



Comparing BaSTI simulations with observational data: a simple use case



Use Case Steps

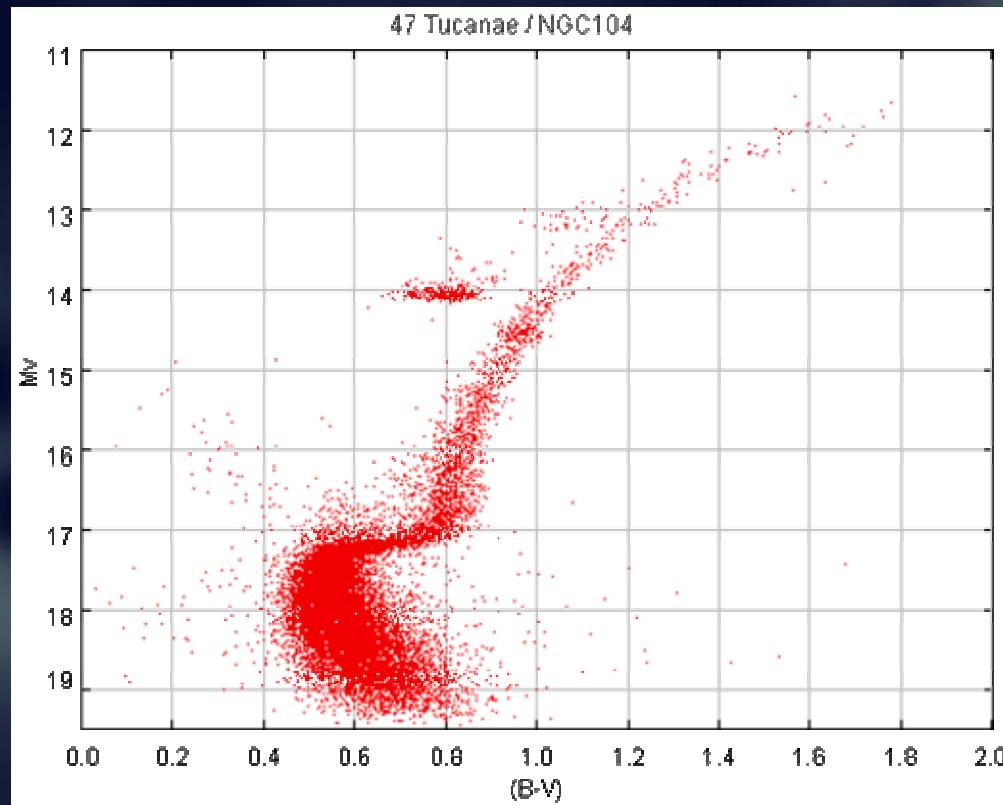
- get observational data for a cluster
 - globular cluster in this example (fine also for other stellar clusters' types)
- download BaSTI simulated isochrones at various ages and metallicities
 - find best fitting metallicity
- get BaSTI simulated ZAHB tracks at identified metallicity
 - determine cluster distance from DM
- superimpose BaSTI isochrones for given metallicity using the determined DM
 - obtain cluster's age checking Turn Off point

Observational Data

Globular cluster

with 'unknown':

- metallicity
- distance
- age



HST data, see: **Gilliland, R.L. & al. 2000 ApJ, 545, L47**

BaSTI Web Portal



INAF
CENTRO ITALIANO ARCHIVI ASTRONOMICI

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Create Query on BaSTI DB

How to use the interface

Fill the interface fields with the values by which you want to search and check the boxes which you want

Filename:

Data type:

Age: (Gyr)

Z:

[Fe/H]:

Type:

Photometric system:

Code version:

Show selected filters

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Search Results : 11 rows

<input type="checkbox"/>	File	Download	VO format	Preview	Data type	Scenario	Age	Z	Y	FE/H	Type	Photo sys.
<input type="checkbox"/>	wz102y259ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.01	.259	-.25	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz103y246ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.001	.246	-1.27	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz104y245ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.0001	.245	-2.27	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz203y248ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.002	.248	-.96	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz302y286ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.03	.288	.25	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz304y245ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.0003	.245	-1.79	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz402y303ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.04	.303	.4	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz403y251ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.004	.251	-.66	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz604y246ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.0006	.246	-1.49	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wz803y256ss2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.008	.256	-.35	NORMAL	JOHNSON CASTELLI
<input type="checkbox"/>	wzeunyuswes2.t611000_c03hbs	ASCIimg	VOTable	Preview	ISO	CANONICAL	11	.0198	.2734	.06	NORMAL	JOHNSON CASTELLI

