Using source catalogs

With the new Obsinp observing software, source catalog files are (unfortunately) stored in a proprietary file format, which cannot be edited using a text editor as it was possible with the (old) VAX source catalogs. However, there exists a script `catalog.py`, which can be used to convert files having the old VAX format to the new Obsinp format. Using

```
catalog.py sources.cat
```

on the **be4** computer will create a file `sources.sdb`. If you place it into `your_directory_on_be4/Catalogues` it will be found automatically by Obsinp (if you choose the correct startup directory).

Graphical source catalog editor - catalogME

For convenience, we also provide a graphical source editor, which can handle the new Obsinp (*.sdb) format as well. You can start it from a terminal/shell on the **observer2** as user **obseff** via

```
catalogME
```

For convenience, we also added catalogME to the start menu in any of the VNC-servers. You will need the current `obseff` password (please ask the operators).

This will open the main screen, where you can load, edit, and save your user catalogs. They can also be visualized, i.e. plotted to the current Effelsberg (horizontal) sky. You can play around with UTC, analyze rise/set times, overlay pointing/calibration catalogs, as well as planets, and even satellites.
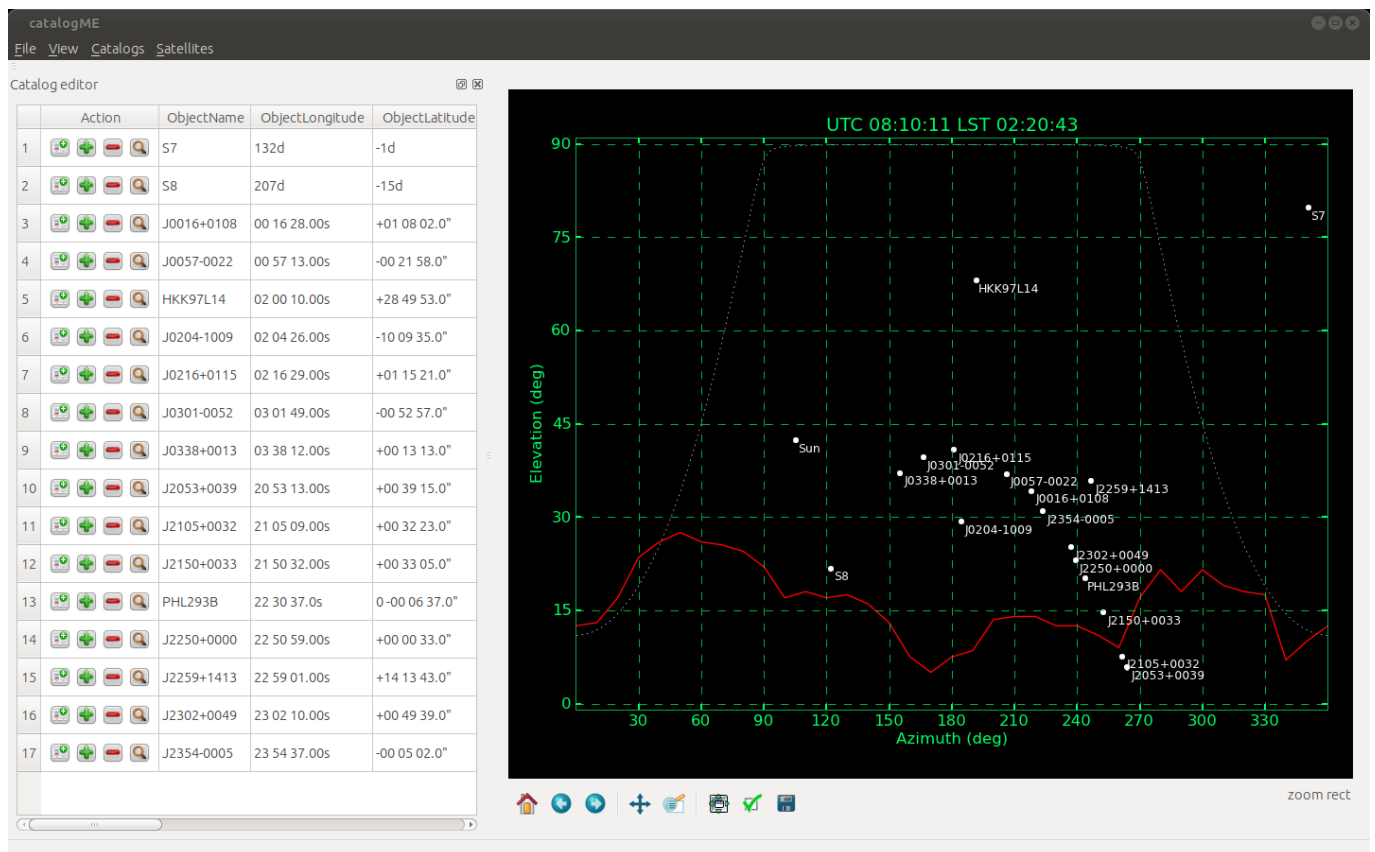
Figure 1: Screen shot of pyCatalog.

