CIAO CNR-IMAA

Observation System for Climate Application at Regional scale

OSCAR

Software Manual

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F. Amato, M. Rosoldi, F. Madonna

Operational Program ERDF Basilicata 2007 - 2013 (Projects for European territorial collaboration)

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Introduction

This is a tutorial for the installation, set-up and usage of OSCAR (Observation System for Climate Application at Regional scale)Ssoftware modules.

The OSCAR application software is capable of :

- Monitoring all the different devices part of the OSCAR observation platform.
- Storing the data in an appropriate database.
- Processing the devices input variables to provide geophysical quantities.
- Graphic display the devices input variables.

System Requirements

The OSCAR application software supports **Ubuntu 14.04 LTS** and later versions operative systems.

Ubuntu has been selected as a compromise between the efficiency of Linux application and user-friendliness of the platform for the users.

In order to install the application software the open source RDBMS (Relational Database Management System) **MySQL** has to be previously installed. Install MySQL setting the root password to : **affmmr**

https://www.mysql.com/

https://help.ubuntu.com/12.04/serverguide/mysql.html

Recommended system configuration

- Intel Pentium or processor equivalent to industry standards with 3.00 GHz or faster.
- Memory 3.7 GiB or higher.
- OS Type 64-bit.
- Graphics Intel Haswell Desktop or graphics equivalent to industry standards.

Installation

Download on your machine the file **OSCAR_SW.zip** from OSCAR web page :

http://www.ciao.imaa.cnr.it/index.php?option=com_content&view=article&id=188&Itemid=256

the zip file will contain the following files :

- **OSCAR.deb** in order to install the application software.
- **OscarDB.sql** in order to install and setup the OSCAR database.

Unzip the OSCAR_SW.zip in the folder you prefer (INST_FOLDER).

In order to install the **OSCAR.deb** package you need to run the dpkg command using the sudo privilege. You should open a shell terminal, browse to the INST_FOLDER and run the following command :

sudo dpkg -i OSCAR.deb

(The dpkg command is a package manager from shell for Debian and Ubuntu Linux systems. The dpkg command can be used to install, build, remove and manage .deb packages.) If dpkg command reports an error due to dependency problems, you must download the missing dependencies and configure it. You can run **sudo apt-get install -f** to download the missing dependencies.

Before running the application the OSCAR database has to be installed. Open a shell terminal and browse to the directory where the file OscarDB.sql is located and go through the following steps:

- login to the MySQL server by typing the following command:
  mysql -u root –p
  Insert the password : **affmmr**
- You should now be at a MySQL prompt that looks very similar to this:
  mysql>
- Create a database with the name **OscarDB** typing the following command:
  CREATE DATABASE OscarDB;
- Export the OSCAR database structure into the database :
  mysql -u root -p OscarDB < OscarDB.sql
  Insert the password : **affmmr**

The application is now ready to run.

Using the software

Once the OSCAR application is launched it presents a tabbed layout in the user interface. Each tab includes the path to all features and functions in the application.

Figure 1 - OSCAR Project User Interface.

