

BaSTI:
query implementaions
for stellar evolution models via S3P



In collaboration with:

M. Molinaro
F. Gasparo
F. Pasian
A. Pietrinferni
S. Cassisi

C. Rodrigo
M. Cerviño
E. Solano
R. Gutierrez

BaSTI

a Bag of Stellar Tracks and Isochrones



BaSTI database is a fundamental tools to investigate the properties of stellar populations in both galactic and extragalactic systems.

BaSTI contain a wide range of stellar masses and chemical compositions, as well as of choices about important parameters such as mass loss and core convective overshooting efficiency.

32010 Isochrones

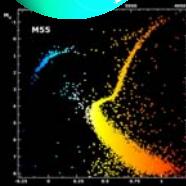
17489 Evolutionary tracks

4438 Evolutionary HB tracks

121 ZAHB (Zero Age Horizontal Branch) tables

121 End He tables

198 Summary tables

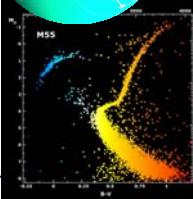


BaSTI inside the ITVO (Italian Theoretical Virtual Observatory) and VOBS.it:

- Aims:
 - Publishing theoretical data, so to share them with the community;
 - Easy finding and searching the data of interest;
 - Give them a standard format (VOTable and/or FITS binary table);
 - Create a standard access protocol (S3P);
 - Create Web services also using the Grid infrastructure and access them via a standard protocol;
 - Registry the database and services;
 - permit an easy comparison between observational and theoretical data, using the same tools for both kind of data.

ITVO project is develop under EuroVOTECH, EuroVO-DCA and Euro VOAIDA.

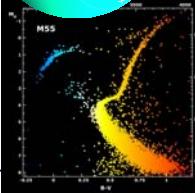
Uses cases of stellar models



These model are important for:

- testing the “physics” in the regime of high density/low temperature;
- Investigating the IMF in various environments;
- Simulated evolutionary tracks and isochrones;
- Simulated the HB for sampling different evolutionary phases and study pulsating stars;
- Study M/L relation and M/R relation and confrontation with observational data;
- Optical photometric bands / near –infrared one;
- Comparison with star clusters, binary systems;
- Study fundamental ingredient for population synthesis;
- Analyze the integrated magnitudes, colours and spectra of composite stellar populations;

BaSTI



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

BaSTI Home Page - Windows Internet Explorer
File Modifica Visualizza Preferiti Strumenti ?
BaSTI Home Page

BaSTI

A Bag of Stellar Tracks and Isochrones...

BaSTI Menu:

- Home
- Database
- Bibliography
- News
- Info
- FAQ
- Contact us
- Links
- STAFF web

last update:
18-03-2008

This is BaSTI Ver. 4.1.0

18-03-2008 Important information for all BaSTI Users

SCALED SOLAR MODELS : α - ENHANCED MODELS:

- canonical
- non-canonical
- canonical
- non canonical

Create Query on BaSTI DB

WEB TOOL:

- Isochrones - Tracks
- Luminosity Function
- Synthetic Color - Magnitude Diagrams

BaSTI database is maintained by: Santi Cassisi, Marco Cassellani, Adriano Pietrinferni, Daniel Cerdier, Maurizio Salaris and Patricia Mancato.

Internet 100%

BaSTI web portal



Query the stellar evolutionary DB having the possibility of personalized the SQL query and choosing all the parameters.

BaSTI Home Page - Windows Internet Explorer

File Modifica Visualizza Preferiti Strumenti ?
 BaSTI Home Page

BaSTI
A Bag of Stellar Tracks and Isochrones...

Create Query on BaSTI DB

Filename:			
<input checked="" type="checkbox"/> Data type:	ISOCHRON	<input checked="" type="checkbox"/> Scenario:	CANONICAL
<input checked="" type="checkbox"/> Age: (Gyr)	min: 0.02 max: 0.5	<input type="checkbox"/> Mass: (Msun)	min: max:
<input checked="" type="checkbox"/> Z:	min: max:	<input checked="" type="checkbox"/> Y:	min: max:
<input checked="" type="checkbox"/> [Fe/H]:	min: max:	<input checked="" type="checkbox"/> [M/H]:	min: max:
<input checked="" type="checkbox"/> Type:	AGB EXTENDED	<input checked="" type="checkbox"/> Mass loss:	0.2
<input checked="" type="checkbox"/> Photometric system:	JOHNSON CASTELLI	<input checked="" type="checkbox"/> Mixture:	SCALED SOLAR

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 to visualize in the result table. Then push the Search button or if you want to personalize your query in SQL press the Go button.