One can easily add or delete rows by using the "plus" and "minus" buttons. By clicking the loupe symbol next to the source name, the sky track of this source will be plotted. This is quite useful to find out about rise and set times of this source. The track markers and labels tell you where the source was/will be located n hours ago/in the future. You can also simply right-click into the plot to change the source track (orange line).
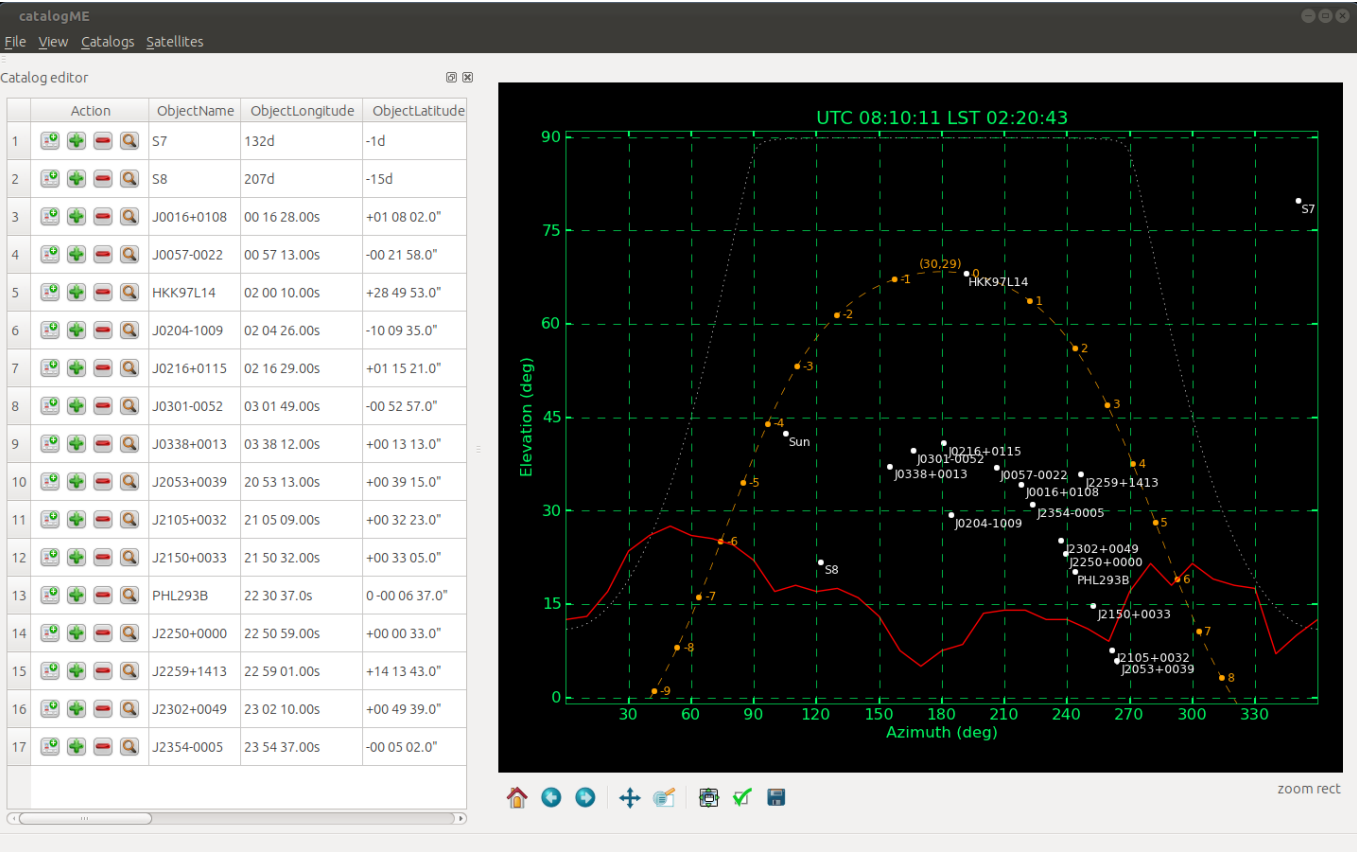
**Figure 2:** Analyzing rise/set times of a source.

The left button in each row will open a dialog where you can edit an entry:

Figure 3: Source editor dialog.