Settings Tab

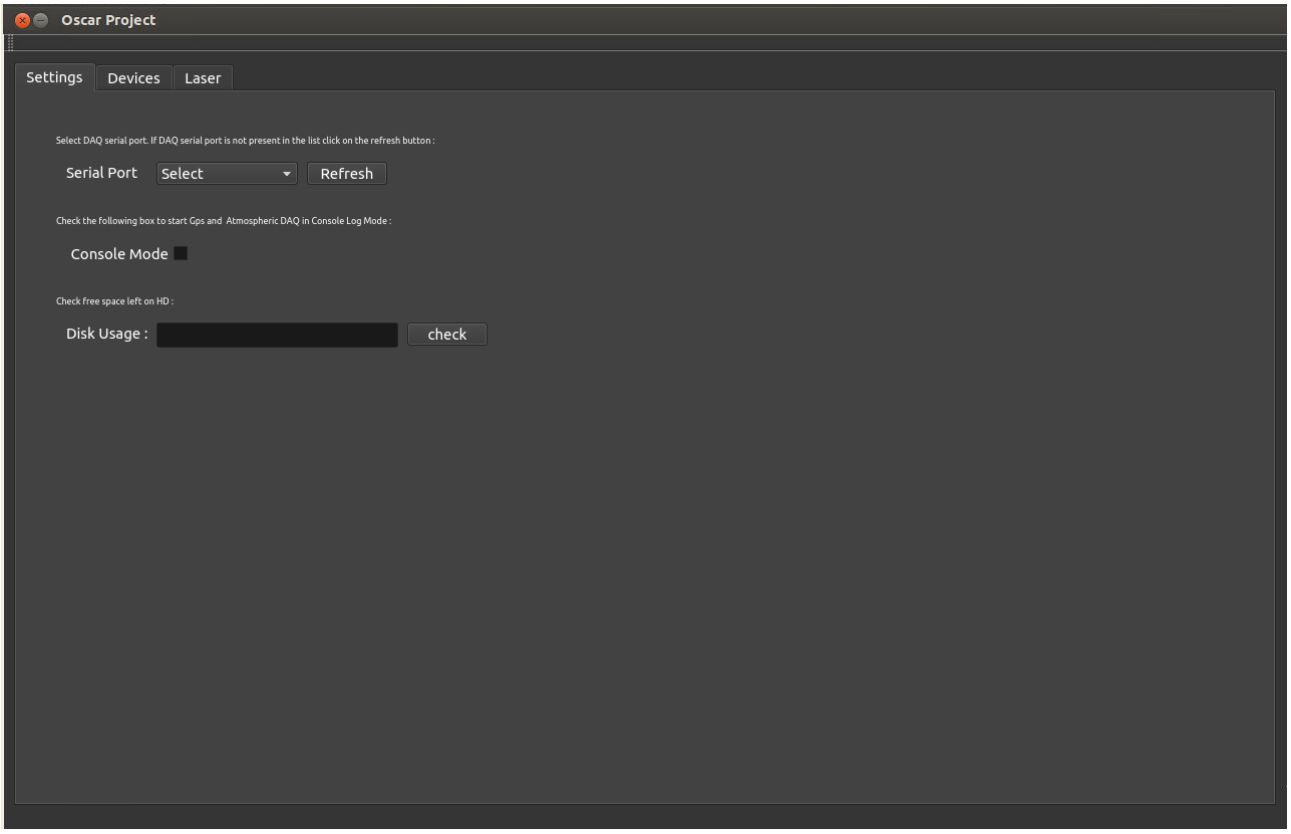

Figure 2 – Settings Tab.

The settings tab allows user to do the following operations :

- Set the devices available data acquisition serial port. User can select the available serial port by clicking on the **select menu** item as shown in the picture below :

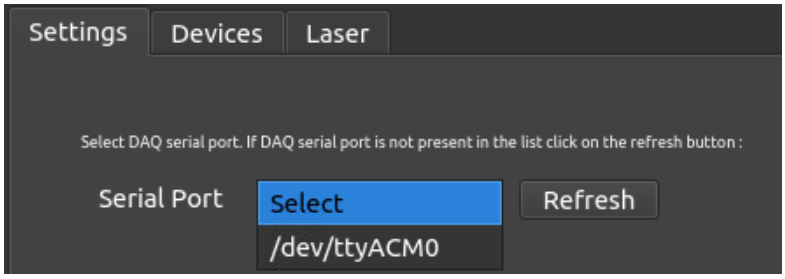

Figure 3 – Settings Tab : serial DAQ port selection.

Moreover, if for some reason there are no available ports, user can press the **refresh** button in order to let the application reload the available ports. The devices serial port selection is mandatory.

- OSCAR application can also run in **Console Mode**. This means that, by checking the consol mode check box, two terminal consoles will appear and they will show the logs from GPS, PTU rain, radiation and lidar observations.

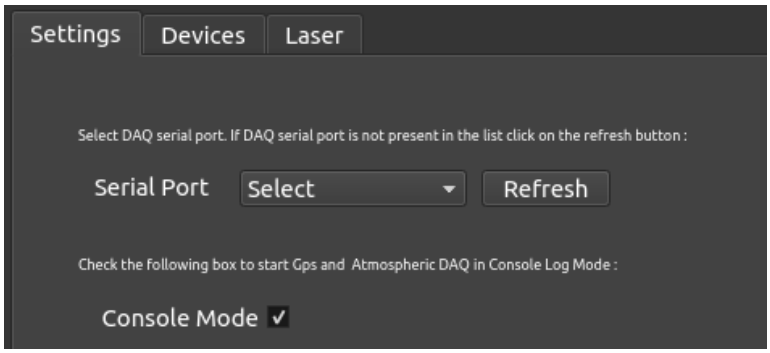

Figure 4 - Settings Tab : Console Mode.

