SimDAL

Preliminary implementation feedback

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IVOA interoperability meeting
Sydney, October 2015

Introduction: SimDAL

The Simulation Data Access Protocol (SimDAL) is a proposed VO protocol to discover simulations and numerical models and to access data extracted from these simulations in a standardized way.

- IVOA Working Draft 07 September 2015.
- Main authors: David Languignon, Franck Le Petit.
- Time for implementing and feedback.

Introduction: SimDAL

Three components (types of services)

- SimDAL Repository: Discover simulations projects dealing with one's research interest, get related info, and find the associated services.
- SimDAL Search: Dig into one project results, using the relevant parameters for this project, and specifying the desired range of values for these parameters, to find particular datasets.
- SimDAL Data Access: Access the simulation raw dataset(s) or subset of it (cutout) for the results identified in the search.

Our use case: grids of theoretical data

- The world of simulations can be very heterogeneus.
- The best way to organize the results and data and make them available to final users can be very different for different projects.
- We are going to focus in the quite “simple”, and usual, case of grids of theoretical data.
- Collections of theoretical data files, each one corresponding to different values of a set of parameters.

Our use case: grids of theoretical data

- There are many simulations of astrophysical interest that are available as “grids” of data.
- Each point of the “grid” is defined by different values of several parameters. And one data file corresponds to each point of the grid.
  - (T_{eff},logg,metallicity...) for theoretical spectra.
  - (age) from isochrones
  - (mass) for evolutionary tracks
  - etc
- Each data file can be seen as a table with several columns:
  - (λ, flux) for theoretical spectra.
  - (mass, teff, logg, ...) from isochrones
  - (age, teff, logg, ...) for evolutionary tracks
  - etc.

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  - etc
- Each data file ca
  - (λ, flux) for th
  - (mass, teff, lo
  - (age, teff, log
  - etc.

teff	logg	meta	filename
3500	0.00	0.00	fp00k2odfnew.pck.teff=3500..logg=0.00000.dat
3500	0.00	0.50	fp05k2odfnew.pck.teff=3500..logg=0.00000.dat
3500	1.00	0.00	fp00k2odfnew.pck.teff=3500..logg=1.00000.dat
3500	1.00	0.50	fp05k2odfnew.pck.teff=3500..logg=1.00000.dat
3750	0.00	0.00	fp00k2odfnew.pck.teff=3750..logg=0.00000.dat
3750	0.00	0.50	fp05k2odfnew.pck.teff=3750..logg=0.00000.dat
3750	1.00	0.00	fp00k2odfnew.pck.teff=3750..logg=1.00000.dat
3750	1.00	0.50	fp05k2odfnew.pck.teff=3750..logg=1.00000.dat
4000	0.00	0.00	fp00k2odfnew.pck.teff=4000..logg=0.00000.dat
4000	0.00	0.50	fp05k2odfnew.pck.teff=4000..logg=0.00000.dat
4000	1.00	0.00	fp00k2odfnew.pck.teff=4000..logg=1.00000.dat
4000	1.00	0.50	fp05k2odfnew.pck.teff=4000..logg=1.00000.dat

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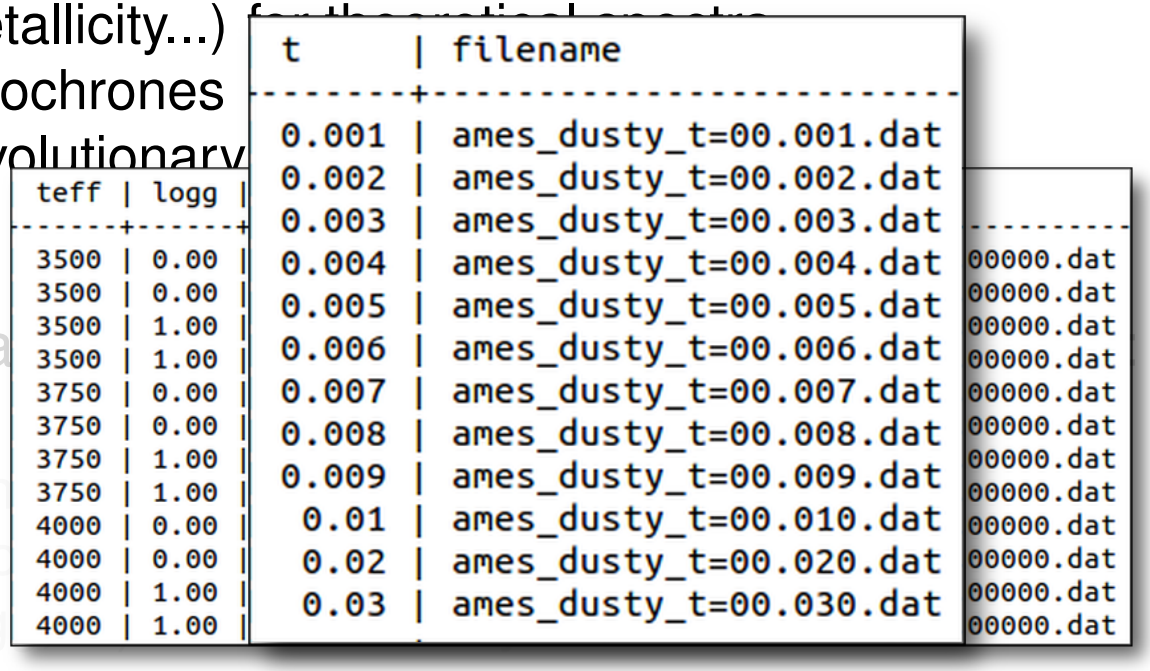
  - (mass) for evolutionary
  - etc
- Each data file ca
  - (λ, flux) for th
  - (mass, teff, lo
  - (age, teff, log
  - etc.



t	filename
0.001	ames_dusty_t=00.001.dat
0.002	ames_dusty_t=00.002.dat
0.003	ames_dusty_t=00.003.dat
0.004	ames_dusty_t=00.004.dat
0.005	ames_dusty_t=00.005.dat
0.006	ames_dusty_t=00.006.dat
0.007	ames_dusty_t=00.007.dat
0.008	ames_dusty_t=00.008.dat
0.009	ames_dusty_t=00.009.dat
0.01	ames_dusty_t=00.010.dat
0.02	ames_dusty_t=00.020.dat
0.03	ames_dusty_t=00.030.dat

teff	logg
3500	0.00
3500	0.00
3500	1.00
3500	1.00
3750	0.00
3750	0.00
3750	1.00
3750	1.00
4000	0.00
4000	0.00
4000	1.00
4000	1.00