If you know the name of your source, you can also query SIMBAD to find coordinates (you have to choose the epoch, J2000 or B1950, and type, Equatorial or Galactic, **before** you press the `Query Simbad` button) and radial velocity. The latter will usually be heliocentric velocity in optical convention, which is not quite the same as the local-standard-of-rest velocity in radio convention used by Obsinp though. Note, that the dialog will ask you whether to use the radial velocity (if differing from zero). This is to avoid accidental application of high source velocities (e.g., as result of a SIMBAD query), because the observer may prefer to set the rest frequency manually to account for redshift.

Using the main menu, one can open/save sdb-files, import the old VAX format (but not write it), and import/export csv-files, i.e., comma-separated ASCII files containing source information (see below).

The source plot refreshes itself every few seconds to account for the virtual motion of the sources across the sky. However, for observation planning it may be useful to look at the sky as it would appear at a different UTC/LST. For this, the interaction dock can be utilized. It allows the user to change the UTC (one should turn off the auto-update checkbox, otherwise catalogME puts it to the current UTC with each refresh). One can also use the time offset slide to fast-forward/rewind a few hours. In the interaction dock you also find two entries (R.A./Dec) which allow to plot a custom EQ track, if you're too lazy to create a source for that.
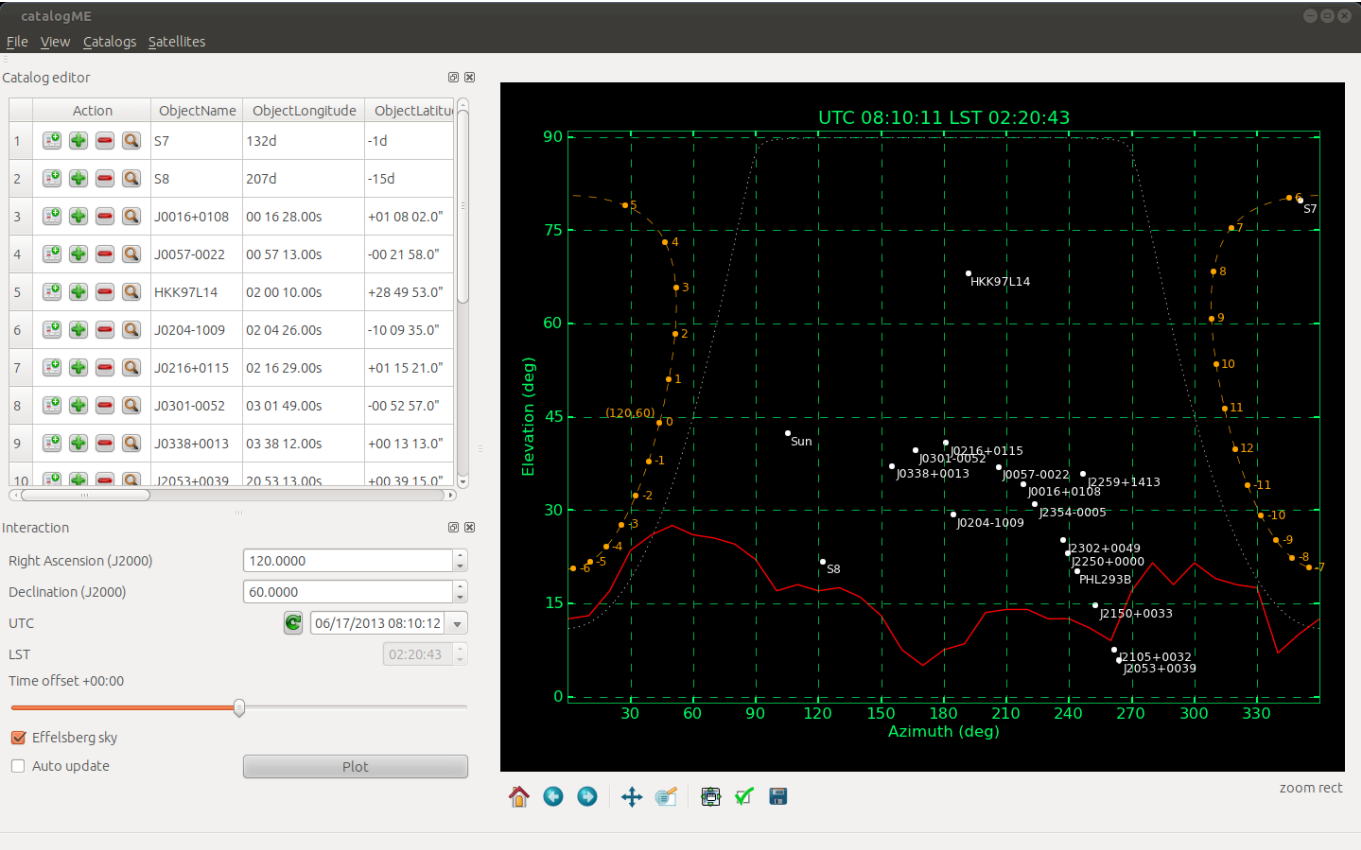
Figure 4: Interaction dock: adjust UTC/LST or plot a custom source track.

