**ETH - Steffen – Fixed Arm and Solar Tracker**

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How often: Daily – instrument check and cleaning

Weekly – data download

Clean requirements: None

Supplies needed: Log sheets, computer for data download

**Introduction:** The radiation balance is a key factor for the climate. With the ‘Solar Tracker’ all components of the radiation are measured since the year 2000 (with a break in winter 2002/3). With a long term monitoring of the radiation the variability and changes in short and long wave radiation can be assessed. Together with climate parameters measured at the Swiss Tower an energy balance for the snow surface can be deducted.

**Procedure:**

* Daily check of the instruments: The daily checks should be done before 10 am and after each rime event.
* General note: Disturb snow surface in the least possible manner and use same footprints every time you access the instruments -> Figures 1a,b and 2a,b show the locations of all the instruments (‘I\*’), the filters (‘F\*’).
* **Fixed arm (Fig 1a,b)**: Clean rime off black filters underneath the up-facing instrument (F1 and F2) and at the end of the two orange tubes (F3 and F4). If there is rime on glass domes or dark dome (I1-I3) remove it with Kimwipes.
* **Rotating Instrument (Solar Tracker, Fig 2a,b)**: Clean rime off black filters underneath the instruments (F1-F3). If there is rime on the translucent glass dome or the dark glass dome (I1-I2) remove it with Kimwipes. Clean rime off the grey tube - if necessary (I3): it is located on the right hand side of the white big box, measuring direct sunlight.
* If necessary remove accumulated snow and rime from and around the radio antenna
* After check/cleaning, fill in Excel sheet on ftp-Summit-server (Shortcut on desktop):

\\server\ftp\data\Zurich\YY\_FTP\_ETH\ YY\_ETH\_Logsheets.xls

**Weekly data download:**

* Data is downloaded via radio modems at MSF. The radio modems (labeled ‘Tracker’ and ‘Tower’) connect to ICECAPS admin computer via the USB/Serial adapter.
* Make sure serial connectors are plugged snuggly into USB/Serial adapter.
* Open PC208 software. There is a shortcut on the desktop of the ICECAPS PC for this.
  + (Note: If the COM port needs to be changed, the settings in the PC208 software will need to be changed within the settings menu. The easiest way to do this is click and drag the “Tracker” and its parent item in the communications tree on the left of the settings window to the new COM port number.)
  + In the horizontal pane of 8 action buttons (‘Setup’,’Connect’,’Status’, etc.), click ‘Connect’.
* In the window that opens, highlight ‘TRACKER’ in the ‘Station List’ on the left.
* Click on ‘Connect’ button in right lower corner.
* Compare data logger time with PC System time in upper right corner of PC208 window (make sure PC time is updated!).
* Note and log the time difference and adjust if necessary (>= 2sec) with ‘Set Data logger Clk’ button.
* Make sure ‘Prompt for data filename’ is enabled.
* Click button ‘Advanced’ and check displayed pointer number (compare with number on log sheet and adjust if necessary to the number on the log sheet. The pointer number is memorized locally on the computer. If you always use the same computer, no adjustment is necessary).
* Click ‘Collect’ button to download the new data.
* A window will pop up and ask you for a new filename; change to the directory: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week## (a new folder for the week will need to be created in the YY\_FTP\_ETH folder to save DIF####.dat in). Increase file-name-number by one: ‘DIF###.dat’ (check log sheet for last file number). (Or TU###.dat for Tower).
  + The drive ‘z://’ is linked to \\server\ftp\data
  + The current year may be garbled text. For 2015, this is ‘1MKGVR~4’.
* Click on the ‘ok’- button the download finally starts!!
* When the download is completed click again the ‘Advanced’ button and note the new pointer number on log sheet.
* Open the downloaded file – file path:
  + \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week##\DIF###.dat and note the day of year and the time (the first and the last row of file, 3rd and 4th position) on the log sheet
* Click ‘Disconnect’
* Repeat for Tower data using ‘TU###.dat for the file name.
* Exit PC208W software