Save all Checked

Page: 1 of 1 Go to page: 1 Rows per page: 30

Powered by IA2 (INAF - Teramo Astronomical Observatory)

designed by IA_webmaster

<http://albione.oa-teramo.inaf.it/>

<http://wwwas.oats.inaf.it/IA2/BaSTI/>

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BaSTI Portal Tools

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[BaSTI Database](#)

BaSTI Stellar MicroSimulations Previewer

File Information: simulation type: **Isochrone**, mixture: SCALED SOLAR MODEL, Z: .01, Y: .259, age: 11 Gyr.

Data can be downloaded as [ASCII](#) or [XML](#) tables.

The image below is updatable using the input form on the left (see [help](#)). To download it use [right-click]+[Save Image as...] (or something similar, depending on your browser). The images below and the update form itself take advantage of [STILTS](#) (Mark Taylor, Bristol, UK) started in its *server* mode.

Change Plot Contents and Style

Axis Data

x values: [\(B-V\)](#)

y values: [Mv](#)

Plot Symbol Properties

Shape: [triangle-down](#)

Size: [10](#)

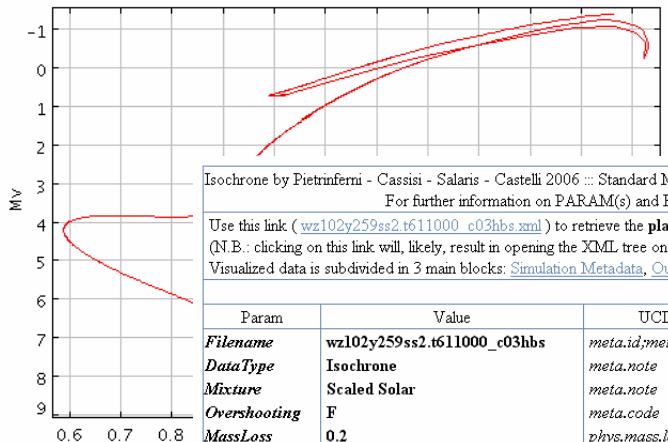
Color: [name](#) [RRGGBB](#)
[or] code

Connection line: [DotToDot](#)

Transparency: [0.5](#)

Hide:

Graphic and Axis Properties



Isochrone by Pietrinferni - Cassisi - Salaris - Castelli 2006 :: Standard Model - Scaled solar model & transformations (Castelli 1999) + BaSeL Library (2002) + Empirical Transf. for C-Stars
For further information on PARAM(s) and FIELD(s) see: "http://wwwas.oats.inaf.it/IA2/index.php?option=com_wrapper&Itemid=87"

(N.B.: clicking on this link will, likely, result in opening the XML tree on your browser. Use right-click + "Save link as ...", or similar, to download it).

Visualized data is subdivided in 3 main blocks: [Simulation Metadata](#), [Output Fields](#) and [Data Table](#).

Simulation Metadata [\(back to top\)](#)

Param	Value	UCD	Description
<i>Filename</i>	wz102y259ss2.t611000_c03hbs	meta.id;meta.file	Name of the converted ASCII file
<i>DataType</i>	Isochrone	meta.note	Type of data simulation
<i>Mixture</i>	Scaled Solar	meta.note	Heavy elements distribution
<i>Overshooting</i>	F	meta.code	Overshooting parameter
<i>MassLoss</i>	0.2	phys.mass.loss	mass loss according to the Reimers (1975) law
<i>PhotSystem</i>	Johnson-Cousins	meta.note	Adopted photometric system used to translate theoretical simulation
<i>Type</i>	Normal	meta.note	Extent of the evolution's simulation
<i>CodeVersion</i>	2007	meta.note	FRANEC code version used
<i>RadOpacity</i>	Ferguson 2005	meta.note	Prescription followed to include the low temperature radiative opacity
<i>Np</i>	2000	meta.number	Number of points in the simulation, i.e. rows in the VOTable
<i>fM/H</i>	.253	phys.abund.Z	The metal abundance in the spectroscopic formalism
<i>Z</i>	.0100	phys.abund.Z	The mass fraction of the initial heavy elements abundance
<i>Y</i>	.259	phys.abund.Y	The mass fraction of the initial helium abundance. Actually calculated as Y = 1.44*(Z-0.0001).
<i>Age</i>	11.0000	time.age	Age (in Gyr) of the isochron
<i>CheckDate</i>	17-02-2006	time.processing	Expresses data computation for further controls or revisions