00000.dat

Our use case: grids of theoretical data

- There are many simulations of astrophysical interest that are available as “grids” of data.
- Each point of the “grid” is defined by different values of several parameters. And one data file corresponds to each point of the grid.
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  - etc
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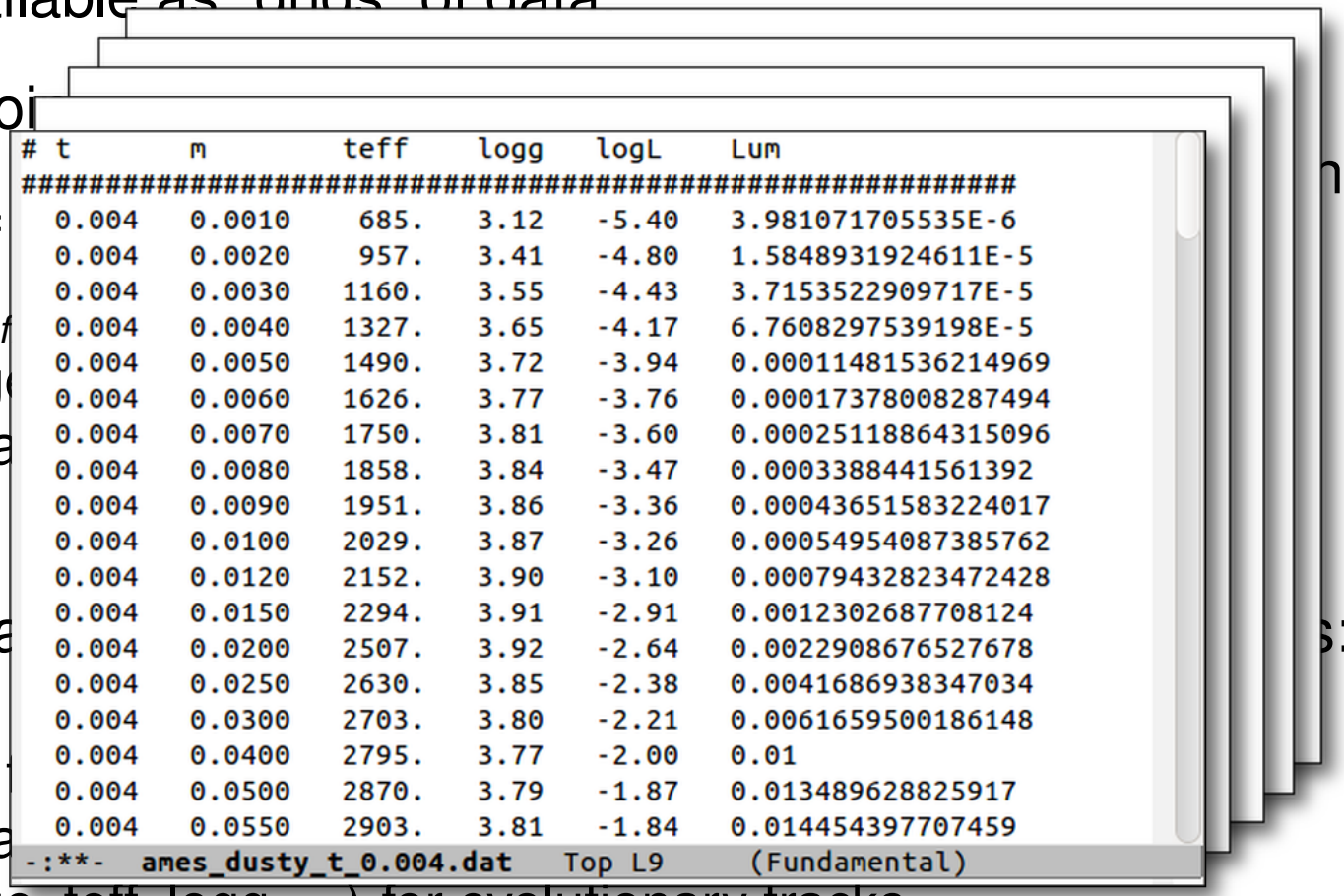
  - (age, teff, logg, ...) for evolutionary tracks
  - etc.

Our use case: grids of theoretical data

- There are many simulations of astrophysical interest that are available as "grids" of data
- Each poi
  several
  point of
  - (T_{ef}
  - (ag
  - (ma
  - etc
- Each da
  - (λ,
  - (ma
  - (age, teff, logg, ...) for evolutionary tracks
  - etc.