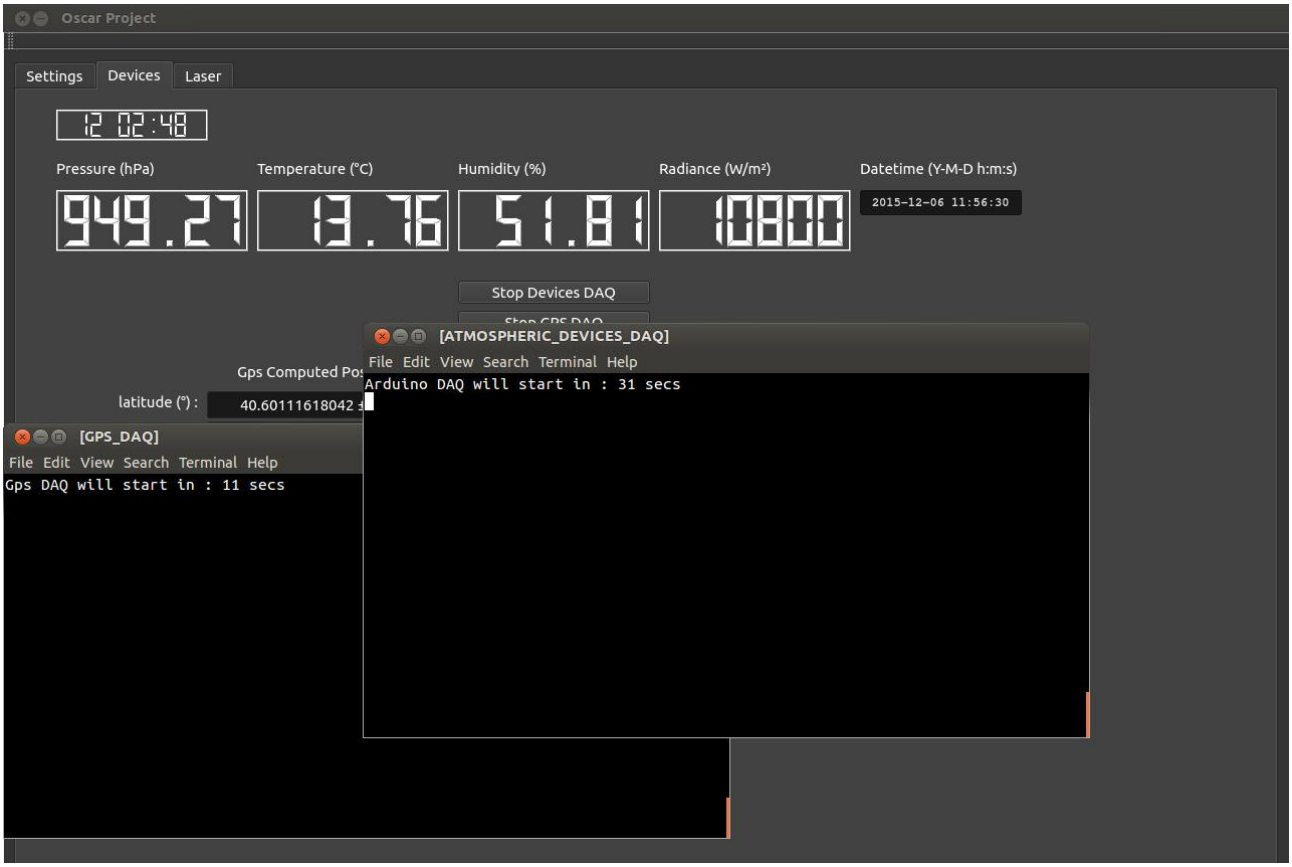

Figure 5 - OSCAR application running in Console Mode.

A possible output of the log console is shown in pictures below.

