GCfit

Globular Cluster Observation Data

Data File Catalog

Version 1

1 Introduction

in a hdf file..... etc

All supplementary error datasets can be either the symmetric dataset or two seperate down and up error datasets.

Everything should be within the given "key" group under the main file group. But if multiple "versions" of the datasets are to be used, then you can put everything under other groups under the key, which should be sorted out correctly under data.

But, this MUST be done for everything in that group, all parent groups of subgroups will not be read in data, so there can be no shared space for groups and datasets. All datasets must go under the lowest level of subgroup.

2 Attributes

Overall cluster attributes.

Variable	Attribute Name	Notes	Default Value	Units
Galactic Longitude	`l`	Required for pulsar fitting	N/A	degrees
Galactic Latitude	`b`	Required for pulsar fitting	N/A	degrees
Right Ascension	`RA`	Required for mass function fitting	N/A	degrees
Declination	`DEC`	Required for mass function fitting	N/A	degrees
Metallicity	`FeHe`	Defines mass function evolution	-1.00	dex
Age	`age`	Defines mass function evolution	12	Gyr
Total Proper Motion	μ	Required for pulsar fitting	N/A	mas/yr
Total escape rate $\dot{N}$	`Ndot`	Defines mass function evolution	-20	

key: `/initials`
All the parameters which are fit on
these values are the initial guesses
defaults are used if this isnt in the file, or any field is missing

Variable	Attribute Name	Description	Default Value
W_0	W0	Central potential	6.0
M	M	Total cluster mass [$10^6 M_\odot$]	0.69
r_h	rh	Half-mass radius [pc]	2.88
$\log(r_a)$	ra	Anisotropy radius [$\log(pc)$]	1.23
g	g	Truncation parameter	0.75
δ	delta		0.45
s^2	s2	Velocity scale nuisance parameter	0.1
F	F	Mass function nuisance parameter	0.45
a_1	a1	1st mass function power law exponent	0.5
a_2	a2	2nd mass function power law exponent	1.3
a_3	a3	3rd mass function power law exponent	2.5
BH_{ret}	BHret	Black hole initial retention fraction	0.5
d	d	Cluster distance [kpc]	6.405

3 Data Products

* denotes required fields

3.1 Pulsar Accelerations

key: `/pulsar`

3.1.1 Datasets

Variable	Dataset Name	Supplementary Datasets	attributes
Radial distance	r*		unit
Spin period	P*	ΔP	unit
Spin period derivative	Pdot_meas*	ΔPdot_meas*	unit
Orbital period	Pb*	ΔPb	unit
Orbital period derivative	Pbdot_meas*	ΔPbdot_meas*	unit
Pulsar identifier	id		

Pulsars can be fit on the timing solutions of both the isolated pulsar spin (P, Pdot_meas) and the binary systems orbit (Pb, Pbdot). The period, derivative and corresponding errors are required for either.

3.1.2 Attributes

Attribute	Description
`source`	Literature source(s) of data
`m`	Mean stellar mass of tracer stars [$M_\odot$]

3.2 Number Density

key: `/number_density`

3.2.1 Datasets

Variable	Dataset Name	Supplementary Datasets	attributes
Radial distance	`r`*		`unit`
Number Density	Σ^*	$\Delta\Sigma^*$	`unit`

3.2.2 Attributes

Attribute	Description
`source`	Literature source(s) of data
`m`	Mean stellar mass of tracer stars [$M_\odot$]

3.3 Proper Motions

key: `/proper_motion`

3.3.1 Datasets

Variable	Dataset Name	Supplementary Datasets	attributes
Radial distance	`r`*	Δ`r`	`unit`
Total proper motion	`PM_tot`*	Δ`PM_tot`*	`unit`
Proper motion ratio	`PM_ratio`*	Δ`PM_ratio`*	`method`
Radial proper motion	`PM_R`*	Δ`PM_R`*	`unit`
Tangential proper motion	`PM_T`*	Δ`PM_T`*	`unit`

The proper motions can be fit on any of these components. The corresponding errors are required for any.

3.3.2 Attributes

Attribute	Description
`source`	Literature source(s) of data
`m`	Mean stellar mass of tracer stars [$M_\odot$]

3.4 Velocity Dispersions

key: `/velocity_dispersion`

3.4.1 Datasets

Variable	Dataset Name	Supplementary Datasets	attributes
Radial distance	$\mathtt{r}^*$		`unit`
LOS velocity dispersion	σ^*	$\Delta\sigma^*$	`unit`

3.4.2 Attributes

Attribute	Description
`source`	Literature source(s) of data
`m`	Mean stellar mass of tracer stars [$M_\odot$]

3.5 Mass Functions

key: `/mass_function`

3.5.1 Datasets

Variable	Dataset Name	Supplementary Datasets	attributes
Number of stars	`N`*	Δ`N`*	
Radial bin inner bound	`r1`*		`unit`
Radial bin outer bound	`r2`*		`unit`
Mass bin inner bound	`m1`*		`unit`
Mass bin outer bound	`m2`*		`unit`
Observation fields	`fields`*		See caption

The `fields` dataset is an empty dataset and exists only as a container for it's attributes. Each mass function will have some number of field boundary polygon attributes, each denoted by a single alphanumeric character (a, b, c, etc.). Each attribute consists of a 2d-array of (RA, DEC) coordinates which define the polygonal boundaries of this observation

3.5.2 Attributes

Attribute	Description
`source`	Literature source(s) of data
`field_unit`	Coordinate units of all `fields` boundaries