**Alternate procedures** in case it is not possible to download the data from the Tracker via radio connection from MSF:

* Go to the tracker, open Logger box (Fig 5) and take out Storage Module (Fig 6, be careful with the cables, they get very stiff in cold conditions).
* Bring Storage Module to MSF and download data from Storage Module with the ‘StgModule-download-set’. Plug blue 9-pin cable into StgModule (gray cable is already plugged into computer).
* Double-click on PC208w icon
* Choose ‘StgModule’
* Select ‘SM4M/SM16M’ on top/right of the window
* On the lower left side of the window choose the ‘data’ tab
* Click on the ‘File Naming Option’ button and choose the new filename number and saving location.
* Click ‘Connect’
* Click on ‘Show module directory’. Wait a couple of seconds until all folders are listed. Open the last two folders. Compare the Pointer Numbers and save the data files that start with the Pointer Number listed on the log sheet. Eventually you will have to open an earlier folder to get to the pointer number.
* Save the data file by choosing the ‘Save New’ button.
* Note the last Pointer Number, called File Mark, on the log sheet.
* Close the window when the download is completed.
* Open the downloaded file and note the day of year and the time (3rd and 4th position of the first and the last row of the file) on the log sheet
* Copy the downloaded file on ftp-Summit-server – file path: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH

**Pictures:**

Swiss Instruments 1: Fixed arm with instruments I 1-3

Swiss Instruments 2: Fixed arm with filters F 1-4

Swiss Instruments 3: Solar Tracker with all Instruments I 1-3

Swiss Instruments 4: Solar Tracker – Filters F1-3 and Data logger box

**ETH / Steffen –Precision Filter Radiometer (PFR) Sunphotometer**

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How often: Daily – instrument check and cleaning

Weekly – data download

Clean requirements: None

Supplies needed: At solar tracker: triangular key to open PFR enclosure, Toughbook laptop computer with SC32A (to reset PFR clock), blue DB9 ribbon cable, black or white data storage module.

At MSF: ICECAPS admin computer “IceBox” with SC532 for data download.

**Introduction:** Aerosol optical depth (AOD) is critically important to an understanding of how Earth's climate is radiatively forced, and to complement satellite observations and global scale model calculations. AOD is a quantitative measure of the extinction of solar radiation by the vertically integrated aerosol load.

The Precision Filter Radiometer (PFR) is a four-channel (368, 412, 500, and 862 nm) solar instrument. It is mounted on the west side of the CIRES solar tracker (when the tracker is facing south). The datalogger and storage module reside in the south facing enclosure. To check the PFR tracking and alignment look at look at how the sun illuminates the two small red circles located on the outside of the aluminum PFR mount.

\*This instrument is removed from the tracker in the fall when the internal temperature loses stability. It is reinstalled in the spring. Remove the instrument from the mount, and the data storage module from the enclosure. Store the PFR and Data Storage Modules at MSF.

**Daily Check:**

* Check the PFR’s window for snow, rime or frost.
* If necessary, clean using a soft bristled paint brush.
* If frost or ice is persistent, use alcohol and a Kim wipe to remove it.
* Check the PFR’s alignment.
* Clear diopter pinholes of snow. (See pictures below.)

**Weekly Data Download:**

The PFR data can be downloaded either via a laptop (make sure PC208 software is installed) at the instrument, or by bringing the storage module into MSF.

**At instrument:**

* Check that the time on the laptop correct (sync it with the NIST time server).
* Take the following to the PFR:
  + Toughbook laptop
  + SC32A optically isolated RS232 interface (with cable)
  + Triangularly shaped key for opening the PFR electrical enclosure
  + Replacement Data Storage Module (black or white).
* At the solar tracker connect the Toughbook to the CR10 (in the S-Facing enclosure) using the SC32.
* Open the S-Facing enclosure
* Disconnect the DB-9 connector from the Data Storage Module.
* Connect the laptop to the CR10 with the blue flat ribbon cable via the SC32.
* Start PC208W if it isn’t already running.
* Click the ‘Connect’ button and select ‘CR10’ from the list of instruments.
* Click ‘connect’ on the bottom right.
* Check the ”Datalogger Date/Time.” Record the time offset in the ETH spreadsheet and click “Set Datalogger Clk.”
* Disconnect the Toughbook laptop.
* Swap storage modules. There is one wrapped in white and another in black. Take the one you removed to TAWO.

**At MSF:**

Use the ICECAPS admin computer in the MSF with the PC208W software. It will keep track of the data pointer. If you lose the pointer you will have to type it in from what was recorded in the spreadsheet.