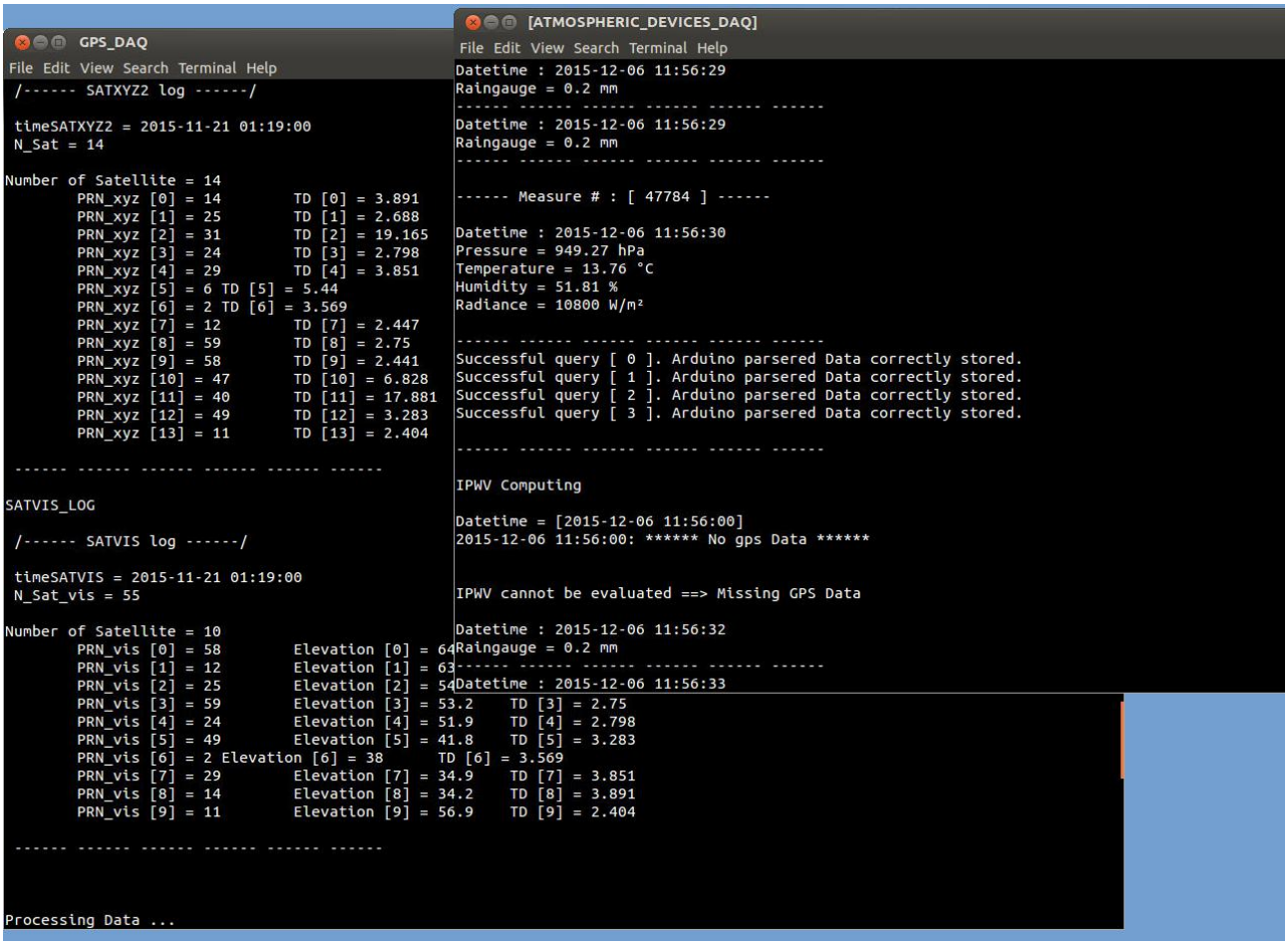

Figure 6 – GPS and Atmospheric devices log console output.

- User can check the free space left on Hard Disk by clicking the **check** button:

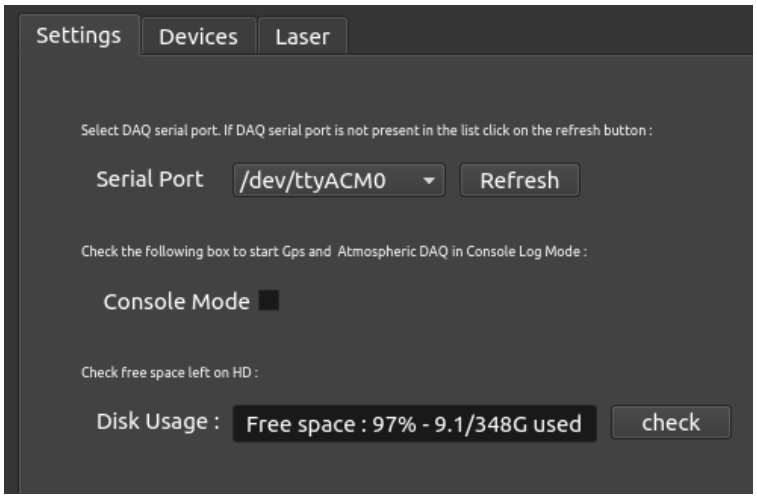

Figure 7 - Settings Tab : Disk Usage.

Devices Tab

Once the serial port has been selected in the Settings tab the application is now ready to start. The **Devices Tab** allows the user to start the OSCAR application and monitoring the input devices variables, like solar irradiance, zenith tropospheric delay, pressure, temperature, etc..