Output Fields [\(back to top\)](#)

Field	UCD	Description
<i>(MMo)in</i>	phys.mass;arith.ratio	Initial mass, in solar units, of the structure
<i>MMo</i>	phys.mass;arith.ratio	Mass of the structure
<i>log(L/Lo)</i>	phys.luminosity;arith.ratio	Logarithmic luminosity, in solar units, of the structure

STILTS
powered



BaSTI S3

IA2-BaSTI theoretical Isochron Access Service

Searched parameters ([back to top](#))

Param	Searched Values(min-max)	UCD	Description
age	0.003/0.03	time.age	Age (in Gyr) of the isochron
meta	0.0/0.004	phys.abund.Z	The mass fraction of the initial heavy elements abundance

Output Fields ([back to top](#))

Field	Unit	UCD	Description
Isochron		VOX:Image_Title	Isochron file name.
age	[Gyr]	time.age	Age (in Gyr) of the isochron.
meta		phys.abund.Fe	The mass fraction of the initial heavy elements abundance.
[M/H]	[‰]	phys.abund.Z	The metal abundance in the spectroscopic formalism.
[Fe/H]	[‰]	phys.abund.Fe	The iron abundance in the spectroscopic formalism.
Y	[‰]	phys.abund.Y	The mass fraction of the initial helium abundance. Actually calculated as Y = 1.44*(Z-0.01).
MassLoss	-	phys.mass.loss	The iron abundance in the spectroscopic formalism.
MIME TYPE		VOX:Image_Format	File type: ascii file.
Link		DATA_LINK	Link to the isochron file.

Output Data Table. Number of rows: 360 ([back to top](#))

Isochron	age	meta	[M/H]	[Fe/H]	Services: VOSA Filters TSAP S3if
wz104y245ss2.t600030_walr	.03	0001	-2.2	-2.2	 
wz104y245ss2.t600030_walr	.03	0001	-2.2	-2.2	
wz104y245s.t600030_walr	.03	0001	-2.2	-2.2	
wz104y245o.t600030_walr	.03	0001	-2.2	-2.2	
wz304y245ss2.t600030_walr	.03	0003	-1.7	-1.7	
wz304y245ss2.t600030_walr	.03	0003	-1.7	-1.7	
wz304y245o.t600030_walr	.03	0003	-1.7	-1.7	
wz304y245s.t600030_walr	.03	0003	-1.7	-1.7	
wz604y246ss2.t600030_walr	.03	0006	-1.4	-1.4	
wz604y246ss2.t600030_walr	.03	0006	-1.4	-1.4	
wz604y246o.t600030_walr	.03	0006	-1.4	-1.4	
wz604y246s.t600030_walr	.03	0006	-1.4	-1.4	
wz103y246ss2.t600030_walr	.03	001	-1.2	-1.2	
wz103y246ss2.t600030_walr	.03	001	-1.2	-1.2	
wz103y246o.t600030_walr	.03	001	-1.2	-1.2	
wz103y246s.t600030_walr	.03	001	-1.2	-1.2	
wz203y248ss2.t600030_walr	.03	002	-.96	-.96	
wz203y248ss2.t600030_walr	.03	002	-.96	-.96	
wz203y248ss2.t600030_walr	.03	002	-.96	-.96	

<http://svo.laeff.inta.es/theory/s3if/>



S3 interface

An interface to test S3 services

Services: VOSA Filters TSAP S3if

Email: Pass: Login Register

S3 interface

Although there are many fields in Astrophysics with a strong need of direct and rigorous comparisons between theoretical and observational data in most of the occasions, however, the different architectures, programming codes, formats,..., make it extremely difficult the comparison between them.

In the context of the IVOA Theory Interest Group, in particular for Microsimulations, in the Spanish Virtual Observatory we are working in the definition of the required framework to provide applications and services of theoretical astrophysics to the general community. One of the lines of work consists in the development of S3 (Simple Self-described Service), a protocol to access theoretical spectral data in a simple way.