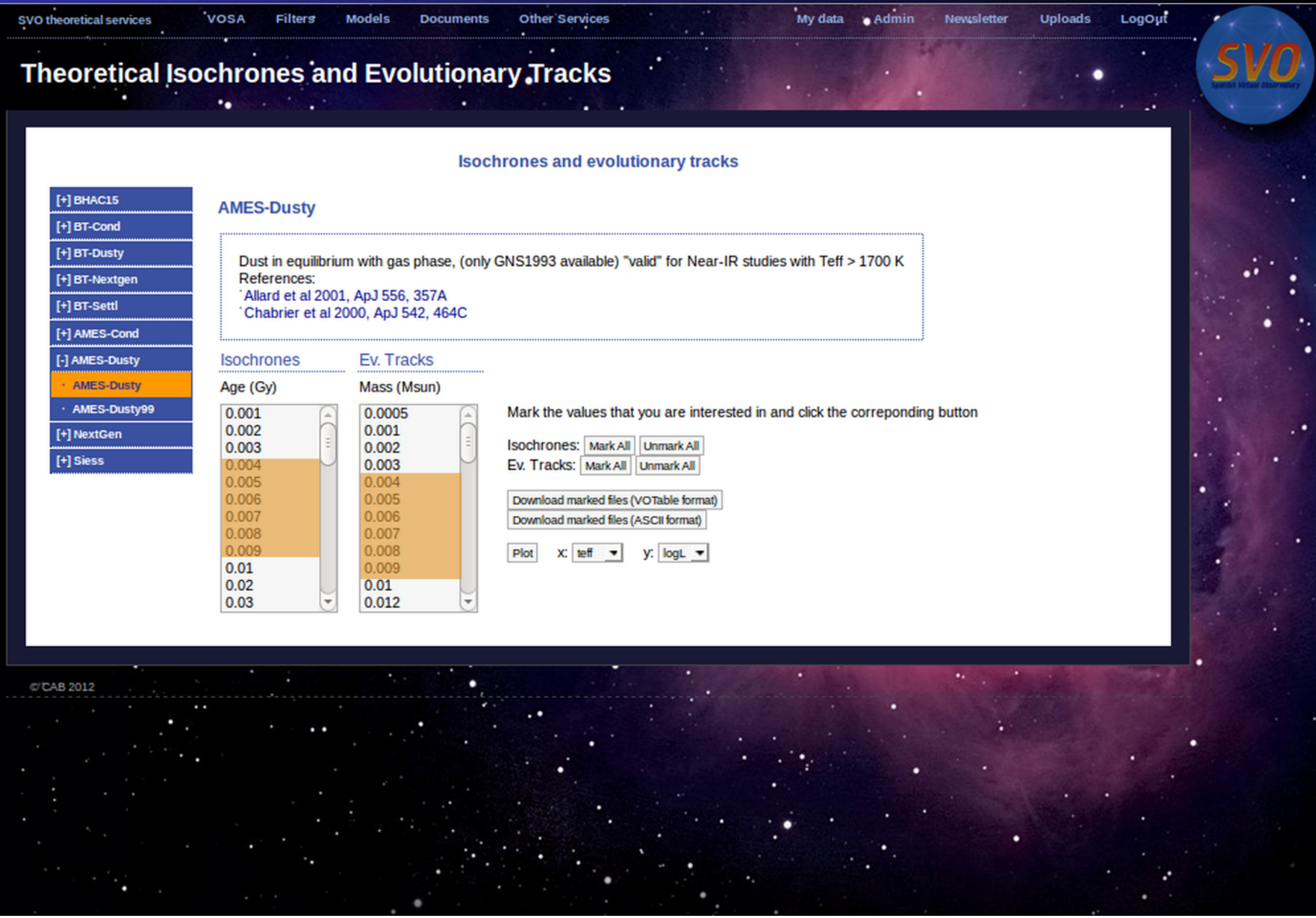


```
# t       m         teff    logg    logL     Lum
#################################################################
  0.004   0.0010     685.    3.12    -5.40    3.981071705535E-6
  0.004   0.0020     957.    3.41    -4.80    1.5848931924611E-5
  0.004   0.0030    1160.    3.55    -4.43    3.7153522909717E-5
  0.004   0.0040    1327.    3.65    -4.17    6.7608297539198E-5
  0.004   0.0050    1490.    3.72    -3.94    0.00011481536214969
  0.004   0.0060    1626.    3.77    -3.76    0.00017378008287494
  0.004   0.0070    1750.    3.81    -3.60    0.00025118864315096
  0.004   0.0080    1858.    3.84    -3.47    0.0003388441561392
  0.004   0.0090    1951.    3.86    -3.36    0.00043651583224017
  0.004   0.0100    2029.    3.87    -3.26    0.00054954087385762
  0.004   0.0120    2152.    3.90    -3.10    0.00079432823472428
  0.004   0.0150    2294.    3.91    -2.91    0.0012302687708124
  0.004   0.0200    2507.    3.92    -2.64    0.0022908676527678
  0.004   0.0250    2630.    3.85    -2.38    0.0041686938347034
  0.004   0.0300    2703.    3.80    -2.21    0.006165950018614 8
  0.004   0.0400    2795.    3.77    -2.00    0.01
  0.004   0.0500    2870.    3.79    -1.87    0.013489628825917
  0.004   0.0550    2903.    3.81    -1.84    0.014454397707459
-:**-  ames_dusty_t_0.004.dat   Top L9     (Fundamental)
```

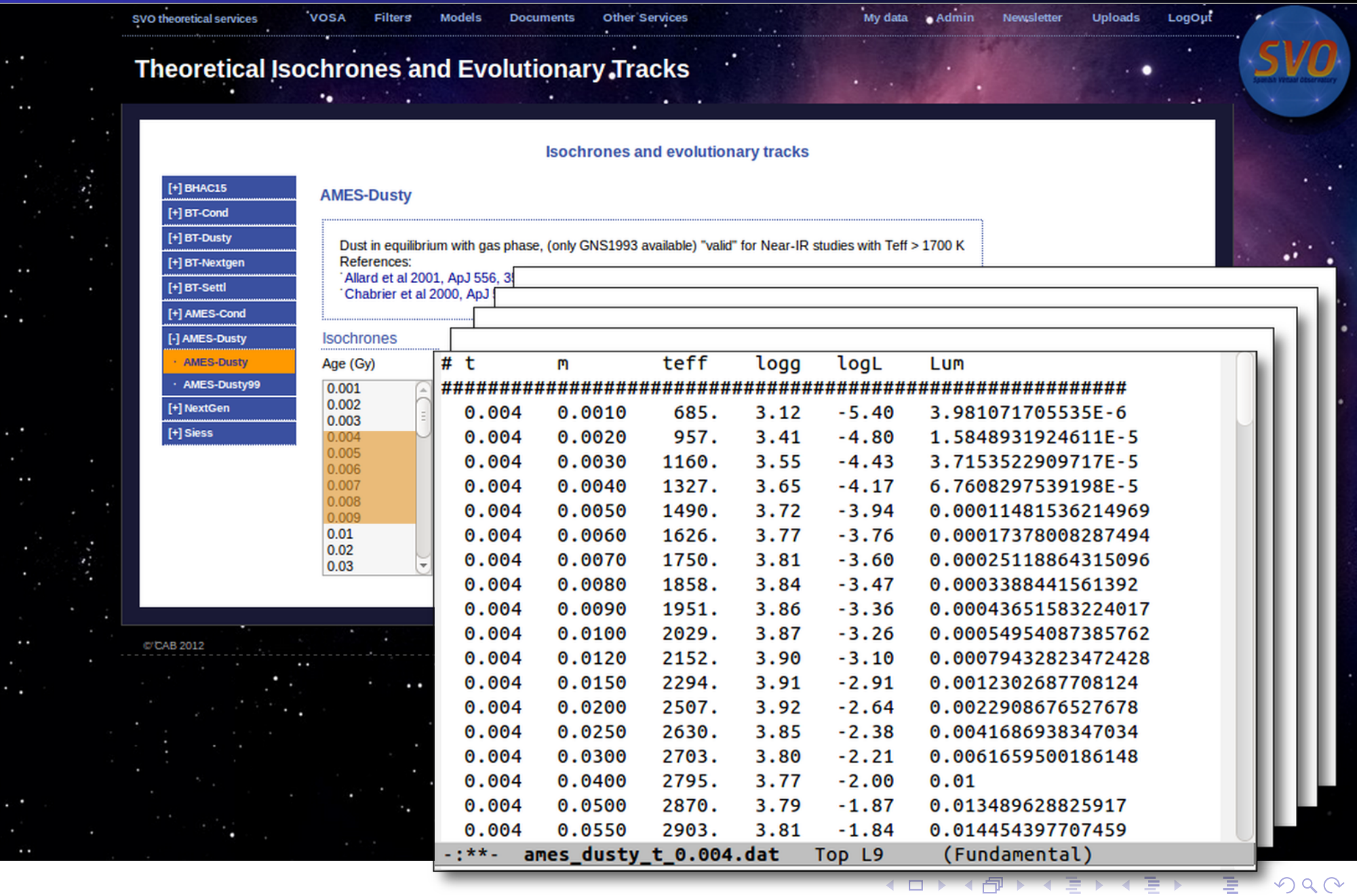
Isochrones and Evol. Tracks implementation