For example:
 you can search for AGE min=2.20 and max=3.50, but not select its checkBox because you don't want to see the AGE column in the result table.

Additional info:
 - BaSTI Help
 - BaSTI FAQ

Advanced Search

<input type="checkbox"/> Code version:	FRANECPCS 2003	<input type="checkbox"/> Rad. opacity:	Alexander & Ferguson 1994
<input type="checkbox"/> Show selected fields.		<input type="button" value="SEARCH"/>	<input type="button" value="Personalize SQL: GO"/>
		<input type="button" value="RESET"/>	

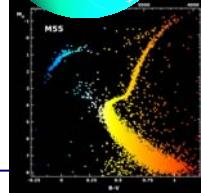
Powered by IA2 (INAF - Teramo Astronomical Observatory)
 For any problem please contact: [BaSTI team](#)

Personalize SQL:

```

TYPE, MASS LOSS, PHOT_SYSTEM, HED_TYPE, SCENARIO_TYPE, VERSION,
RAD_OPACITY
from
ARCHA.OUT_FILE, ARCHA.PROPRIETIES, ARCHA.SCENARIO,
ARCHA.PROGRAM_PARAM, ARCHA.CHEMICAL
where
OUT_FILE.ID_PROP = PROPERTIES.ID_PROP and OUT_FILE.ID_SCENARIO =
SCENARIO.ID_SCENARIO and OUT_FILE.ID_PROG = PROGRAM_PARAM.ID_PROG
and CHEMICAL.ID_CHEMICAL = PROPERTIES.ID_CHEMICAL
and upper(SCENARIO_TYPE) like upper('CANONICAL%') and AGE >= 0.02
and AGE <= 0.5 and upper(FILE_TYPE) like upper('ISO%') and upper
(TYPE) like upper('AGB EXTENDED%') and MASS LOSS = 0.2 and upper
(PHOT_SYSTEM) like upper('JOHNSON CASTELLI%') and upper(HED_TYPE)
like upper('SCALED SOLAR MODEL%')
order by FILENAME
    
```

Results table



- This is the response after a query. The files are downloadable as ASCII table, or transform on-the-fly in VOTable.

Search Results : 1232 rows											
	File	Download	VO format	Data type	Scenario	Age	Z	Y	FE/H	M/H	Type
<input type="checkbox"/>	wz102y259ae2_t600030_c04ae	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600030_sloan	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600030_strm	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600030_walr	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600040_c04ae	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600040_sloan	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600040_strm	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_t600040_walr	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_af94_t600030_c04ae	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_af94_t600030_strm	ASCII/targz	VOTable	ISO	CANONICAL	.03	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_af94_t600040_c04ae	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL
<input type="checkbox"/>	wz102y259ae2_af94_t600040_strm	ASCII/targz	VOTable	ISO	CANONICAL	.04	.01	.259	-.6	-.25	NORMAL

EUROVO

VOTable



Isochrone by Pietrinferni - Cassisi - Salaris - Castelli 2006 :: Standard Model - Alpha-enhanced model & transf. Stroemgren (Castelli 2006)
 For further information on PARAM(s) and FIELD(s) see: "http://wwwas.oats.inaf.it/IA2/index.php?option=com_wrapper&Itemid=87"

Use this link (wz102y259ae2_af94.t600040_strm.xml) to retrieve the plain XML VOTable
 (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>	wz102y259ae2_af94.t600040_strm	meta.id;meta.file	Name of the converted ASCII file
<i>Data Type</i>	Isochrone	meta.note	Type of data simulation
<i>Mixture</i>	alfa-enhanced	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>	Stroemgren	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>	2003	meta.note	FRANEC code version used
<i>RadOpacity</i>	Alexander & Ferguson 1994	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>[M/H]</i>	-2.53	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-0.0100)
<i>Age</i>	.0400	time.age	Age (in Gyr) of the isochron
<i>CheckDate</i>	04-02-2006	time.processing	Expresses data computation for further controls or revisions

