# METADATA
# Putney Study Plot

Putney Study Plot (PTSP) data: http://snowstudies.org/data1.html
Senator Beck Basin Study Area (SBBSA), Red Mountain Pass, San Juan Mountains
Center for Snow and Avalanche Studies (CSAS)

I.  Putney Study Plot (PTSP)
  1) Type of Site
     a) Study Plot: site is an elevated and prominent 'sub-summit' on a N/S ridgeline, on the San Juan County/Ouray County line.  PTSP was initially developed in the 1970s by the INSTAAR Red Mountain Project, installing the 30' Rohn tower still in use by CSAS.  This site is routinely wind scoured and rarely accumulates even thin snowcover.  By virtue of its elevation and adjoining terrain configuration, PTSP wind data is considered the least terrain-affected wind data collected in the CSAS network. Air temperature and humidity data are also minimally terrain influenced and considered representative of 'free air' at that elevation.

  2) Site Datum
     a) Location: August 2008 GPS Lat 37° 53' 32.39415", Lon -107° 41' 44.77002"
        i)   Originally estimated as 37° 53' 34" N, 107° 41' 42" W; per USGS Ironton, Colorado quadrangle 1955, NAD 1927
     b) Elevation: August 2008 GPS survey: 12,323.4 feet (3,756 meters)
        i)   Originally estimated as 12,325 feet (3757 meters) per USGS Ironton, Colorado quadrangle 1955, NAD 1927
     c) Aspect & Slope: PTSP is a generally level site
     d) Soils: very thin or none
     e) Vegetation: sparse, alpine tundra vegetation and bare mineral soil and bedrock
     f) Ownership: PTSP is private property; permission to operate PTSP granted to CSAS by landowner
     g) Changes to site: no alterations to tundra site since original INSTAAR installation other than CSAS removal of obsolete equipment from mast and cleanup of power and data land lines
     h) Photographs: see CSAS website at http://www.snowstudies.org/ptsp1.html

  3) System Operation
     a) PTSP Winter operations began in 2004/2005 season, on October 5, 2004; PTSP Summer (year-round) operations began Summer 2007
     b) Since Summer 2007, PTSP performs continuous collection of 'Winter' and 'Summer' datasets spanning the 'Water Year' (October 1 through September 30)
        i)   'Winter' datasets begin October 1 (start of 'Water Year') through midnight of the last day of Spring (through the day before summer solstice)
        ii)  'Summer' datasets extend from Summer Solstice through September 30 (through the day before start of new 'Water Year')

    c) Data Arrays
       i) 1 hour data arrays: *Flag* field = 101
       ii) 3 hour data arrays: *Flag* field = 103
       iii) 24 hour data arrays: *Flag* field = 124
    d) All data collected on Mountain <u>Standard</u> Time, by day-of-year (DOY)
       i) System clocks *are <u>not</u>* switched from/to Mountain Daylight Time in Fall or Spring
       ii) 24 hour summary datasets (*Flag* = 124) are calendar day, ending at midnight
    e) Measurements are calculated in both SI (International System of Units) and imperial/US units to facilitate use by other public safety agencies.

## 4) System Operations Notes (see also Sensor History notes for individual sensors)

    a) Notable changes in operations (additions of sensors, recalibrations, etc.), or sensor or system malfunctions with extended periods of missing data are listed below.  Other, brief periods of missing data exist.

| Year | Date(s) | Day of Year | Note |
|---|---|---|---|
| 2015 | Jun 8 | 159 | CS500 air temp/RH sensor installed to replace HMP35C air temp measurements and restore RH measurements; no missing hourly temperature data for DOY 159; 24-hour summary temperature data valid for DOY 159; RH data resume 1000 hrs |
| 2015 | Jun 6 | 157 | Temporary disruption to HMP35C air temperature measurements from 1300-2100 hrs; no valid air temperature measurements during those hours; no valid 24-hour mean air temp DOY 157 |
| 2015 | Jun 6-8 | 157-159 | HMP35C lost RH function at 1300 hrs Jun 6 (DOY 157); no valid RH measurements until CS500 sensor installed 1000 hrs Jun 8 (DOY 159) |
| 2012 | Sep 30 – Oct 21 | 274-295 | Intercalibrated HMP 35C in-situ with refurbished CS500 sensor; HMP 35C data within specs, per CSI; no missing data |
| 2011 | Aug 8 | 220 | Replaced Wind Monitor #61999 with refurbished Wind Monitor #12387; #61999 in good condition on removal;  no lost data |
| 2009 | Jul 20 | 201 | Nearby lightning strike damaged radio equipment; no lost data |
| 2007 | Aug 29 | 241 | Replaced all mast guywires; no effect on data |
| 2007 | Aug 7 | 250 | Power supply upgrade; two hours lost data 1100-1200 |
| 2006 | Sep 19 | 262 | PTSP restarted for continuous, year-round operations |
| 2006 | Jun 5 | 156 | PTSP shut down for summer |
| 2006 | Feb 2-13 | 33-44 | No wind direction data for this period; sensor arm slipped out of alignment, was permanently repaired; speed data OK |
| 2005 | Oct 8 | 281 | PTSP restarted for winter |
| 2005 | May 28 | 148 | PTSP shut down for summer |
| 2004 | Dec 10 | 345 | PTSP reprogramming for both scalar and resultant wind data |
| 2004 | Oct 16 | 290 | PTSP reprogramming; no data for October 16, 2004 |
| 2004 | Oct 5 | 279 | PTSP startup; wind programming for scalar data only |