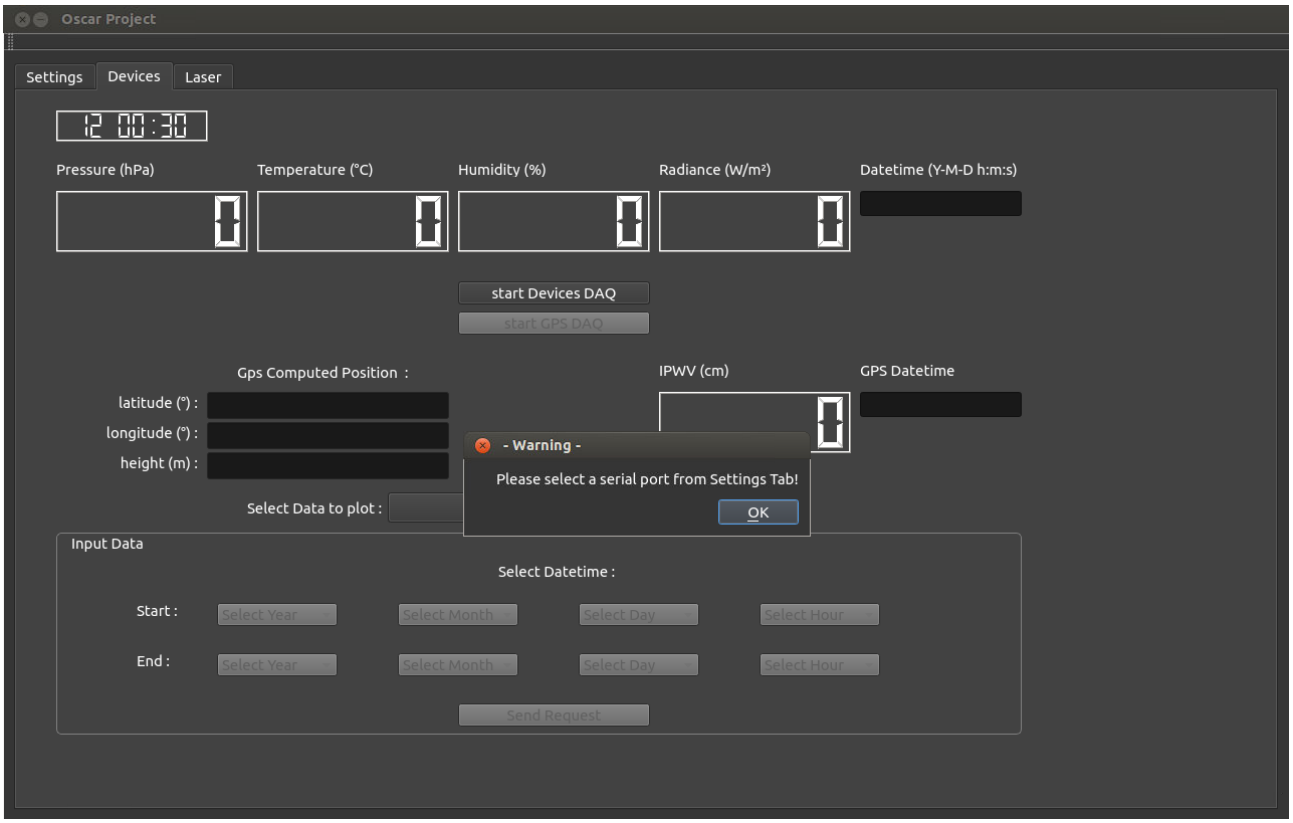

Figure 8 - Devices Tab: Interface Warning if no serial port has been selected.

User can start the application by clicking on the **start Devices DAQ** button, this will start the atmospheric devices data acquisition. In this way the **start GPS DAQ** button will become available and by clicking on it also the GPS data acquisition will start. These three steps are shown in figure 9.

Figure 9 - Devices Tab: start button status.

Now the application will start the monitoring :