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

Field	UCD	Description
<i>(M/Mo)in</i>	phys.mass;arith.ratio	Initial mass, in solar units, of the structure
<i>M/Mo</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
<i>logTe</i>	phys.temperature.effective	Logarithmic value of the effective temperature
<i>My</i>	phot.mag	Photometric magnitude
<i>u-b</i>	phot.color	Color index
<i>u_0-b</i>	phot.color	Color index
<i>b-y</i>	phot.color	Color index
<i>m1</i>	phot.color	Color index
<i>c1</i>	phot.color	Color index
<i>c1_0</i>	phot.color	Color index
<i>H_beta</i>	phot.color	Color index
<i>hk</i>	phot.color	Color index

Output Data Table. Number of rows: 2000 [\(back to top\)](#)

(M/Mo)in	M/Mo	log(L/Lo)	logTe	My	u-b	u_0-b	b-y	m1	c1	c1_0	H_beta
.5000000000	4999958383	-1.31174	3.60944	8.902	2.734	2.728	.788	.332	.491	.485	2.502

Mozilla Firefox

File Modifiche Visualizza Cronologa Segnalibri Strumenti ?

File:///C:/molinare/RaSTIASCI2VO/wz102y259o.t600030_acs_hst.vml

Bookmarks Varie Virtual Observatories TUTOS - Login WebMail Tomcat - Palantir

```
<VOTABLE version="1.1" xsi:noNamespaceSchemaLocation="http://www.ivoa.net/xml/VOTable/v1.1">
  <DESCRIPTION>
    Isochrone by Pietrinferni - Cassisi - Salaris - Castelli 2006 :: Non Standard Model - Scaled solar model & transformations for ACS (Castelli 2004)
  </DESCRIPTION>
  <RESOURCE>
    <DESCRIPTION>
      For further information on PARAM(s) and FIELD(s) see: "http://wwwas.oats.inaf.it/IA2/index.php?option=com_wrapper&Itemid=87"
    </DESCRIPTION>
    +<PARAM arraysize="" datatype="char" name="Filename" ucd="meta.id;meta.file" unit="" value="wz102y259o.t600030_acs_hst"></PARAM>
    +<PARAM arraysize="" datatype="char" name="DataType" ucd="meta.note" unit="" value="Isochrone"></PARAM>
    -<PARAM arraysize="" datatype="char" name="Mixture" ucd="meta.note" unit="" value="Scaled Solar">
      <DESCRIPTION>Heavy elements distribution</DESCRIPTION>
    -<VALUES>
      <OPTION>Scaled Solar</OPTION>
      <OPTION>alfa-enhanced</OPTION>
    </VALUES>
    <PARAM>
    +<PARAM datatype="boolean" name="Overshooting" ucd="meta.code" unit="" value="T"></PARAM>
    +<PARAM datatype="float" name="MassLoss" ucd="phys.mass.loss" unit="" value="0.4"></PARAM>
    +<PARAM arraysize="" datatype="char" name="PhotSystem" ucd="meta.note" unit="" value="ACS-HST"></PARAM>
    +<PARAM arraysize="" datatype="char" name="Type" ucd="meta.note" unit="" value="Normal"></PARAM>
    +<PARAM arraysize="" datatype="char" name="CodeVersion" ucd="meta.note" unit="" value="2007"></PARAM>
    +<PARAM arraysize="" datatype="char" name="RadOpacity" ucd="meta.note" unit="" value="Ferguson 2005"></PARAM>
    +<PARAM datatype="int" name="Np" ucd="meta.number" unit="" value="2000"></PARAM>
    +<PARAM datatype="float" name="M/H" ucd="phys.abund.Z" unit="" value=".253"></PARAM>
    -<PARAM datatype="float" name="Z" ucd="phys.abund.Z" unit="" value=".0100">
      <DESCRIPTION>The mass fraction of the initial heavy elements abundance</DESCRIPTION>
    -<VALUES>
      <MIN>0.0001</MIN>
      <MAX>0.04</MAX>
    </VALUES>
    <PARAM>
    +<PARAM datatype="float" name="Y" ucd="phys.abund.Y" unit="" value=".259"></PARAM>
    +<PARAM datatype="float" name="Age" ucd="time.age" unit="" value=".0300"></PARAM>
    +<PARAM arraysize="" datatype="char" name="CheckDate" ucd="time.processing" unit="DD-MM-YYYY" value="16-05-2005"></PARAM>
    -<TABLE>
      <DESCRIPTION>Output Data Table. Number of rows: 2000</DESCRIPTION>
      +<FIELD datatype="float" name="M/Mo/in" ucd="phys.mass;arith.ratio" unit=""></FIELD>
      +<FIELD datatype="float" name="M/Mo" ucd="phys.mass;arith.ratio" unit=""></FIELD>
      +<FIELD datatype="float" name="log(L/Lo)" ucd="phys.luminosity;arith.ratio" unit=""></FIELD>
      -<FIELD datatype="float" name="logTe" ucd="phys.temperature.effective" unit="">
        <DESCRIPTION>Logarithmic value of the effective temperature</DESCRIPTION>
      </FIELD>
      +<FIELD datatype="float" name="F435W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F475W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F555W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F606W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F625W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F775W" ucd="phot.mag" unit="mag"></FIELD>
      +<FIELD datatype="float" name="F814W" ucd="phot.mag" unit="mag"></FIELD>
    -<DATA>
      -<TABLEDATA>
        -<TR>
          <TD>.5000000000</TD>
          <TD>4999958383</TD>
          <TD>-1.32717</TD>
          <TD>3.60453</TD>
          <TD>10.272</TD>
          <TD>9.769</TD>
          <TD>9.059</TD>
          <TD>8.597</TD>
          <TD>8.229</TD>
          <TD>7.499</TD>
          <TD>7.392</TD>
        -<TR>

