BolometrikusV3p3.cpp

Installation needs standard cpp compiler.

This program makes bolometric lightcurves from optical/NIR/Swift datas.
The optical data can be either Johnson UBVRI, or SDSS ugriz, NIR is JHK, Swift is w2 m2 w1 u b v. These must be placed in 3 separate fájl respectively: all-gorbe.txt, JHK-gorbe.txt, swiftbe.txt. The order of the filters and their errors are the same as described above. One example:
JD J mag err H mag err K mag err
The time order does not count, the program arranges it. **Only the optical data is neccessary**. This will be the base. Its time (JD) values will be used.
The NIR and Swift data will be shifted (interpolated) to this time values! Example: there is optical data at JD=10, and NIR data at JD=8 and JD=12, but no data at JD=10. The program will interpolate a value for JD=10, and this will be used.

The program needs an input parameter file: parametersBOL.inp. If not present, the program genarates a deafult. These parameters are the follows:
==========

1 [Data is? sdss griz =0 or Johson BVRI =1]

Is the data is Johnson or SDSS? Only one type can be used! Other values are invalid

1 [Interpolate for data gaps? (2: force interpolate)]

The program tries to interpolare the data gaps. Example: if V R I data exist, but B does not at a given time, the program tries to interpolate B values from its neighbor B datas. If this parameter sets 0 then no interpolation will happen. There are limits for this though. If the gap is bigger then 30 days, then there will be no interpolation, unles the parameter set to 2.

120.0 [Forbidden interpolation time start]

140.0 [Forbidden interpolation time end]

A forbidden time interval can be added here. In this region there will be NEVER

(event with forced interpolation) interpolation. Even if the point itself is outside the range, but the neighbouring points are diagonal to the range, no interprojection occurs. The best use for this is the plateu of a supernova.

0.36 [Extinction value for u/U]

0.23 [Extinction value for g/V]

0.18 [Extinction value for r/R]

0.13 [Extinction value for i/I]

0.30 [Extinction value for z/B]

0.025 [Extinction value for J]

0.016 [Extinction value for H]

0.011 [Extinction value for K]

Extinction values for the correspongind bands. Use Nasa Extragalactic Database (NED) for example.

0.00 [E(B-V) Extinction value for SDSS]

For Johnson, this is simply E(B-V), the values are given above, and the program uses this, unless their value is 0. For SDSS it msut be given.

10.00 [Distance of the object [Mpc]]

The distance of the target object in Megaparcecs.

3 [MIN valid wavelength to fit]

The Spectral Energy Distribution (SED) fitting requires wavelength points to be fitted. At this parameter it can be given how many is neccessary. If there are insuffecent points, then it will be skipped. Minimum value is 2.

1 [UV fit model: -1 ignore, 0 descent to zero at 2000 A, 1 extrapolation (from first 2 point), 2 BB fit]

1 [IR fit model: -1 ignore, 0 Rayleigh-Jeans approx., 1 BB fit]

345 [Allowed wavelength for BB fit, 1:u/U, 2:g/B, 3:r/V, …]

See below.

The integration

The program arranges all data to have as many wagelength at the same time as possible. After that it will integrate the bands to aquire the bolometric values. Between existing bands **trapesoid integration** is used. **However the program tries to estimate the not measured regions too**; the UV and NIR/MIR regions. Different models can be set to estimate these regions. These can be set.

UV models:

-1, ignore this part.

0, Lyman et al. (2014) modell. The flux at 2000 A deemed 0, and used as a point for the trapesoid integration. In other words if the first avaible bands is B, then this is 0.5*B_flux*(B_wavelength-2000A).

1, extrapolation. Use the first two avaible band (eg. U B) to extrapolate this region furthermore.

2, Black Body (BB) fitting. More of this below.

IR models:

-1, ignore this part.

0, Rayleigh-Jeans approximation.

1, Black Body fitting. More precisely Diluted BB; Dessart & Hiller 2005. Tries to fit the model to existing SED points. If these points are less mentioned MIN value, then the fit is dropped. The fitting will be generate the object photospere Radius and Temperature. Valid Bands are can also be set. For example you can forbid that the BB will be fitted to U or B bands (last parameter). This is set via the numbers. E.g. 345 stands for only fit to VRI, 12345 stand for only fit for UBVRI, 345678 stand for only fit for VRIJHK. UB should not used for SN fitting. **If not adequate bands are given, then the BB fit will be skipped!**

Output

The output is straightforward, and labeled. There are 4 output: Adatsor.txt which is just basicaly a log, bol-gorbe.txt and bolF-gorbe.txt contains the bolometric values, BC-gorbe.txt contains the Bolometric correction, and colors, and Tr-gorbe.txt contains the T and R of the BB fit. The bol-gorbe is compatable with the SN-LC-MCMC lightcurve fitting model of Jäger et al. 2020.

Author:
Dr. Zoltán Jäger