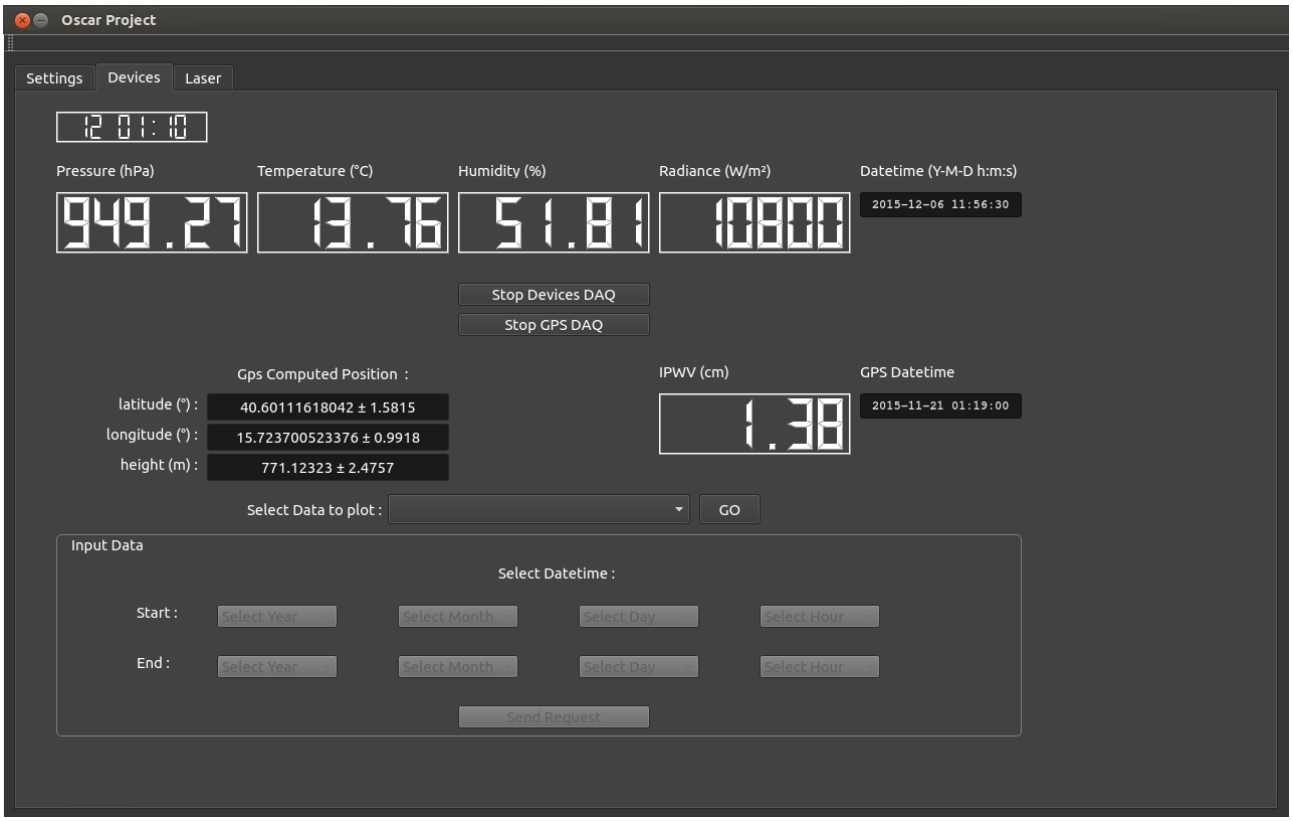

Figure 10 - Devices Tab: Monitoring.

On the other way by clicking on the **Stop Devices DAQ** and **Stop GPS DAQ** buttons the application will stop the acquisition.

Data Plotting

In order to plot a variable click on the selection menu item, choose the variable to plot and click on the **GO** button.

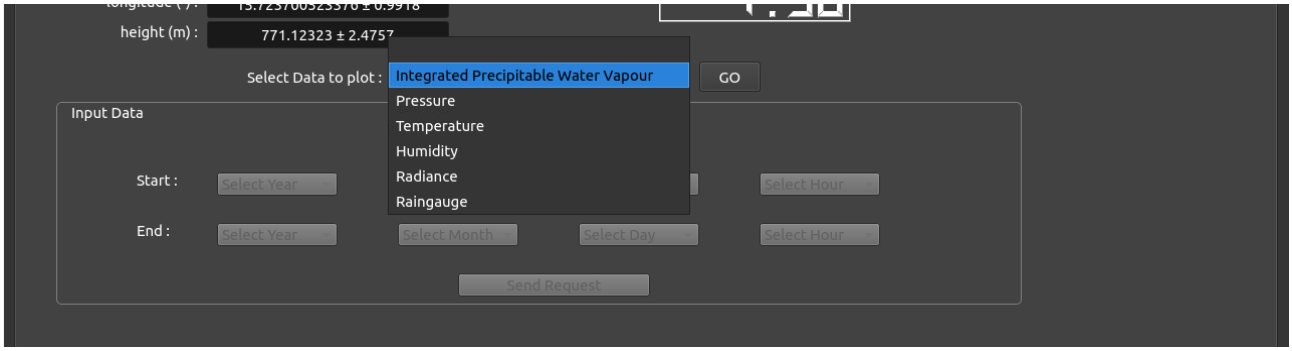

Figure 11 - Data Plotting: variable selection.

Now the **Input Date** group box will become available for user input.