```

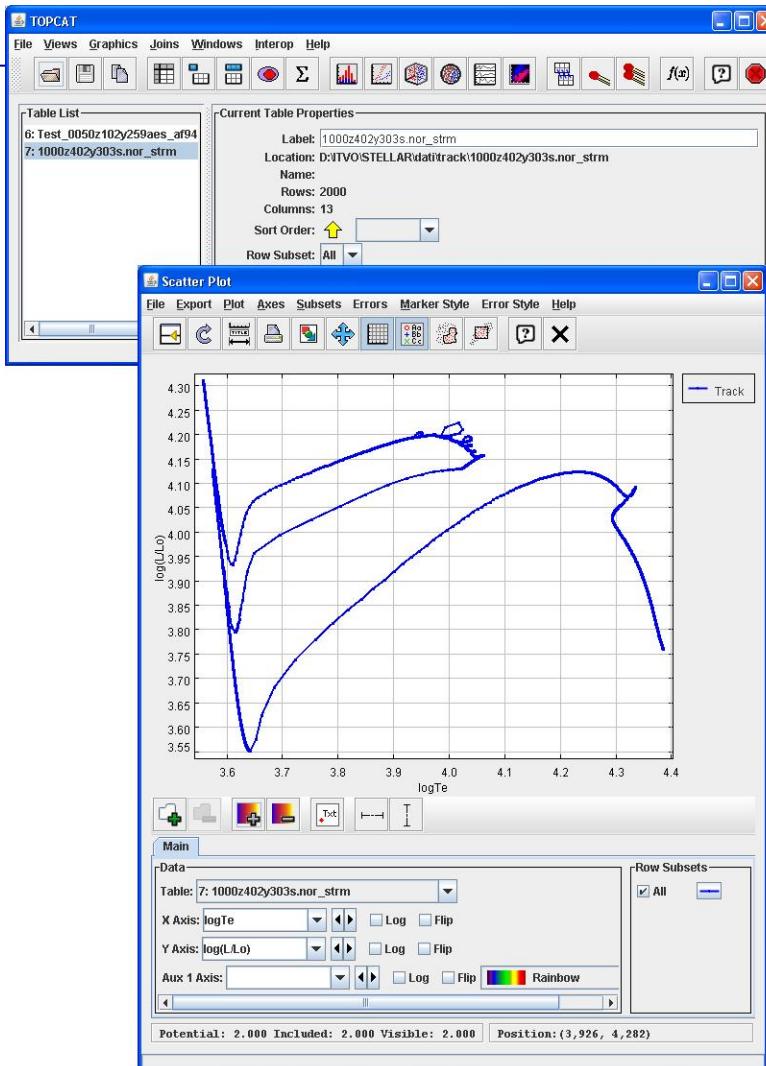
BaSTI and VO tool



The output of BaSTI
is an **ASCII file**
so the natural tool
to analyze these
data is TOPCAT.