- We implement all the 3 simDAL services (repository, search, and data access) for theoretical isochrones and evolutionary tracks.
  - $\sim$ 60 data collections.
  - Different codes, groups, etc.
  - Isochrones: identified by age (*t* parameter).
  - Tracks: identified by mass (*m* parameter).
  - Data files provide t,m,teff,logg,logL,Lum data (for constant age or mass).
- Probably one of the simplest possible examples (although rich enough).

Isochrones and Evolutionary Tracks



Isochrones and Evolutionary Tracks




```
# t        m          teff     logg    logL     Lum
#############################################################
  0.004    0.0010     685.     3.12    -5.40    3.981071705535E-6
  0.004    0.0020     957.     3.41    -4.80    1.5848931924611E-5
  0.004    0.0030    1160.     3.55    -4.43    3.7153522909717E-5
  0.004    0.0040    1327.     3.65    -4.17    6.7608297539198E-5
  0.004    0.0050    1490.     3.72    -3.94    0.00011481536214969
  0.004    0.0060    1626.     3.77    -3.76    0.00017378008287494
  0.004    0.0070    1750.     3.81    -3.60    0.00025118864315096
  0.004    0.0080    1858.     3.84    -3.47    0.0003388441561392
  0.004    0.0090    1951.     3.86    -3.36    0.00043651583224017
  0.004    0.0100    2029.     3.87    -3.26    0.00054954087385762
  0.004    0.0120    2152.     3.90    -3.10    0.00079432823472428
  0.004    0.0150    2294.     3.91    -2.91    0.0012302687708124
  0.004    0.0200    2507.     3.92    -2.64    0.0022908676527678
  0.004    0.0250    2630.     3.85    -2.38    0.0041686938347034
  0.004    0.0300    2703.     3.80    -2.21    0.0061659500186148
  0.004    0.0400    2795.     3.77    -2.00    0.01
  0.004    0.0500    2870.     3.79    -1.87    0.013489628825917
  0.004    0.0550    2903.     3.81    -1.84    0.014454397707459
-:**-  ames_dusty_t_0.004.dat   Top L9     (Fundamental)
```

Isochrones and Evolutionary Tracks

SVO theoretical services | VOSA | Filters | Models | Documents | Other Services | My data | Admin | Newsletter | Uploads | LogOut

Theoretical Isochrones and Evolutionary Tracks

Isochrones and evolutionary tracks

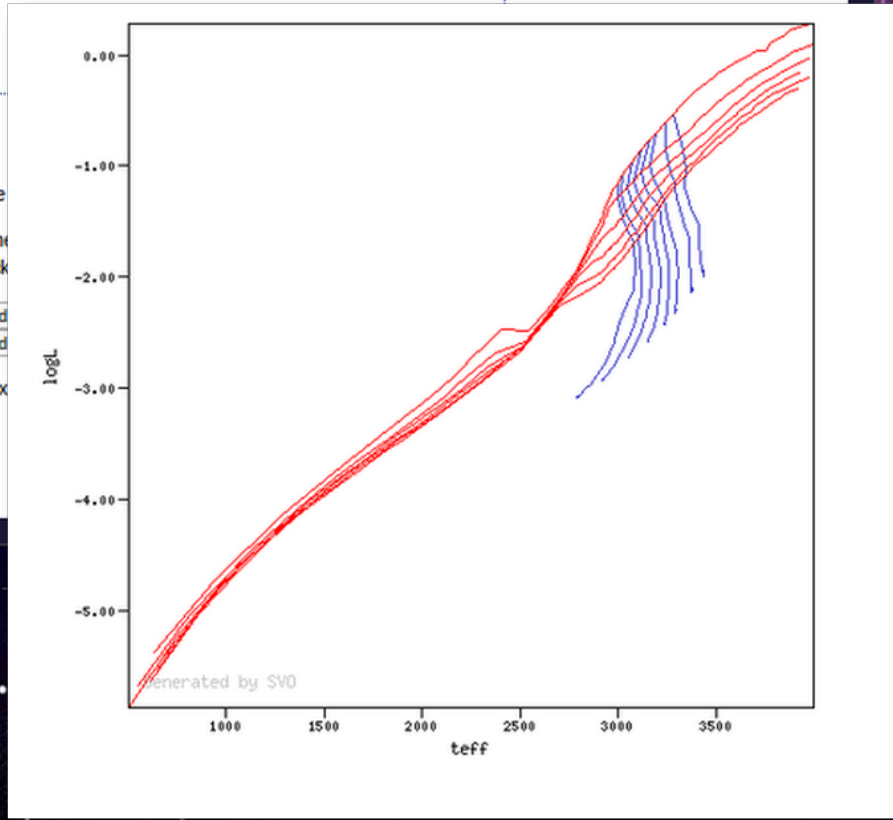
- [+] BHAC15
- [+] BT-Cond
- [+] BT-Dusty
- [+] BT-Nextgen
- [+] BT-Settl
- [+] AMES-Cond
- [-] AMES-Dusty
  - AMES-Dusty
  - AMES-Dusty99
- [+] NextGen
- [+] Siess