* Make sure the DC converter power for the Campbell SC532 is plugged in.
* Connect the Data Storage Module (SM4) to the “peripheral” end of the SC532. Connect the “PC” end of the SC532 to a serial port.
* Start up the PC208W software.
* Click the button labeled “Storage Module.”
* Choose the tab for SM4M/SM16M.
* Click the button for “File Naming Options” and navigate to \\server\ftp\data\Zurich\14\_FTP\_ETH\14\_FTP\_ETH\week##. Increase the file-name-number by one: “PFR###.dat” (check log sheet for last file number). Click ”ok.”
* Click “Connect” to download data. If download doesn’t start, click “get new.” It will take a few minutes.
* Record the pointer number in the spreadsheet and check the file to see if it is complete.
* Store the Data Storage Module to swap out the following week.

**PFR Seasonal Removal:**

The PFR is removed every fall (usually September) under direction from the PI.

* Remove the Data Storage Module from the PFR electrical enclosure per the Weekly Data Download instructions.
* Disconnect the LEMO connector from the back of the PFR, cover the LEMO connector with a whirlpack and stow on the Solar Tracker.
* Loosen the two socket head cap screws using a 3mm hex wrench (this will loosen the Teflon pads that hold the PFR in place).
* Remove the PFR and return to MSF for safe storage.

**PFR Seasonal Installation:**

The PFR is installed every spring (usually mid-March to May) under direction from the PI.

SEE PICTURES BELOW.

* Slide the PFR into the further out of the two sets of large mounting holes on the east side of the Solar Tracker (when it is pointed south). The LEMO connector should be down.
* Gently tighten the two socket head cap screws on the top of the aluminum mount using a 3mm hex wrench; this will cause Teflon pads to tighten down on the PFR.
* Connect the LEMO connector to the back end of the PFR.
* Connect the LEMO connector to the bottom of the PFR electronics box.
* If necessary, connect the orange power cable.
* Set the PFR clock and install the Data Storage Module (black or white taped) per the Weekly Data Download instructions.
* Check the PFR tracking/alignment per the Introduction.

PFR 2: Install the PFR in the outermost slot.

PFR 3: LEMO connector should be down and plugged into the cable coming out of the Tracker’s altitude hub.

PFR 4: The LEMO connector and orange power cable should both be connected to the bottom of the PFR electronics box.

**ETH / Steffen – Swiss Tower**

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**How often:** Daily – instrument check and cleaning

Weekly – data download

**Clean requirements:** None

**Supplies needed:** Log sheets, laptop computer for data download

***Introduction:*** The goal is to assess the energy balance of the surface and the planetary boundary layer. This winter we measure profiles of temperature, relative humidity, wind speed and wind direction up to a height of 50 meters. The data is used to examine the planetary boundary layer and - together with the data of the radiation station - an energy balance for the snow surface can be evaluated.

**Procedure:**

**Daily check of the instruments:** The daily checks should be done before 10am and after rime events. We no longer climb the tower to clean rime off instruments. Any rime removal is only done on lowest two instruments.

* Always access the tower from the north. -> Fig 5 shows the locations of all the instruments and Fig 6 the ‘delicate’ areas.
* There is an instrument measuring the snow surface height at about 1 meter on a boom directing south.
* In direction east of the tower is a small, now buried, ‘Bamboo forest’. A temperature chain in the snow is measuring snow temperatures down to 18 meters. Do not step into this area and never drive with the D6 or any other vehicle over this area (Fig 6).
* Be careful not to walk into the guy wires around the tower on conditions with bad visibility.
* If necessary: clean rime off silver temperature/relative humidity tubes (Fig 1) – black filters at the end of the tubes catch a lot of rime during foggy conditions (spare filters are stored in the box in MSF). Do not bang on the side of the tube to remove rime; instead, brush the surface of the filter. DO NOT use a paintbrush mounted on a long bamboo pole.
* If necessary: clean rime off heated wind anemometers (Fig 4).
* To clean the rime off the anemometers on the higher levels the boom can be retrieved: open the two black screws on the bracket.
* Grab arm outside of tower, push up and in at same time. Grab arm inside of tower, push up and in at same time .Grab arm inside of tower and pull back the rest. Guide cable so it doesn’t tangle or crinkle.
* After cleaning, push arm back, support last bit from outside tower. Tighten black screws again. Make sure the arm is level again.
* Clean the lower arms from the ground. Never retrieve in the three lowers arms – the cables are not long enough for that.
* Especially on Mondays, check Tower antenna for frost/rime build-up. Clean if necessary.
* After the check/cleaning, fill in paper forms and complete Excel logsheet:

\\Server\ftp\data\zurich\YY\_FTP\_ETH\YY\_ETH\_Logsheets.xls

**Weekly data download**

* Data is downloaded via radio modems at MSF. The radio modems (labeled ‘Tracker’ and ‘Tower’) connect to ICECAPS admin computer via the USB/Serial adapter.
* Make sure serial connectors are plugged snuggly into USB/Serial adapter.
* Open PC208 software. There is a shortcut on the desktop of the ICECAPS PC for this.
  + - (Note: If the COM port needs to be changed, the settings in the PC208 software will need to be changed within the settings menu. The easiest way to do this is click and drag the “Tower” and its parent item in the communications tree on the left of the settings window to the new COM port number.)
* Open PC208 software. There is a shortcut on the desktop of the ICECAPS PC for this.
* Highlight ‘TOWER’ in left window
* Click on ‘Connect’ button in right lower corner
* Compare data logger time with PC System time in upper right corner of PC208 window:
* Note the time difference and adjust if necessary (>= 2sec) with ‘Set Data logger Clk’ button
* Make sure ‘Prompt for data filename’ is enabled
* Click button ‘Advanced’ and check displayed pointer number (compare with number on log sheet and adjust if necessary to the number on the log sheet. The pointer number is memorized locally on the computer. If you always use the same computer, no adjustment is necessary.)
* Click ‘Collect’ button to download the new data
* A browse window will pop up and ask you for a new filename; change to the directory: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week## - increase file-name-number by one: ‘TU###.dat’ (check log sheet for last file number); a new folder for the week may need to be created in the ETH YYYY folder to save TU####.dat in). Click on the ‘ok’- button the download finally starts!!
* When the download is completed click again the ‘Advanced’ button and note the new pointer number on log sheet
* Open the downloaded file – file path:
* \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week##\TU###.dat and note the day of year and the time (the first and the last row of file, 3rd and 4th position) on the log sheet
* Complete Excel-sheet on ftp-Summit-server – file path:
* \\Server\ftp\data\zurich\YY\_FTP\_ETH\YY\_ETH\_Logsheets.xls
* Click ‘Disconnect’
* Exit PC208W software by pressing the “X” in the upper right.

**Alternate procedure** in case it is not possible to download the data from the Tracker via radio connection from MSF:

* + - Go to the tower, open Logger box (Fig 5) and take out Storage Module (Fig 6, be careful with the cables, they get very stiff in cold conditions).
    - Bring Storage Module to MSF and download data from Storage Module with the ‘StgModule-download-set’. Plug blue cable into StgModule and gray cable into computer.
    - Double-click on PC208w icon
    - Choose ‘StgModule’
    - Select ‘SM4M/SM16M’ on top/right of the window
    - On the lower left side of the window choose the ‘data’ tab
    - Click on the ‘File Naming Option’ button and choose the new filename number and saving location.
    - Click ‘Connect’
    - Click on ‘Show module directory’. Wait a couple of seconds until all folders are listed. Open the last two folders. Compare the Pointer Numbers and save the data files that start with the Pointer Number listed on the log sheet. Eventually you will have to open an earlier folder to get to the pointer number.
    - Save the data file by choosing the ‘Save’ button.
    - Note the last Pointer Number, called File Mark, on the log sheet.
    - Close the window when the download is completed.
    - Open the downloaded file and note the day of year and the time (3rd and 4th position of the first and the last row of the file) on the log sheet
    - Copy the downloaded file on ftp-Summit-server – file path: \\Server\ftp\data\zurich\YY\_FTP\_ETH\ftp\_ETH\_YYYY
    - Complete Excel-sheet on ftp-Summit-server – file path: \\Server\ftp\data\zurich\YY\_FTP\_ETH

**Alternate procedure using Loggernet software** in case, it is not possible to download the data from the tower data logger via radio link:

* Set up the Panasonic Toughbook to minimize the amount of time it will have to be outside in the cold.
* Ensure that COM1 is enabled
* Open the Loggernet Software, and choose the ‘connect’ icon to view the options screen
* Click on ‘Custom Data Collection’. Ensure that in the dropdown menus the following are selected: ‘All the Data’, ‘Create New File’, and ‘ASCII data, short header’. Also, in the same window, further down be sure that the ‘Tower’ box is ticked. The ‘Public’ and ‘Status’ boxes do not need to be checked.
* Close the ‘Custom Data Collection’ window, but keep the Loggernet Software open.
* Go to the tower, open Logger box (Fig 5) and disconnect the RF antenna from the RS232 port. Plug in the blue 9-pin serial connector to the RS232 port, and connect it to the laptop.
* In the Loggernet program connect screen, choose ‘Connect’
* Check to see that data is being collected: select the box 'Numeric' 1..., a new window opens; in that you tick 'Add' - a next window appears - there you select 'Public' and from the right column you highlight all the parameters and do 'paste'. That will list all parameters in the 'Monitoring' window and when you go to 'start', you should be able to see A) all the relevant data from the sensors at present, and B) a slight change of these numbers every 6 seconds.
* Click on ‘Custom Data Collection’ again. The same parameters that you chose inside should still be selected.
* Click on ‘Start Collection’. You should see the records being loaded. The program will notify you when all records have been loaded.
* unplug
* Close the window when the download is completed. Detach the computer, and replace the antenna cable in the RS232 port. Close the silver Logger box, and go inside.
* Find the file in C:\Campbellsci\LoggerNet\Data and paste it into the ETH folder on the laptop C:\ Documents and Settings\NSF1795\ETH\_YYYY\week##\
* Open the downloaded file and note the day of year and the time (3rd and 4th position of the first and the last row of the file) on the log sheet
* Copy the downloaded file on ftp-Summit-server – file path:
* \\Server\ftp\data\zurich\YY\_FTP\_ETH\ftp\_ETH\_YYYY\week##\TU###.dat
* Complete Excel-sheet on ftp-Summit-server – file path:
* \\Server\ftp\data\zurich\YY\_FTP\_ETH\YY\_ETH\_Logsheets.xls

**Swiss Weekly Download Quick Reference**

* Make a new file folder for the current week in: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH

Start with TRACKER:

* Open Tracker Weekly tab on spreadsheet: \\Server\ftp\data\zurich\YY\_FTP\_ETH\YY\_ETH\_Logsheets.xls
* Increase file number for week by 1
* Plug Tracker cable (red) into computer
* Open PC208w
* Click ‘Connect’
* Choose ‘Tracker’
* Click ‘Connect’ in lower right corner
* Compare data logger time w/ PC System Tim in upper right corner:
* Log time difference in Tracker Weekly spreadsheet
* If difference is 2 seconds or more, click ‘Set Data Logger Clk”
* Make sure ‘Prompt for data filename’ is enabled
* Click ‘Advanced’ and compare pointer number to number in spreadsheet. Adjust pointer number to match last entry in spreadsheet, if necessary. Click OK.
* Click ‘Collect’
* Change directory path and file name to this week’s folder/file name: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week##
* Click OK
* When download is done, click ‘Advanced’ and note new pointer number on Tracker Weekly spreadsheet
* Open downloaded file and note the day (3rd position) and time (4th position) from the first and last lines of data on Tracker Weekly spreadsheet
* Click ‘Disconnect’
* Unplug Tracker cable

Continue on to TOWER

* Open Tower Weekly tab on spreadsheet
* Increase file number for week by 1
* Plug Tower cable (blue) into computer
* Choose ‘Tower’ on PC208w
* Click ‘Connect’ in lower right corner
* Compare data logger time w/ PC System Tim in upper right corner:
* Log time difference in Tower Weekly spreadsheet
* If difference is 2 seconds or more, click ‘Set Data Logger Clk”
* Make sure ‘Prompt for data filename’ is enabled
* Click ‘Advanced’ and compare pointer number to number in spreadsheet. Adjust pointer number to match last entry in spreadsheet, if necessary. Click OK.
* Click ‘Collect’
* Change directory path and file name to this week’s folder/file name: \\server\ftp\data\Zurich\YY\_FTP\_ETH\YY\_FTP\_ETH\week##
* Click OK
* When download is done, click ‘Advanced’ and note new pointer number on Tracker Weekly spreadsheet
* Open downloaded file and note the day (3rd position) and time (4th position) from the first and last lines of data on Tracker Weekly spreadsheet
* Click ‘Disconnect’
* Unplug Tower cable
* Exit PC208w software

**Pictures:**

Figure 1: Temperature and Relative humidity tube

Figure 2: data logger box and snow surface height sensor

Figure 3: interior of data logger box

Figure 4: Heated Instrument - Anemometer

Figure 5: full length of tower

Figure 6: lower sections of tower