We transform it in a
VOTable (or
FITS-Table).

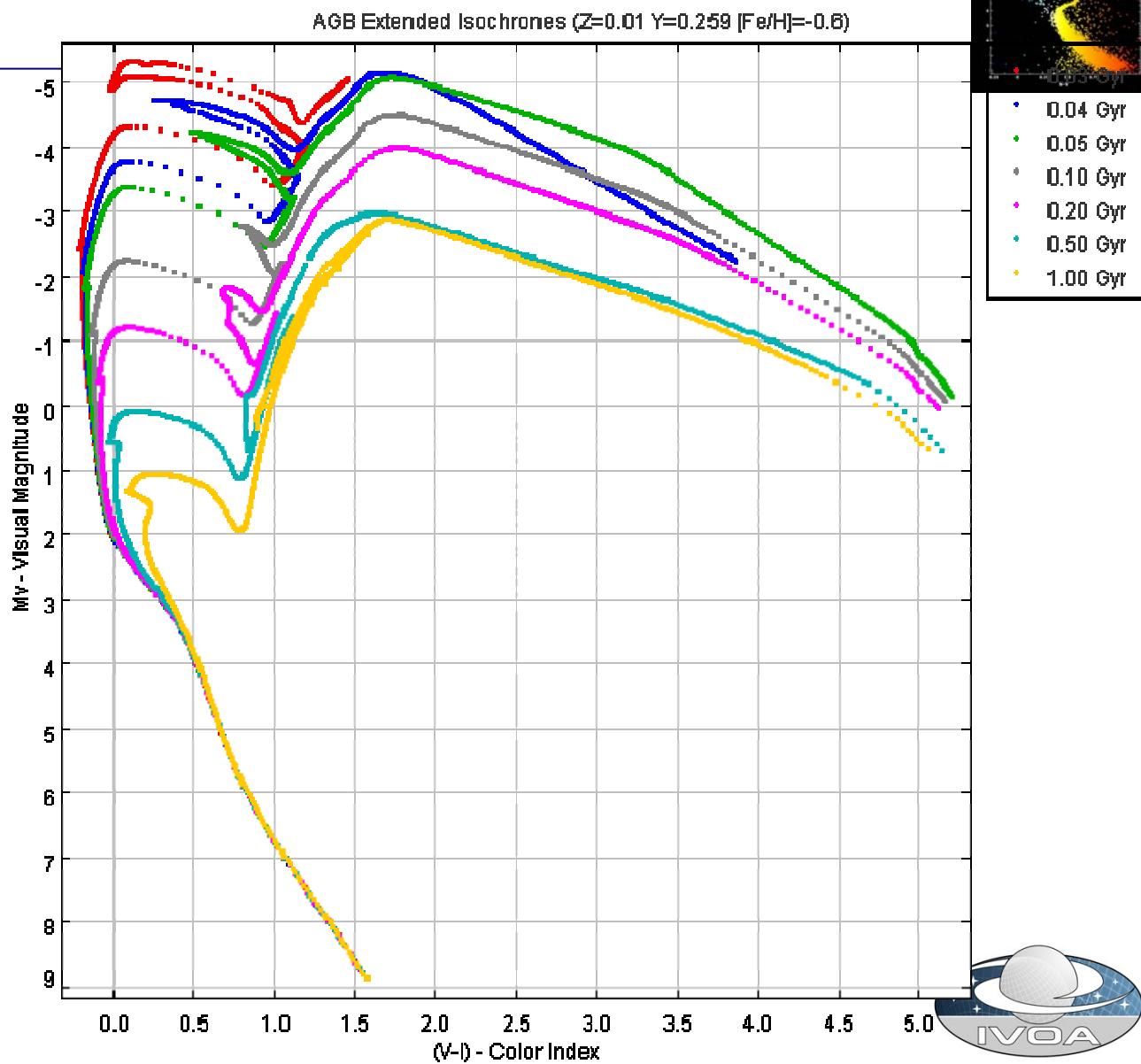


STILTS for creating plots

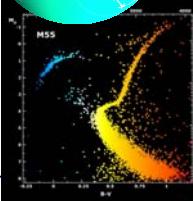


STILTS (Mark Taylor, Bristol, UK) is a VO tool that forms the command-line counterpart of the GUI table analysis tool **TOPCAT**.