Using catalogME as "Astro-PC"

If you have been to Effelsberg before, you probably know our "Astro-PC" display. It shows the current Effelsberg sky and is often used by observers and operators to search for suitable pointing/calibration sources etc. CatalogME can be used as an easier-to-use alternative. If you close the Catalog editor and Interaction docks (you can bring them back in the view menu), the plot display is (almost) full screen. One can choose from several pre-defined pointing/calibration catalogs using the catalogs menu. Also, planets and the galactic/ecliptic planes can be activated for convenience. Even satellites in Earth's orbit can be shown, but one should make sure to use an up-to-date set of satellite TLE's (two-line elements). For convenience, CatalogME tries to run a script to load TLEs from a remote server every 12 hours. Only if this fails, the user needs to do it manually.

Figure 5: "Astro-PC" mode: standard pointing/calibration sources. The blue/green line mark the ecliptic/galactic plane.

Figure 7: "Astro-PC" mode: showing SiO pointing sources.

Figure 6: "Astro-PC" mode: satellites in Earth's orbit.

CSV import/export

For CSV import, you don't even need to provide all keywords/columns used by Obsinp, but it would be sufficient to just provide source names and coordinates for example. All you need to do is to use a header row containing one or more of the following key words (which of course should match the columns in your file):

ObjectName
ObjectLongitude
ObjectLatitude
CoordinateSystem
Equinox
UserSystem
VelSystem
SourceVelocity
SCANRotation
RefOffsetLon
RefOffsetLat

An example csv-file could look like this:

```
ObjectName,ObjectLongitude,ObjectLatitude,CoordinateSystem,Equinox
M31,00 42 44.3s,+41 16 8",Equatorial,J2000
M82,09 55 52.2s,+69 40 49",Equatorial,J2000
NGC2403,07 36 51.4s,+65 36 9",Equatorial,J2000
W3MAIN,02 27 4.1s,+61 52 27",Equatorial,J2000
```

Customizing catalogME

The catalog and satellites menu can easily be enhanced. For additional entries in the catalog menu, all you need to do, is to put a file into the programs sub-directory `default_catalogs`. This file has to follow the Gildas ASTRO format. Then you put a new line into `catalogs.menu` to register the catalog. A sample `catalogs.menu` looks like this:

```
root:Pointing,yellow,pointing_withflux.sou,true
root:Calibrators,cyan,calibrators_withflux.sou,true
root:Pointing (many),yellow,pointing_many_withflux.sou,false
root:Pointing (gold),yellow,pointing_gold_withflux.sou,false
root:By wavelength:7-mm Pointing,yellow,bywave_poi_7mm_withflux.sou,false
root:By wavelength:10-mm Pointing,yellow,bywave_poi_10mm_withflux.sou,false
root:By wavelength:60-mm
Pointing,yellow,bywave_poi_60mm_withoutflux.sou,false
root:Spectroscopy:H2O masers,lightblue,spectroscopy_H2O_withflux.sou,false
root:Spectroscopy:SiO masers,lightblue,spectroscopy_SiO_withflux.sou,false
root:Spectroscopy:Line
pointing,cyan,spectroscopy_linepoi_withoutflux.sou,false
```

Everything which comes before the catalog name (right of the rightmost colon) will be interpreted as menu structure. Root denotes a top-level item in the catalogs menu, while `root:Spectroscopy:Line pointing` will put the catalog "Line pointing" into a sub-menu

"Spectroscopy". After the catalog menu name, one defines a color, the file containing the sources, and a boolean ("true" or "false") which lets catalogME either show or not show the catalog at startup.

Please don't use this mechanism to show your personal source catalog. For that you can easily load your catalog.sdb (or import VAX format). Changing the default catalogs is meant to provide a quick access to general-purpose/often-to-be-used catalogs.

For satellites this works basically in the same way, except, that the files need to contain so-called two-line elements (TLEs), which look like this:

```
COBE
1 20322U 89089A   13166.82431169 -.00000124  00000-0 -49705-4 0   656
2 20322 098.9998 177.3562 0008907 028.0982 074.4765 14.04560606208057
HST
1 20580U 90037B   13167.74008509  .00000891  00000-0  51223-4 0  2634
2 20580 028.4696 275.7628 0003325 350.3355 136.2094 15.03692199 69630
```

The TLEs need to be updated frequently, since the orbits of satellites are suspect to quick changes. In the sub-directory `satellite_tle` there is a script `update_tle.sh` which can be used to download some predefined satellite TLEs.