AMES-Dusty

Dust in equilibrium with gas phase, (only GNS1993 available) "valid" for Near-IR studies with Teff > 1700 K
References:
- Allard et al 2001, ApJ 556, 357A
- Chabrier et al 2000, ApJ 542, 464C

Isochrones	Ev. Tracks
Age (Gy)	Mass (Msun)
0.001	0.0005
0.002	0.001
0.003	0.002
0.004	0.003
0.005	0.004
0.006	0.005
0.007	0.006
0.008	0.007
0.009	0.008
0.01	0.009
0.02	0.01
0.03	0.012

Mark the
Isochron
Ev. Track
Download
Download
Plot



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SimDAL Repository

Discover simulations projects dealing with one's research interest, get related info, and find the associated services.

- {tsearch} : text search of projects
- {services} : services for one project

- {projects} : list of projects
- {protocols} : list of protocols associated to one project
- project.xml : SimDM xml serialization for a project
- protocol.xml : SimDM xml serialization for a protocol

SimDAL Repository: tsearch

repository.php?q=*dusty*

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE type="results">
  <INFO name="QUERY_STATUS" value="OK"/>
  <TABLE name="results">
(...)
    <FIELD name="match" datatype="char" arraysize="*"/>
    <FIELD name="class" datatype="char" arraysize="*"/>
    <FIELD name="attribute" datatype="char" arraysize="*"/>
    <FIELD name="authority" datatype="char" arraysize="*"/>
    <FIELD name="project" datatype="char" arraysize="*"/>
    <FIELD name="descrip" datatype="char" arraysize="*"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>AMES-Dusty</TD>
          <TD>Resource</TD>
          <TD>name</TD>
          <TD>svo.cab</TD>
          <TD>ames_dusty</TD>
          <TD>Dust in equilibrium with gas phase, (only GNS1993 available)</TD>
        </TR>
(...)
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Repository: services

repository.php?what=services&project=ames_dusty

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE type="results">
  <INFO name="QUERY_STATUS" value="OK"/>
  <TABLE name="results">
    <FIELD name="vodid" datatype="char" arraysize="*"/>
    <FIELD name="authority" datatype="char" arraysize="*"/>
    <FIELD name="project" datatype="char" arraysize="*"/>
    <FIELD name="type" datatype="char" arraysize="*"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>ames_dusty</TD>
          <TD>svo.cab</TD>
          <TD>ames_dusty</TD>
          <TD>SimDAL_search_service</TD>
        </TR>
      </TABLEDATA>
    </DATA>
  </TABLE>
  <TABLE name="links">
    <FIELD name="service" datatype="char" arraysize="*"/>
    <FIELD name="link-rel" datatype="char" arraysize="*"/>
    <FIELD name="link-uri" datatype="char" arraysize="*"/>
    <GROUP name="foreign_key" ref="results">
      <GROUP>
        <PARAM name="local_field" value="service" datatype="char" arraysize="*"/>
        <FIELDRef ref="vodid"/>
      </GROUP>
    </GROUP>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>ames_dusty</TD>
          <TD>SimDAL/search</TD>
          <TD>http://mysimdal.com/search.php?project=ames_dusty</TD>
        </TR>
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Repository

- We have identified a project of interest:
  - ames_dusty
- and the corresponding SimDAL Search service URI:
  - http://mysimdal.com/search.php?project=ames_dusty
- we go now to the SimDAL Search service to search for simulations.

SimDAL Search

Dig into one project results,

- in terms of the relevant parameters for this project,
- specifying the desired range of values for these parameters,
- to find particular datasets.

In our case: find Dusty isochrones for age $\sim$ 0.7 Gyr.

SimDAL Search

Several functionalities

- {views} : different views of the data
- {view schema} : parameters for each view
- {cutout} : search into a view to find datasets
- {cutout-preview} : preview summary of the cutout

- {fields} : search fields
- {field schema} : see the schema.xml file for a field.

SimDAL Search: views

search.php?project=ames_dusty&what=views

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE type="results">
  <INFO name="QUERY_STATUS" value="OK"/>
  <TABLE name="results">
    <FIELD name="id" datatype="char" arraysize="*"/>
    <FIELD name="objecttype" datatype="char" arraysize="*"/>
    <FIELD name="protocol" datatype="char" arraysize="*"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>isochrones</TD>
          <TD>isochrone</TD>
          <TD>ames_dusty</TD>
        </TR>
        <TR>
          <TD>tracks</TD>
          <TD>track</TD>
          <TD>ames_dusty</TD>
        </TR>
      </TABLEDATA>
    </DATA>
  </TABLE>
```

SimDAL Search: views

search.php?project=ames_dusty&what=views

```
<VOTABLE XMLns="http://www.ivo
<RESOURCE type="results">
  <INFO name="QUERY_STATUS" va
  <TABLE name="results">
    <FIELD name="id" datatype=
    <FIELD name="objecttype" d
    <FIELD name="protocol" dat
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>isochrones</TD>
          <TD>isochrone</TD>
          <TD>ames_dusty</TD>
        </TR>
        <TR>
          <TD>tracks</TD>
          <TD>track</TD>
          <TD>ames_dusty</TD>
        </TR>
      </TABLEDATA>
    </DATA>
  </TABLE>
```