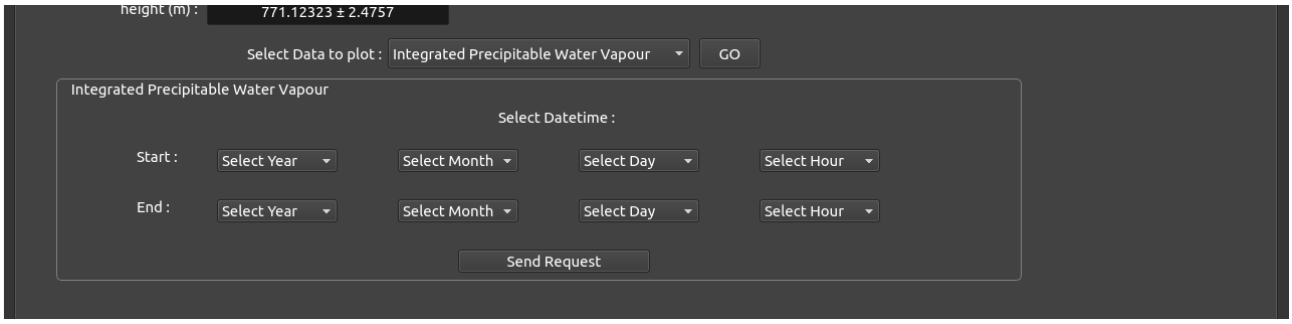

Figure 12 - Data Plotting: Input Date group box.

Fill in the Input Date group box in order to select a start date and an end date you are interested in.

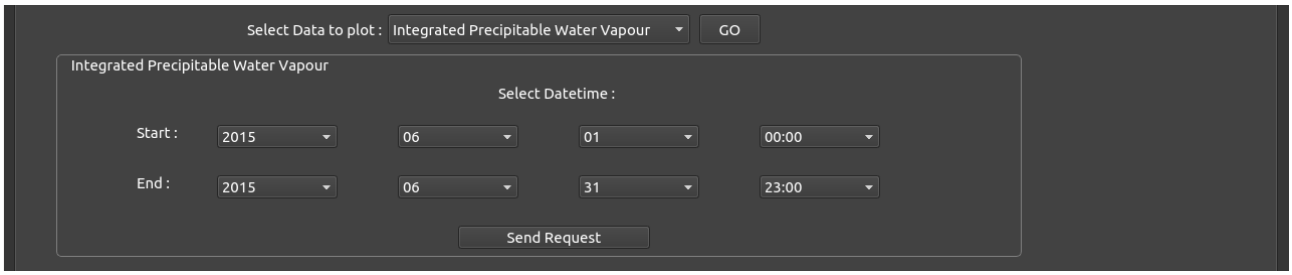

Figure 13 - Data Plotting: Input Date group box selection.

Finally, click on the **Send Request** button. Your selection will be now plotted on a new form, the Display form. this allows the user to interact with times series of the selected variable to study trends and seasonal variability over the selected time period.

