



# Pollux Provenance Status

Michèle Sanguillon



# Pollux



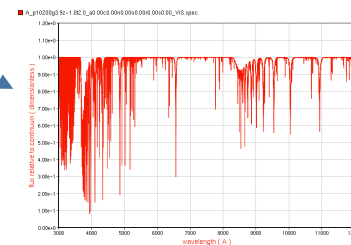
POLLUX database collects and presents very high resolution synthetic spectra computed\* at high resolution.

- The computing of the spectra is done by the producers and not done on the fly.



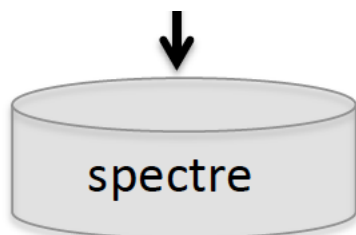
temperature = 5000°K  
gravity = ...

...





# Pollux data and database



Entête  
+  
Données

```
header_name_SSHR = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_VIS.spec.txt'
short_name_SSHR  = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_VIS.spec'
Key_SSHR         = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_conv1.5convny0.076convb0.5mti'

code1            = 'marcs'          / code for atmosphere model
version1         = '2008.5'         / version of code for model atmosphere
type            = 'p'               / type of model atmosphere (Spherical/Parallel)
filename         = 'p7250_g+5.0_m0.0_t01_st_z+1.00_a+0.00_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod' / model atm
author_mod       = 'Marcs-team'     / model atmosphere creator name

Teff             = '7250'           / effective temperature (K) - model atmosphere data
logg            = '5.0'            / log10(gravity) (cgs) - model atmosphere data
mass            = 'irrelevant'      / mass (solar mass) - model atmosphere data
lum             = 'irrelevant'      / luminosity (solar luminosity) - model atmosphere data
turbvel         = '1.00'           / microturbulent velocity (km/s) - model atmosphere data

conv_alpha       = '1.5'           / convection parameter (conva) - model atmosphere data
conv_ny          = '8.0'           / convection parameter (convny) - model atmosphere data
conv_y          = '0.076'          / convection parameter (convy) - model atmosphere data
conv_beta        = '0.5'           / convection parameter (convb) - model atmosphere data
macroturbvel     = '0.0'           / macroturbulence parameter (mt) - model atmosphere data
macrobeta        = '0.0'           / macroturbulence parameter (mb) - model atmosphere data

Mdot            = 'irrelevant'      / log10(mass loss) (solar mass/year) - model atmosphere data
Vinfy           = 'irrelevant'      / terminal velocity (km/s) - model atmosphere data
beta            = 'irrelevant'      / velocity law parameter - model atmosphere data
finfty          = 'irrelevant'      / 1st clumping law parameter - model atmosphere data
vcl             = 'irrelevant'      / 2nd clumping law parameter (km/s) - model atmosphere data

metallic_mod     = '1.00'           / metallicity ([Fe/H])
alpha_mod        = '0.000'         / [alpha/Fe]
r_process_mod    = '0.000'         / [r elements/Fe]
s_process_mod    = '0.000'         / [s elements/Fe]
```

```
PolluxSpectrum
#key: string
+short_name: string
+creation_date: datetime
+code1: string
+version1: string
+author1: string
+model_atmosphere: string
+code2: string
+version2: string
+author2: string
+teff: float
+logg: float
+...
```



# One of our motivations for Provenance



A way to **display** all our provenance information in VO spectra tools, **easy readable** and **normalized**

## Flat header (Web users)

```
header_name_SSHR = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_VIS.spec.txt'
short_name_SSHR = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_VIS.spec'
Key_SSHR         = 'M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_conv1.5convny8.0convy0.076convb0.5mt'

code1             = 'marcs'                / code for atmosphere model
version1          = '2008.5'              / version of code for model atmosphere
type              = 'p'                   / type of model atmosphere (Spherical/Parallel)
filename          = 'p7250_g+5.0_m0.0_t01_st_z+1.00_o+0.00_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod' / model atm
author_mod        = 'Marcs-team'          / model atmosphere creator name

Teff              = '7250'                 / effective temperature (K) - model atmosphere data
logg              = '5.0'                  / log10(gravity) (cgs) - model atmosphere data
mass              = 'irrelevant'           / mass (solar mass) - model atmosphere data
lum               = 'irrelevant'           / luminosity (solar luminosity) - model atmosphere data
turbvel           = '1.00'                 / microturbulent velocity (km/s) - model atmosphere data

conv_alpha        = '1.5'                  / convection parameter (conva) - model atmosphere data
conv_ny           = '8.0'                  / convection parameter (convny) - model atmosphere data
conv_y            = '0.076'                / convection parameter (convy) - model atmosphere data
conv_beta         = '0.5'                  / convection parameter (convb) - model atmosphere data
macroturbvel      = '0.0'                  / macroturbulence parameter (mt) - model atmosphere data
macrobeta         = '0.0'                  / macroturbulence parameter (mb) - model atmosphere data

Mdot              = 'irrelevant'           / log10(mass loss) (solar mass/year) - model atmosphere data
Vinfy             = 'irrelevant'           / terminal velocity (km/s) - model atmosphere data
beta              = 'irrelevant'           / velocity law parameter - model atmosphere data
finfy             = 'irrelevant'           / 1st clumping law parameter - model atmosphere data
vc1               = 'irrelevant'           / 2nd clumping law parameter (km/s) - model atmosphere data

metallic_mod      = '1.00'                 / metallicity ([Fe/H])
alpha_mod         = '0.000'                / [alpha/Fe]
r_process_mod     = '0.000'                / [r elements/Fe]
s_process_mod     = '0.000'                / [s elements/Fe]
```