```
  <TABLE name="links">
    <FIELD name="view" datatype="char" arraysize="*"/>
    <FIELD name="link-rel" datatype="char" arraysize="*"/>
    <FIELD name="link-uri" datatype="char" arraysize="*"/>
    <GROUP name="foreign_key" ref="results">
      <GROUP>
        <PARAM name="local_field" value="view" datatype="char" arraysize="*"/>
        <FIELDRef ref="id"/>
      </GROUP>
    </GROUP>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>isochrones</TD>
          <TD>view/schema</TD>
          <TD>http://mysimdal.com/search.php?project=ames_dusty&amp;view=iso&amp;what=schema</TD>
        </TR>
        <TR>
          <TD>isochrones</TD>
          <TD>resources/cutout</TD>
          <TD>http://mysimdal.com/search.php?project=ames_dusty&amp;view=iso&amp;what=cutout</TD>
        </TR>
        <TR>
          <TD>isochrones</TD>
          <TD>simdal/data_access</TD>
          <TD>http://mysimdal.com/data.php?project=ames_dusty&amp;view=iso</TD>
        </TR>
(...)
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Search: view schema

search.php?project=ames_dusty&view=iso&what=schema

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE name="view_schema">
  <TABLE name="isochrones">
    <GROUP utype="vo-dml:Instance.root">
      <PARAM name="type" utype="vo-dml:Instance.type" value="simdm:resource/experiment/output_dataset" data
itype="char" arraysize="*"/>
      <PARAM name="object" utype="simdm:resource/experiment/output_dataset.object_type" value="isochrone" d
atatype="char" arraysize="*"/>
      <FIELDRef ref="fid" utype="simdm:resource/experiment/output_dataset.publisherdid"/>
      <FIELDRef ref="fid" utype="vo-dml:ObjectType.ID"/>
    </GROUP>

    <GROUP name="dataset_id">
      <FIELDRef ref="fid"/>
    </GROUP>

    <FIELD name="t" id="age" unit="Gyr" ucd="time.age"
           utype="simdm:/resource/experiment/parameter_setting.numeric_value.value" datatype="float">
      <DESCRIPTION>value for the age of the star in Gyr</DESCRIPTION>
      <VALUES>
        <MIN value="0.001" inclusive="yes"/>
        <MAX value="12" inclusive="yes"/>
      </VALUES>
      <LINK content-role="type" href="http://purl.org/astronomy/vocab/PhysicalQuantities/Age"/>
    </FIELD>
    <FIELD name="fid" id="fid"
           utype="simdm:resource/experiment/output_dataset.publisherdid" datatype="int"/>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Search: cutout

```
curl -H "Content-Type: application/JSON" -d

'{"where": [{":att": "t", ":op": ">", ":val": 0.5},
            {":att": "t", ":op": "<", ":val": 3}],
  "select": ["t"]}'

"http://.../search.php?project=ames_dusty&view=iso&what=cutout"
```

We require two conditions:

- $t > 0.5$
- $t < 3$

We ask only for one field in the results:

- t

SimDAL Search: cutout

```
curl -H "Content-Type: application/JSON" -d

'{"where": [{":att": "t", ":op": ">", ":val": 0.5},
            {":att": "t", ":op": "<", ":val": 3}],
  "select":

"http://...
```

We rec

- *t*
- *t*

We as

- *t*

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE name="cutout">
  <TABLE name="isochrones">
(...)
    <GROUP name="dataset_id">
      <FIELDRef ref="fid"/>
    </GROUP>
    <FIELD name="t" id="age" unit="Gyr" ucd="time.age"
           utype="simdm:/resource/experiment/parameter_setting.numeric_value.value" datatype="float">
      <DESCRIPTION>value for the age of the star in Gyr</DESCRIPTION>
      <LINK content-role="type" href="http://purl.org/astronomy/vocab/PhysicalQuantities/Age"/>
    </FIELD>
    <FIELD name="fid" id="fid"
           utype="simdm:resource/experiment/output_dataset.publisherdid" datatype="int"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>0.6</TD>
          <TD>106</TD>
        </TR>
        <TR>
          <TD>0.7</TD>
          <TD>107</TD>
        </TR>
        <TR>
          <TD>0.8</TD>
          <TD>108</TD>
        </TR>
(...)
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Search

- We have identified a dataset of interest:
  - t = 0.7 Gyr
  - dataset_id = 107
- and the corresponding SimDAL Data Access service URI:
  - http://mysimdal.com/data.php?project=ames_dusty&view=iso
- we go now to the SimDAL Data Access service to get the data.

SimDAL Data Access

Access a simulation dataset (raw) or a subset of it (cutout) for the results identified in the search.

- {datasets} : Info about a dataset (URL's, etc)
- {schema} : parameters/columns
- {raw} : download raw data
- {cutout} : select only a subset of data

SimDAL Data Access: datasets

data.php?project=ames_dusty&view=iso&what=datasets&dataset_id=107

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE type="results">
  <INFO name="QUERY_STATUS" value="OK"/>
  <PARAM name="dataset" value="107" datatype="int"/>
  <TABLE name="results">
    <FIELD name="id" datatype="char" arraysize="*"/>
    <FIELD name="objecttype" datatype="char" arraysize="*"/>
    <FIELD name="protocol" datatype="char" arraysize="*"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>107</TD>
          <TD>isochrone</TD>
          <TD>ames_dusty</TD>
        </TR>
      </TABLEDATA>
    </DATA>
  </TABLE>
```

SimDAL Data Access: datasets

data.php?project=ames_dusty&view=iso&what=datasets&dataset_id=107

```
<TABLE name="links">
  <FIELD name="dataset" datatype="char" arraysize="*"/>
  <FIELD name="link-rel" datatype="char" arraysize="*"/>
  <FIELD name="link-uri" datatype="char" arraysize="*"/>
  <GROUP name="foreign_key" ref="results">
    <GROUP>
      <PARAM name="local_field" value="dataset" datatype="char" arraysize="*"/>
      <FIELDRef ref="id"/>
    </GROUP>
  </GROUP>
  <DATA>
    <TABLEDATA>
      <TR>
        <TD>107</TD>
        <TD>dataset/schema</TD>
        <TD>http://mysimdal.com/data.php?project=ames_dusty&amp;view=iso&amp;dataset_id=107&amp;what=schema</TD>
      </TR>
      <TR>
        <TD>107</TD>
        <TD>resources/cutout/sync</TD>
        <TD>http://mysimdal.com/data.php?project=ames_dusty&amp;view=iso&amp;dataset_id=107&amp;what=cutout</TD>
      </TR>
      <TR>
        <TD>107</TD>
        <TD>resources/rawdata</TD>
        <TD>http://mysimdal.com/data.php?project=ames_dusty&amp;view=iso&amp;dataset_id=107&amp;what=raw</TD>
      </TR>
    </TABLEDATA>
  </DATA>
</TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Data Access: raw data