This interface allows you to access to the data offered by any S3 server if you know its main URL, and can be used by service providers to check that they are offering their data as VO-S3 compliant.

Enter the full base URL of a S3 service, starting with http://
(not including the format=metadata parameter)

S3 URL: Go

Or try a known S3 service

S3 Service: Synthetic photometry server

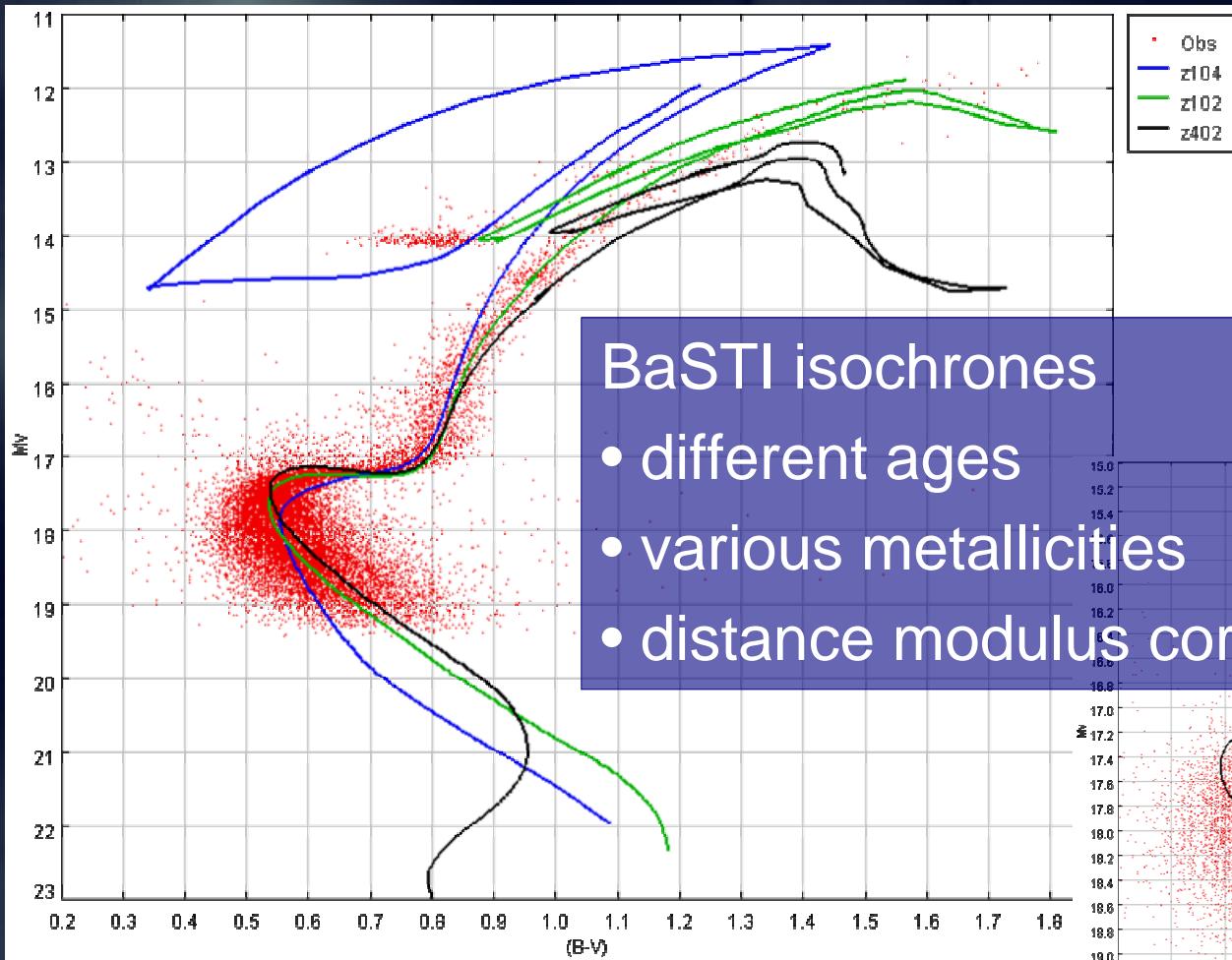
<http://albione.oa-teramo.inaf.it/PHMetadata/BaSTIisochron.php>