It will be implemented by M. Molinaro on the BaSTI Web portal, the result will be as show in the figure.



S3P implementations



A simple access protocol to search stellar evolution files:

S3P (Simple Self-described Service Protocol)

- For searching Tracks:
 - INPUT: Mass;
 - INPUT: Metallicity;
 - OUTPUT:Mass;
 - OUTPUT:Metallicity;
 - OUTPUT:....
- For searching Isochrones:
 - INPUT: Age;
 - INPUT: Metallicity;
 - OUTPUT:Age;
 - OUTPUT:Metallicity;
 - OUTPUT:....

(see Carlos Rodrigo talk about S3P and IVOA document Note)

S3P example implementations



Isochrones:

- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTIisochron.php?format=metadata>
- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTIisochron.php?age=0.003/0.03&meta=0.0/0.004>
- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTIisochron.php?id=42749>

Tracks:

- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTItrack.php?format=metadata>
- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTItrack.php?mass=0.4/0.7&meta=0.0/0.002>
- <http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTItrack.php?id=42611>



developed by OATeramo



The tools will be transformed in web-services:

- Isochrones- tracks extractor;
- Luminosity function
- Syntetic color – Magnitude diagrams (stellar population synthesis program)

All is written in PERL.

BaSTI Home Page - Windows Internet Explorer

http://193.204.1.62/index.html

File Modifica Visualizza Preferiti Strumenti ?

BaSTI Home Page Stili Spostare Pagina iniziale Feed Stampa >

BaSTI
A Bag of Stellar Tracks and Isochrones...

BaSTI Menu

- Home
- Database
- Bibliography
- News
- Info
- FAQ
- Contact us
- Links
- STAFF only

8,179 Visitors Since February 2, 2004

This is BaSTI Ver. 4.0.1

New Important information for all BaSTI Users **New**

SCALED SOLAR MODELS :

- canonical
- non-canonical

α - ENHANCED MODELS:

- canonical
- non canonical

New Create Query on BaSTI DB **New**

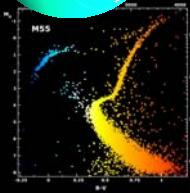
WEB TOOL:

- Isochrones - Tracks
- Luminosity Function
- Synthetic Color - Magnitude Diagrams

last update:
10-01-2008

BaSTI database is maintained by: [Santi Cassisi](#), [Marco Castellani](#), Adriano Pietrinferni, [Daniel Cordier](#), Maurizio Salaris and [Patrizia Manzato](#).

Tool: isochrone/track extractor



BaSTI

A Bag of Stellar Tracks and Isochrones...

Isochrone/track Extractor

Output Type

- Isochrone (for a given age)
- Interpolated track (for a given mass)

Heavy Elements Mixture

- Scaled to solar mixture
- Alpha enhanced mixture (not yet available)

Color-temperature Transformation

- UBVRJHKL (Scaled solar or Alpha enhanced)
- ACS (Scaled solar only)

Model Type

- Standard - $\eta=0.2$ - (without overshooting)
- Non standard - $\eta=0.4$ - (with overshooting)

Chemical composition

- | | |
|--|--|
| <input type="radio"/> Z= 0.0001 Y= 0.245 | <input type="radio"/> Z= 0.008 Y= 0.256 |
| <input type="radio"/> Z= 0.0003 Y= 0.245 | <input type="radio"/> Z= 0.01 Y= 0.259 |
| <input type="radio"/> Z= 0.001 Y= 0.246 | <input type="radio"/> Z= 0.0198 (Sun) Y= 0.273 |
| <input type="radio"/> Z= 0.002 Y= 0.248 | <input type="radio"/> Z= 0.03 Y= 0.288 |
| <input type="radio"/> Z= 0.004 Y= 0.251 | <input type="radio"/> Z= 0.04 Y= 0.303 |