data.php?project=ames_dusty&view=iso&what=raw&dataset_id=107

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE name="results">
  <TABLE>
(...)
    <FIELD name="t" id="t" unit="Gyr" ucd="time.age" datatype="float"/>
    <FIELD name="m" id="m" unit="Msun" ucd="phys.mass" datatype="float"/>
    <FIELD name="teff" id="teff" unit="K" ucd="phys.temperature.effective" datatype="float"/>
    <FIELD name="logg" id="logg" unit="" ucd="phys.gravity" datatype="float"/>
    <FIELD name="logL" id="logL" unit="" ucd="phys.luminosity" datatype="float"/>
    <FIELD name="Lum" id="Lum" unit="Lsun" ucd="phys.luminosity" datatype="float"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>0.700</TD>
          <TD>0.0090</TD>
          <TD>510.</TD>
          <TD>4.32</TD>
          <TD>-6.15</TD>
          <TD>7.0794578438414E-7</TD>
        </TR>
        <TR>
          <TD>0.700</TD>
          <TD>0.0100</TD>
          <TD>545.</TD>
          <TD>4.37</TD>
          <TD>-6.04</TD>
          <TD>9.1201083935591E-7</TD>
        </TR>
        <TR>
          <TD>0.700</TD>
          <TD>0.0120</TD>
          <TD>665.</TD>
          <TD>4.45</TD>
          <TD>-5.70</TD>
          <TD>1.9952623149689E-6</TD>
        </TR>
(...)
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Data Access: schema

data.php?project=ames_dusty&view=iso&what=schema&dataset_id=107

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE name="view_schema">
  <TABLE name="isochrones">
    <PARAM name="object" value="isochrone"
           utype="simdm:resource/experiment/output_dataset.object_type" datatype="char" arraysize="*"/>
    <PARAM name="dataset_id" value="107"
           utype="simdm:resource/experiment/output_dataset.publisherdid" datatype="int"/>
    <PARAM name="t" value="0.7" id="age" unit="Gyr" ucd="time.age"
           utype="simdm:/resource/experiment/parameter_setting.numeric_value.value" datatype="float">
      <DESCRIPTION>value for the age of the star in Gyr</DESCRIPTION>
      <LINK content-role="type" href="http://purl.org/astronomy/vocab/PhysicalQuantities/Age"/>
    </PARAM>

    <FIELD name="t" id="t" unit="Gyr" ucd="time.age" datatype="float">
      <DESCRIPTION>value for the age of the star in Gyr</DESCRIPTION>
    </FIELD>
    <FIELD name="m" id="m" unit="Msun" ucd="phys.mass" datatype="float">
      <DESCRIPTION>M/Ms = mass in Msun</DESCRIPTION>
    </FIELD>
    <FIELD name="teff" id="teff" unit="K" ucd="phys.temperature.effective" datatype="float">
      <DESCRIPTION>value for the effective temperature for the model.
      Temperatures are given in K</DESCRIPTION>
    </FIELD>
    <FIELD name="logg" id="logg" unit="" ucd="phys.gravity" datatype="float">
      <DESCRIPTION>log g</DESCRIPTION>
    </FIELD>
    <FIELD name="logL" id="logL" unit="" ucd="phys.luminosity" datatype="float">
      <DESCRIPTION>log(L/Lsun)</DESCRIPTION>
    </FIELD>
    <FIELD name="Lum" id="Lum" unit="Lsun" ucd="phys.luminosity" datatype="float">
      <DESCRIPTION>L/Lsun</DESCRIPTION>
    </FIELD>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

SimDAL Data Access: cutout

```
curl -H "Content-Type: application/JSON" -d

'{"where": [{":att": "teff", ":op": ">", ":val": 2000},
            {":att": "LogL", ":op": "<", ":val": -3}],
  "select": ["teff","LogL"]}'

"http://.../data.php?project=ames_dusty&view=iso&what=cutout&dataset_id=107"
```

We require two conditions:

- $teff > 2000$ K
- $LogL < -3$

We ask only for two fields in the results:

- *teff*
- *LogL*

SimDAL Data Access: cutout

```
curl -H "Content-Type: application/JSON" -d

'{"where": [{":att": "teff", "
            {":att": "LogL", "
  "select": ["teff","LogL"]}'

"http://.../data.php?project=a
```

We require two con

- *teff* $>$ 2000 K
- *LogL* $<$ -3

We ask only for two

- *teff*
- *LogL*

```
<VOTABLE XMLns="http://www.ivoa.net/XML/VOTable/v1.2">
<RESOURCE name="results">
  <TABLE name="">
(...)
    <FIELD name="teff" id="teff" unit="K" ucd="phys.temperature.effective" datatype="float"/>
    <FIELD name="logL" id="logL" unit="" ucd="phys.luminosity" datatype="float"/>
    <DATA>
      <TABLEDATA>
        <TR>
          <TD>2015.</TD>
          <TD>-3.85</TD>
        </TR>
        <TR>
          <TD>2102.</TD>
          <TD>-3.77</TD>
        </TR>
        <TR>
          <TD>2153.</TD>
          <TD>-3.72</TD>
        </TR>
        <TR>
          <TD>2212.</TD>
          <TD>-3.66</TD>
        </TR>
        <TR>
          <TD>2295.</TD>
          <TD>-3.59</TD>
        </TR>
        <TR>
          <TD>2422.</TD>
          <TD>-3.47</TD>
        </TR>
        <TR>
          <TD>2543.</TD>
          <TD>-3.35</TD>
        </TR>
(...)
      </TABLEDATA>
    </DATA>
  </TABLE>
</RESOURCE>
</VOTABLE>
```

In summary

We have finally got the data that we wanted!

- Repository:
  - {tsearch} : Identify a collection of isochrones.
  - {services} : Get Search URL.
- Search:
  - {views} : Identify a view and get Data Access URL.
  - {schema} : Get relevant fields to make a search (age) and the valid range/s of values.
  - {cutout} : Make a search for some values of the fields and identify a dataset_id.
- Data Access:
  - {datasets} : Get the URL's for this dataset_id.
  - {schema} : Get the fields for this dataset_id.
  - {raw} : Download the full isochrone.
  - {cutout} : Make a cutout using the fields.