5) Power
    a) Solar powered by 20 watt photovoltaic panel providing regulated charge to two, 90 amp hour, gel, 12V DC batteries.

6) Measurements and Sensors
   a) Wind Speed and Direction
      i) Properties
         (a) Make: RM Young
         (b) Model: #05103-5
         (c) Serial Number: #12387 replaced unit # WM61999 August 2011
         (d) Type: Wind Monitor
         (e) Specifications: CSI_RMYoung_WindMonitor_05103_manual.pdf
      ii) Installation & Maintenance
         (a) Height above ground: 9.5 m
         (b) Distance from tower or obstacle: 0.5 m, on arm extending due north
         (c) Data begin: October 5, 2004 (DOY 279)
         (d) Comment: sensor operated with Campbell Scientific Edlog software instruction P69 parameter 3 set at option 2 to calculate both resultant and scalar mean wind speeds, calculate resultant mean wind direction (only), and standard deviation of mean wind direction.  Instruction P73 calculates peak wind gust.
      iii) Sensor History:

| Serial # | Date | Action | Condition |
|---|---|---|---|
| 12387 | Aug 8, 2011 | Installed | CSI refurbished Aug 2011 |
| 61999 | Aug 8, 2011 | Removed for servicing | Good, on CSI inspect |
| 61999 | Oct 5, 2004 | Installed | New |

   b) Air Temperature and Humidity
      i) Properties
         (a) Make: Campbell/Vaisala
         (b) Model: HMP-35C until Jun 8, 2015 (DOY 159), then CS500 (temporary)
         (c) Serial Number: 7063 (replaced CS500 Dec 2004), then #Z1840003
         (d) Type: Vaisala humiter and Fenwall UUT51J1 thermistor
         (e) Specifications:
      ii) Installation
         (a) Height above ground: 3.1 m to prevent damage from blowing debris
         (b) Distance from tower or obstacle: 0.1 m on bracket mounted to tower leg
         (c) Data begin: October 5, 2004 (DOY 279)
      iii) Sensor History:

| Serial # | Date | Action | Condition |
|---|---|---|---|
| CS500 #Z1840003 | Jun 8, 2015 | Replaced damaged HMP35C, temporary | Refurbished |
| HMP 35C #7063 | Sep 30 – Oct 21, 2012 | Intercalibration in-situ with refurbished CS500 | HMP 35C data within specs, per CSI; no change |
| HMP 35C #7063 | Dec 11, 2004 | Installed, replacing CS500 | CSI refurbished Oct 2003 |
| CS500 #Z1840003 | Oct 5, 2004 | Installed for startup | Used, operating normally |

7) Datalogger
    a) Make: Campbell Scientific
    b) Model: CR10X
    c) Serial Number: 40362
    d) Type: fully programmable measurement and control system with ring memory, extended temperature tested (-55 to +85C)
    e) Specifications: CSI_cr10x_specs.pdf
    f) Sensor History:

| Serial # | Date | Action | Condition |
|---|---|---|---|
| 40362 | Oct 5, 2004 | Installed at startup | New |

8) Data Retrieval
    a) RF Station ID = 1
    b) Radio telemetry using phone-to-RF base station; no repeater utilized
        i) Campbell Scientific model RF 310M modem; serial #6928
        ii) Original RF310 Maxon SD-125 V2 VHF radio, serial #030604688, damaged by lightning July 20, 2009 and replaced with same make/model radio, serial #030604719, on August 2, 2009
        iii) Cellwave PS1121-2 dipole antenna