Submit

Synthetic Colour-Magnitude diagrams



The BASTI Population Synthesis Program Web Interface - Mozilla Firefox

Eicher Edition Affichage Aide Marque-pages Outils Aide

Getting Started Latest Headlines Google BPO Routier SFP CUPS

Stellar Population Synthesis Program

User Id: [] Help

Photometric error

- No error
- Gaussian error with the mean photometric error:
0.02 (in mag)
- User Specified error law table
Number of values: 10 (Max. 200)

Mean spectroscopic error: 0.0001 (in dex)

Colour excess E(B-V): 0.0 Total spatial depth of the population: 0.0

Distance modulus: 0.0

Fraction of unresolved binaries: 0.1 (e.g. 1/10 => 0.1)

Minimum mass ratio for binary systems: 0.7

Scale factor for SFR: 12000 (Max. 8 digits integer)

Mass range

- Default mass range (0.1-120 M_{sun})
- User-specified lower mass limit: 0.1 (solar masses)

Initial Mass Function

- IMF type
 - Single power law
 - Kroupa, Tout, Gilmore (1993)
- IMF exponent (in case of single power law): 2.35

Stellar Formation History

- Fixed Stellar Formation Histories (SFH)
 - NGC6822 (*) bulge
 - SMC (*)
 - LMC (bar field)
 - Local disk (*) (global SFH)
- User Specified SFH
Number of age values: 50 (max. 200)

Search for variable stars

- Yes No

Selected set of isochrones

- Heavy Elements Mixture
 - Scaled to solar mixture
 - Alpha enhanced mixture
- Mass loss
 - $\alpha=0.2$
 - $\alpha=0.4$
- Extra core mixing
 - Standard (No overshooting)
 - Overshooting

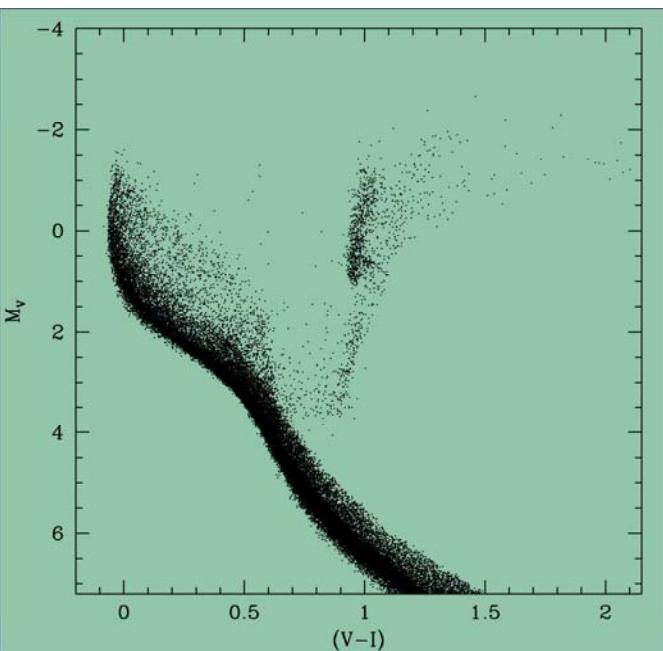
Random numbers generating

- The random number generator is automatically initialized through the Web taking a seed from <http://www.random.org> (recommended option)
- The random number generator is initialized with seeds provided by the user:

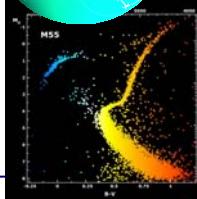
Seed 1: 860934 Seed 2: 542039

Submit

p.- Theory, Baltimore



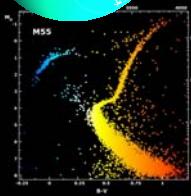
VOTable description of the archive



As C. Gheller present we will investigate if will be possible describe the micro-archive content (directory and files) in a xml file (VOTable) an adopt this as a standard format to exchange information in an interoperable way.



The end



You can see my poster at ADASS, Quebec.

Thanks for your attention.