Feedback: good

- SimDAL allows to create this type of service/s.
- And it is posible to find and retrieve isochrones from the service.
- That's great.

Feedback: not clear

project vs protocol.

- I don't see the difference between both concepts, and how that's expected to be implemented.
- I don't find it explained in the simDAL document.
- And even in SimDM it's not very clear (for me).
- This is not a problem for this particular implementation because I have decided to have a 1-1 relation between protocols and projects but this should be clarified.

Feedback: SimDM xml serializations

Relying on what are called SimDM xml serializations for any important feature would be dangerous.

- simDM is too complex and conceptually flexible to be predictable and authomatically understable.
- I would expect a mess from a number of reasons:
  - incorrect simDM serializations,
  - incorrect interpretation of them from applications,
  - several services providing serializations of similar concepts in ways difficult to compare to each other.
- protocol.xml, project.xml, experiment.xml, vo-dml simDM serializations... are ok as something that can be provided just in case somebody gets some profit of them.
- But no important protocol operation should rely on them.

Feedback: not so many endpoints?

Many functionalities to implement (from the service point of view) and many queries to do (from user/application).

- Repository: {tsearch}. Include search URI's, in a "links" table?
  $\Rightarrow$ A single tsearch query would be enough to have the more relevant information and, in most cases, go directly to the Search service.
- Search: {fields}. Mostly redundant.
  You already need to get the full list of fields in the "schema" in order to do a cutout.
- Full listing functionalities. Too many. Really useful?
  - Repository: {projects}, {protocols},
  - Search: {experiments},
  - Data Access: {datasets}.

Feedback: Human readable descriptions

It would be useful to add human-readable description at some points. For instance:

- Repository {tsearch}: Add a field with a human readable description of found projects.
- Search {views} : Add a field with a human readable description of each view.
- etc.

Implementators are free to include extra fields (I have done it in the tsearch). But it would be nice that this is defined in SimDAL document so that applications know where to look for the information.

Feedback: {cutout} fields

fields: (a, b, c, d, e, f)

select {a,e,f} where a<5 && b> 2 && c=2.3

Now: all fields can be used in queries both in 'select' and 'where'.

We **need** to allow services to specify that some fields can be used in a 'where' clause and some can't.

Solution: use Data-Link approach for self-described services in "view schemas" (both in Search and Data Access). (?)

- Database queries.
  - a service could allow only queries on indexed columns, but allow to retrieve all columns.
  - Example: Asteroseismology: Huge database of models, complex joins of tables, etc. This service cannot accept queries on all the available fields.
- On the fly calculation services.
  - Some simDAL services could calculate quantities on the fly. You can retrieve those values but, in principle, not making a 'where' condition on them.
  - Example: Interpolation of isochrones and tracks. Given (*teff*, *Lum*) the values of (*age*, *mass*) are calculated on the fly. All can be seen as fields but only (*teff*, *Lum*) can be used in a 'where' clause.

Feedback: complex 'datasets'

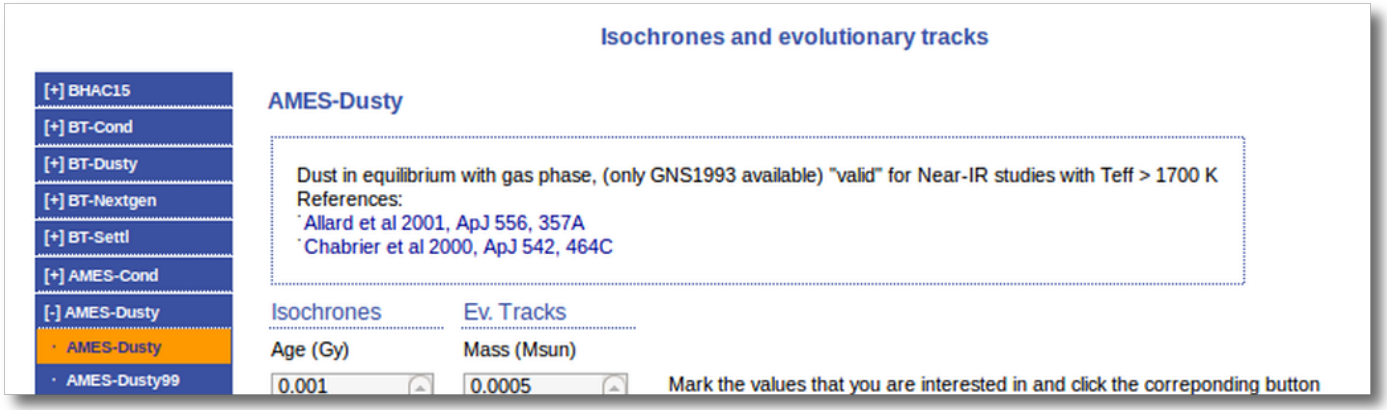
- SimDAL lacks the posibility of implementing services so that a 'dataset' is made of several files of different types.
- We need a way to link several results.

- Natural solution, in SimDAL 'style', seems to be:
  - replicate, in SimDAL DataAccess, the "views" functionality already present in SimDAL Search.

- Example: for asteroseismology models, the final result of each experiment is :
  - the stellar structure (many stellar properties as a function of radius) and
  - the oscillation spectra for that star (frequencies, energies, etc for each oscillation mode).

  $\Rightarrow$ two views for the same dataset_id

Feedback: citable references



- Having easy access to references to papers that should be cited (or at least, extra documentation url's, how to acknowledge, etc) is specially important for theoretical services.
- We should give this information in an easy to access place.
- Maybe, at least, in "views" as links (with some extra information)?.

Feedback: summary

- Easy to implement for this simple case (appart from simDM xml serializations)
- Suggested improvements:
  - Some clarifications/explanations.
  - Make optional, at least, all functionalities that don't seem useful, specially 'full listings' (most already are).
- More important:
  - Make citable references explicit and easy to access.
  - Fields: specifying which ones can be used for cutout or only for retrieval.
  - Allow that several files can be linked as belonging to the same dataset. For instance, adding a "views" functionality to DataAccess.

THANK YOU!