<http://albione.oa-teramo.inaf.it/PHMetadata/BaSTItrack.php>

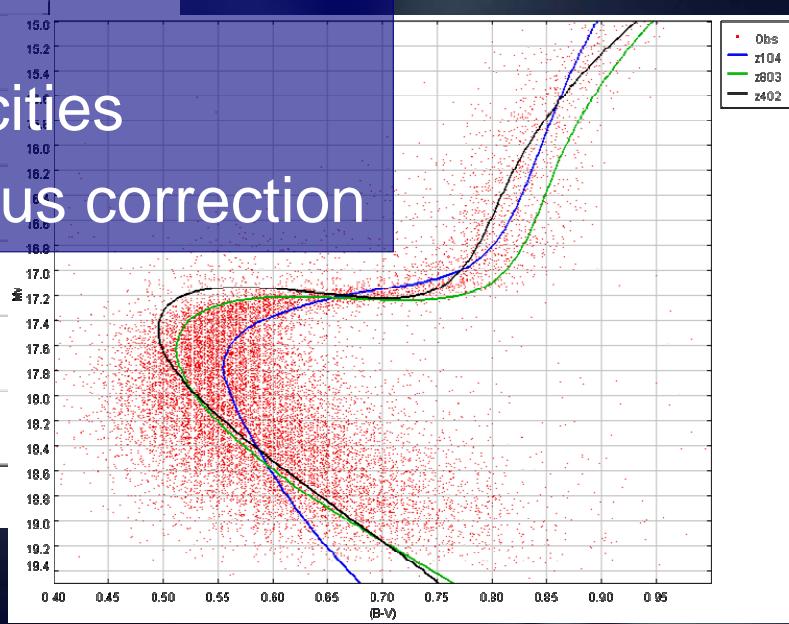


BaSTI Isochrones

step 1
metallicity

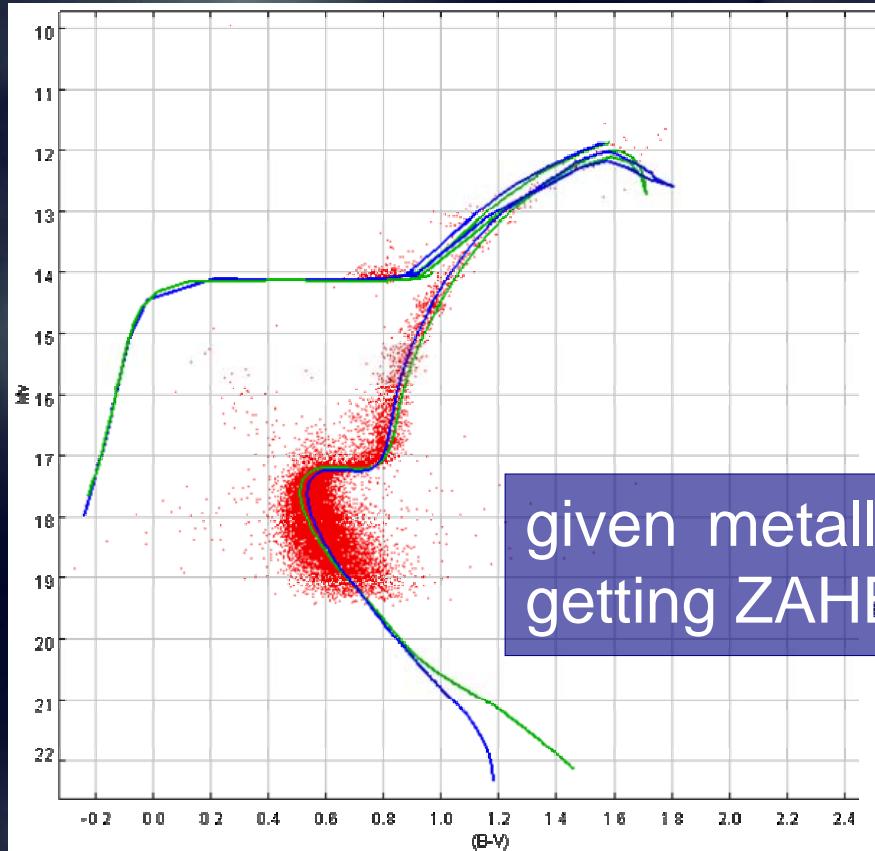


- BaSTI isochrones
- different ages
 - various metallicities
 - distance modulus correction