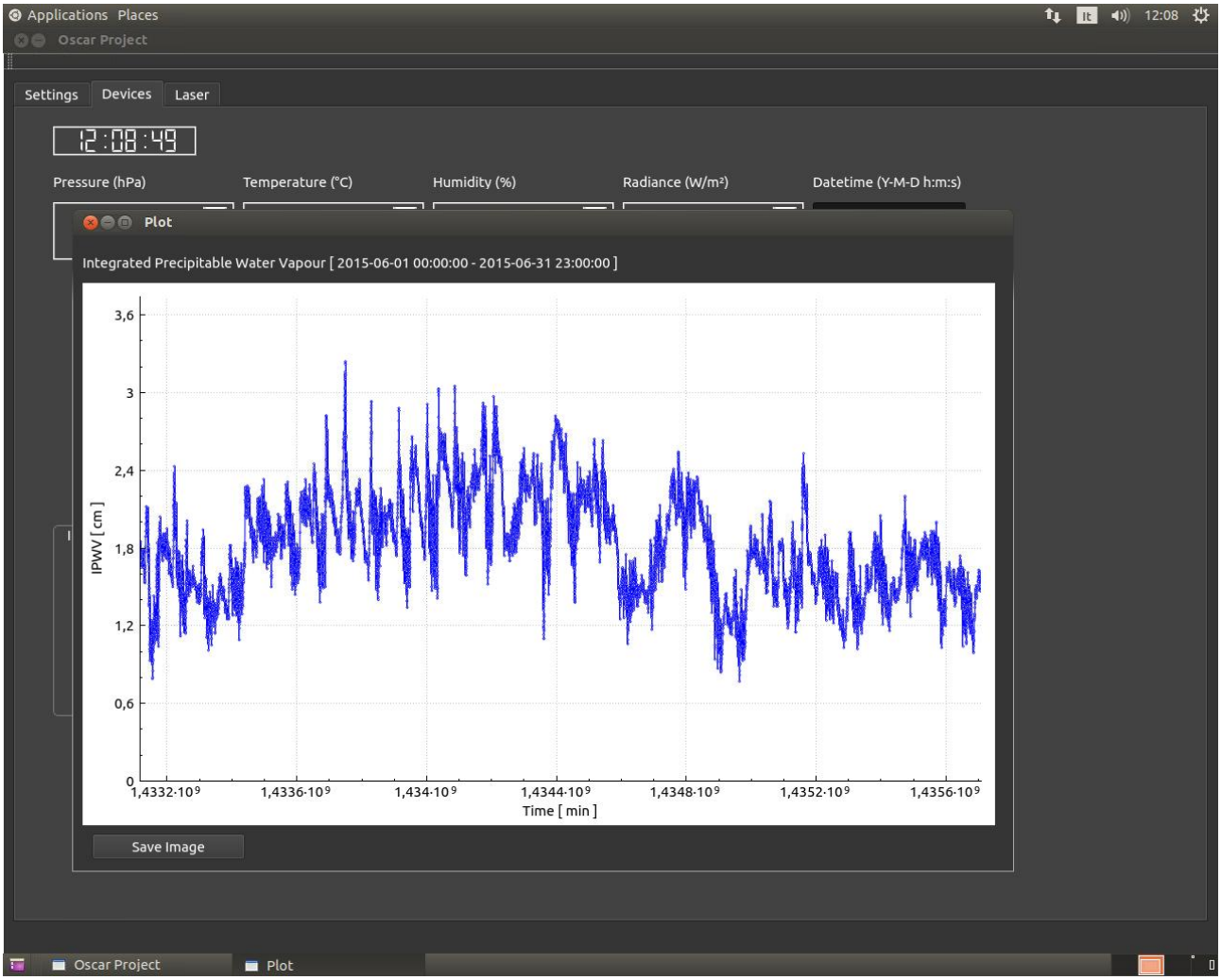

Figure 14 - Data Plotting: Plot Display form.

Study of the climate impact of aerosol and thin clouds

The lidar observation of the aerosol and thin clouds optical properties are used as input to the Fu-Liou-Gu model to estimate their radiative impact on the solar incoming shortwave radiation.

The one-dimensional Fu-Liou-Gu radiative transfer model, developed in the early 90's, recently has been adapted to retrieve the cloud and aerosol radiative forcing using as input the aerosol and cloud lidar extinction coefficient atmospheric profile measurements (Lolli et al., 2015, Tosca et al., 2015). The FLG RT model calculates the direct effect of the aerosol forcing at each altitude level inputting the aerosol optical depth of the layer and for the column the partial contribution to the total AOD for each aerosol species. The FLG parameterization contemplates eighteen different types of aerosols, with single scattering aerosol properties parameterized through the OPAC (Optical Properties of Aerosol and Clouds) catalog. Differently, for cloud forcing, the FLG RT model needs as input, at each altitude level where the cloud is present, the

IWC and the effective drop/crystal diameter De. These parameters cannot be retrieved directly by lidar measurements, for this reason we use the parameterization (for cirrus clouds especially) proposed by Heymsfield et al., 2014 where De and IWC are retrieved through the atmospheric temperature and lidar extinction profiles (Lolli et al., 2015, Tosca et al., 2015).

The code is described here: **http://www2.mmm.ucar.edu/wrf/users/wrfv3.4/Description_FLG.htm**

For the OSCAR purposed the adaptation of the Fu-Liou-Gu radiative transfer model described to Lolli et al., 2015 is used.

Contacts

Mentor

Fabio Madonna, PhD
Istituto di Metodologie per l'Analisi Ambientale - Consiglio Nazionale delle Ricerche
CNR-IMAA
C.da S. Loja - Zona Industriale I-85050 Tito Scalo Potenza (Italy)
Phone: +390971427252
Fax: +390971427271
E-mail: fabio.madonna@imaa.cnr.it

Marco Rosoldi, PhD
Istituto di Metodologie per l'Analisi Ambientale - Consiglio Nazionale delle Ricerche
CNR-IMAA
C.da S. Loja - Zona Industriale I-85050 Tito Scalo Potenza (Italy)
Phone: +390971427250
Fax: +390971427271
E-mail: marco.rosoldi@imaa.cnr.it

Francesco Amato
Istituto di Metodologie per l'Analisi Ambientale - Consiglio Nazionale delle Ricerche
CNR-IMAA
C.da S. Loja - Zona Industriale I-85050 Tito Scalo Potenza (Italy)
Phone: +390971427261
Fax: +390971427271
E-mail: francesco.amato@imaa.cnr.it