9) Software
    a) Campbell Scientific LoggerNet 2.1c
    b) Contact CSAS for specific Winter or Summer season Loggernet programming

10) Observer Contact Information
    a) Name:  Chris Landry - Executive Director
    b) Organization:  Center for Snow and Avalanche Studies
    c) Address:  PO Box 190, Silverton, CO, USA 81433
    d) Telephone:  (970) 387-5080
    e) Email:  clandry@snowstudies.org
    f) Website: http://www.snowstudies.org

11) Data processing and output methods:
    a)  Measurement execution interval:  5 seconds
    b)  Measurements and Loggernet instructions: see table below
        i)   Location # in the table below refers to position in data file string (within a given array) as well as column number in relevant Excel spreadsheet header

| Parameter Spreadsheet Labels (some abbreviations expanded) | Loc'n # | LoggerNet 2.1c Output Instruction | Type of Measurement | Notes |
|---|---|---|---|---|
| ArrayID | 1 | P80 | na | 101 = 1 hour array, 103 = 3 hour array<br>124 = 24 hour array |
| Year | 2 | P77 | Na | Calendar year |
| DOY | 3 | P77 | na | Sequential day of calendar year |
| Hour | 4 | P77 | na | Mountain Standard Time at end of array period in military time; calendar day ends with 2400 hour array |
| Air_Min_C<br>Air_Min_Time | 5<br>6 | P74 | Minimize | Array minimum air temperature (C),<br>time of minimum |
| Air_Max_C<br>Air_Max_Time | 7<br>8 | P73 | Maximize | Array maximum air temperature (C),<br>time of max |
| Air_Min_F | 9 | P74 | Minimize | Array minimum air temperature (F) |
| Air_Max_F | 10 | P73 | Maximize | Array maximum air temperature (F) |
| RH | 11 | P70 | Sample | Samples relative humidity (%) at end of array |
| Wind_Pgust_MPH<br>Wind_PGust_Time<br>Wind_PGust_MS<br>Wind_SAvg_MPH<br>Wind_Uavg_MPH<br>Wind_Dir_Uavg<br>Wind_Dir_StDev<br>Wind_SAvg_MS<br>Wind_Uavg_MS<br>Wind_Dir_Uavg_Copy<br>Wind_Dir_StDev_Copy | 12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22 | P73<br><br><br>P69 | Maximize<br><br><br>Wind vector | Array peak gust in MPH, MS<br><br>P69 output option '2': scalar mean horizontal wind speed S; resultant mean wind speed U; resultant mean wind direction; standard deviation wind direction using Campbell Scientific algorithm. |
| Sys_Volts | 23 | P70 | Sample | Voltage at datalogger sampled once at end of array |
| Air_Avg_C | 24 | P71 | Average | Averages all measurements of air temperature collected during a day, from 0000 hrs through 2400 hrs |
| Air_Avg_F | 25 | P71 | Average | As above |
| See also: **Table of variables, CF standard names and attributes: snowstudies.org/data/metadata/PTSP_Variable_Table.xlsx** | | | | |

# Web Links for CSAS Metadata and Supplemental Documents:

- CF Standard Name Table for each variable measured:
  http://snowstudies.org/data/metadata/PTSP_Variable_Table.xlsx

- Archived Datasets by Season, Snow Profiles, and Storm Reports:
  http://snowstudies.org/data1.html

- Metadata for all CSAS Study Plots:
  Swamp Angel Study Plot: http://snowstudies.org/data/metadata/SASP.pdf
  Senator Beck Study Plot: http://snowstudies.org/data/metadata/SBSP.pdf
  Putney Study Plot: http://snowstudies.org/data/metadata/PTSP.pdf
  Senator Beck Stream Gauge: http://snowstudies.org/data/metadata/SBSG.pdf

- Photographs of all Study Plots:
  Swamp Angel Study Plot: http://snowstudies.org/sasp1.html
  Senator Beck Study Plot: pthttp://snowstudies.org/sbsp1.html
  Putney Study Plot: http://snowstudies.org/sasp1.html
  Senator Beck Stream Gauge: http://snowstudies.org/sbsg1.html

- Instrument Manuals: http://snowstudies.org/data/metadata/InstrumentManuals/

- Interpolated Data Notes (Winter 2011/2012 and onward) for all CSAS Study Plots:
  http://snowstudies.org/data/metadata/DataNotes.xls