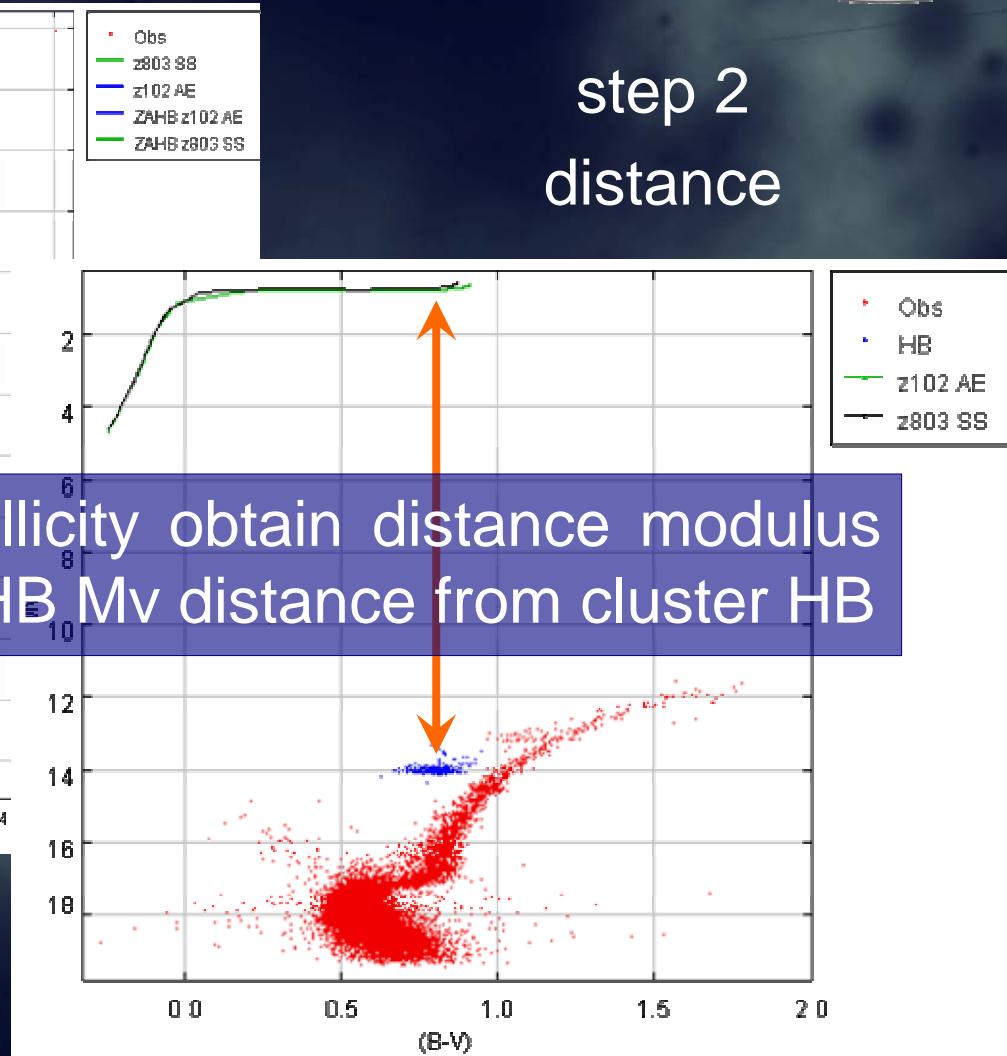


$$z = 0.01 \text{ (\alpha-enh)} ; 0.008 \text{ (scaled solar)}$$

BaSTI ZAHB

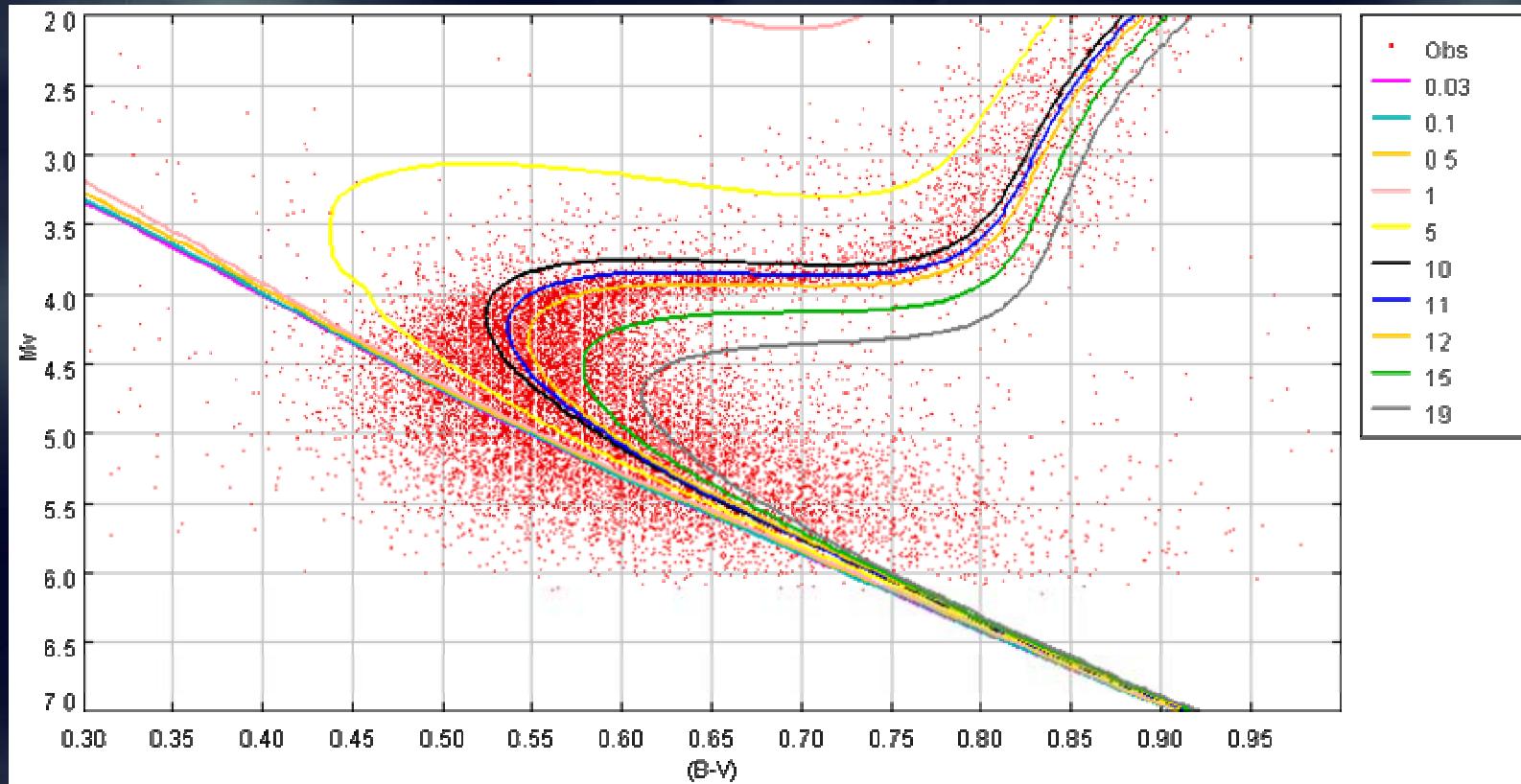


$MD = 13.3 \rightarrow \sim 15k \text{ ly}$



BaSTI Isochrones

step 3
age



age ~ 11 Gyr

metallicity and DM defined
check Turn Off point to obtain age



Reiteration

- example use case was presented
‘cheating’ ☺ (on results of course...)
 - target results taken from: **Gratton & al. 2003 A&A, 408** and **Percival & al. 2002 ApJ, 573**
- iteration on steps actually a must to obtain good results

	[Fe/H]	DM	Age [Gyr]
BaSTI	-0.6	13.3	11
Gratton & al.	-0.66 ± 0.04	13.47 ± 0.03	11.2 ± 1.1
Percival & al.	-0.7 ± 0.07	13.37 ± 0.11	11.0 ± 1.4



Comments (use case)

- simple but performances can be easily improved
 - better outlined steps and hints
 - more in-depth use of VO tools (not only visualization aided results)
- (except from spectra) first observational vs. simulation comparison based use case
- (once detailed) could it be added to the EURO-VO scientific workflows page?



Comments (on VO)

- tools
 - easy to use and stable
 - difficult to use them at their maximum capabilities with theoretical data
- interfaces
 - need to be improved, use cases can help
- standards
 - used the BaSTI S3 (also through the Spanish VO S3 interface)
 - SimDB/SimDAP