu/calendar/
%
%   * The raw voltages are include in case you need to calculate (or check) anything.
%
%   * the incoming longwave from the SL-510 sensor seems to be a bit
%     strange in 2019 (note this sensor failed in July 2019 and was replaced
%     on 23 Oct 2019)...the issues with the SL-510 are confirmed by
%     comparison to the SN-500 radiation: for both 2019 and 2020 there is an
%     offset between the SL-510 and SN-500 that needs to be better
%     understood...however, in 2019, the differences are large and variable,
%     but in 2020, the differences are fairly consistent.  Based on this, I
%     think the 2019 SL-510 longwave data are questionable...
%
%   * it took some effort to add/remove/add the SN-500 sensor, but Im
%      happy we did...I have not tried to compare Rlw_out calculated from the
%      T_ir data to Rlw_out from the SN-500...
%
%    * the IR surface temperature sensor seemed to have a strange negative
%      shift of around 2 degC on day 96 of 2019.  see
%      "radiation_usnr1_2019_zoom.pdf" for details.  with the snowpack I
%      expect a max surface temp of around 0 degC, but on day 96 of 2019 this
%      seemed to shift...this shift seems to go away in the 2020 data?...
%
%
%
% --------
%
%  Columns are:
%
%  1-6. Year, Month, Day, Hour, Minute, Sec -- in MST, Time Stamp Corresponds to center of Averaging Time Period
%  07. Decimal Day of Year (MST)
%  08. Rsw_in_25m_KZ        W/m2            25.5m            Incoming Shortwave Radiation                                  Kipp and Zonen CNR1
%  09. Rsw_out_25m_KZ       W/m2            25.5m            Outgoing Shortwave Radiation                                  Kipp and Zonen CNR1
%  10. Rlw_in_25m_KZ        W/m2            25.5m            Incoming Longwave Radiation                                   Kipp and Zonen CNR1
%  11. Rlw_out_25m_KZ       W/m2            25.5m            Outgoing Longwave Radiation                                   Kipp and Zonen CNR1
%  12. Rppfd_in_25m         umol/m2/s       25.5m            Incoming Photosynthetic Active Photon Flux Density (PPFD)          LI-COR 190-SA
%  13. Rppfd_out_25m        umol/m2/s       25.5m            Outgoing PPFD                                                 LI-COR 190-SA
%  14. Rnet_25m_REBS        W/m2            25.5m            Net Radiation                                                 REBS Q*7.1 (sn ?)
%  15. Rnet_0200cm_REBS     W/m2            2m               Net Radiation                                                 Rebs Q*7.1 (sn Q96333)
%  16. Rsw_in_sp510         W/m2            2.2m             Incoming Shortwave Radiation                                  Apogee SP-510
%  17. Rsw_in_sn500         W/m2            2.2m             Incoming Shortwave Radiation                                  Apogee SN-500
%  18. Rsw_out_sp610        W/m2            2.2m             Outgoing Shortwave Radiation                                  Apogee SP-610
%  19. Rsw_out_sn500        W/m2            2.2m             Outgoing Shortwave Radiation                                  Apogee SN-500
%  20. Rlw_in_sl510         W/m2            2.2m             Incoming Longwave Radiation                                   Apogee SL-510
%  21. Rlw_in_sn500         W/m2            2.2m             Incoming Longwave Radiation                                   Apogee SN-500
%  22. Rlw_out_sn500        W/m2            2.2m             Outgoing Longwave Radiation                                   Apogee SN-500
%  23. Tir_si121            degC            ground (sensor at 2m)    Infrared Surface Temperature                         Apogee SI-121
%  24. T_therm_si121        degC            2.2m             Thermistor Temperature                                        Apogee SI-121
%  25. T_therm_sl510        degC            2.2m             Thermistor Temperature                                        Apogee SL-510
%  26. T_med_uc             degC            2.5m             Air Temperature at Mini-tower                                 Medtherm Thermocouple
%  27. snowdepth_judd       cm              2.5m             Snow Depth                                                    Judd Ultrasonic Depth Sensor
%  28. Rsw_in_sp510_mV      mV              2.2m             Incoming Shortwave Radiation Voltage                          Apogee SP-510
%  29. Rsw_out_sp610_mV     mV              2.2m             Outgoing Shortwave Radiation Voltage                          Apogee SP-610
%  30. Rpile_in_sl510_mV    mV              2.2m             Thermopile Voltage                                            Apogee SL-510
%  31. T_therm_sl510_mV     mV              2.2m             Thermistor Voltage                                            Apogee SL-510
%  32. Tir_pile_si121_mV    mV              2m               Thermopile Voltage                                            Apogee SI-121
%  33. Tir_term_si121_mV    mV              2m               Thermistor Voltage                                            Apogee SI-121
%  34. Rsw_in_spn1          W/m2            25.5m            Incoming (Total = Direct + Diffuse) Shortwave Radiation       Delta-T Devices SPN1
%  35. Rdiff_in_spn1        W/m2            25.5m            Incoming (Diffuse) Shortwave Radiation                        Delta-T Devices SPN1
% --------
%
%
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