Easy to read and to understand

Keywords and format not normalized

No UCD, no utypes

## Fits header (OV users)

```
<PARAM arraysize="60" datatype="char" name="short_name_SSHR" value="M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_VIS.spec.txt">
<PARAM arraysize="106" datatype="char" name="Key_SSHR" value="M_p7250g5.0z1.00t1.0_a0.00c0.00n0.00o0.00r0.00s0.00_conv1.5convny8.0convy0.076convb0.5mt">
<DESCRIPTION>code for atmosphere model</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="version1" ucd="meta.code;meta.version" value="2008.5">
<DESCRIPTION>version of code for model atmosphere</DESCRIPTION>
</PARAM>
<PARAM arraysize="1" datatype="char" name="type" ucd="meta.code.class" value="p">
<DESCRIPTION>type of model atmosphere (Spherical/Parallel)</DESCRIPTION>
</PARAM>
<PARAM arraysize="76" datatype="char" name="filename" ucd="meta.id;meta.file" value="p7250_g+5.0_m0.0_t01_st_z+1.00_o+0.00_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod">
<DESCRIPTION>model atmosphere filename</DESCRIPTION>
</PARAM>
<PARAM arraysize="10" datatype="char" name="author_mod" ucd="meta.bib.author" value="Marcs-team">
<DESCRIPTION>model atmosphere creator name</DESCRIPTION>
</PARAM>
<PARAM datatype="int" name="Teff" ucd="phys.temperature.effective" unit="K" value="7250">
<DESCRIPTION>effective temperature (K) - model atmosphere data</DESCRIPTION>
</PARAM>
<PARAM datatype="float" name="logg" ucd="phys.gravity;arith.zp" unit="log(cm/s2)" value="5.0">
<DESCRIPTION>log10(gravity) (cgs) - model atmosphere data</DESCRIPTION>
</PARAM>
<PARAM arraysize="10" datatype="char" name="mass" ucd="phys.mass" unit="M_sun" value="irrelevant">
<DESCRIPTION>mass (solar mass) - model atmosphere data</DESCRIPTION>
</PARAM>
<PARAM arraysize="10" datatype="char" name="lum" ucd="phys.luminosity" unit="L_sun" value="irrelevant">
<DESCRIPTION>luminosity (solar luminosity) - model atmosphere data</DESCRIPTION>
</PARAM>
```

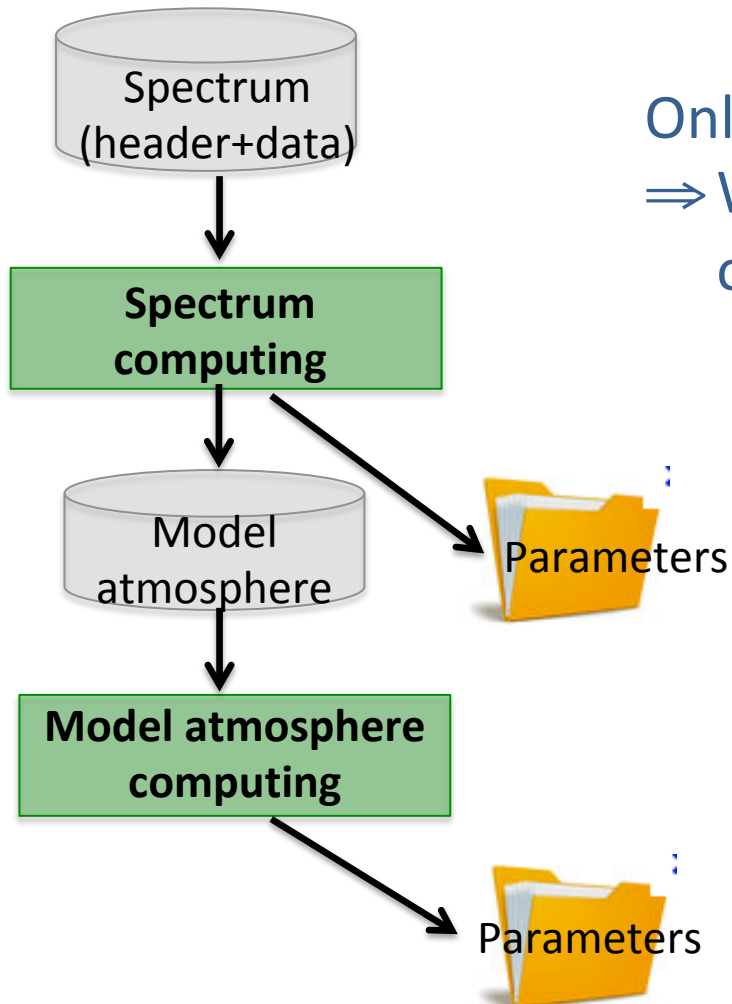
Not very easy to read and to understand

VOTable (normalized)

UCD, no utypes



# Pollux spectra history



Only the spectra are available on the VO  
⇒ We decide to provide the provenance of these items first



# Pollux database



All the metadata are in the database:  
mainly one table

| PolluxSpectrum            |
|---------------------------|
| +key: string              |
| +short_name: string       |
| +creation_date: datetime  |
| +code1: string            |
| +version1: string         |
| +author1: string          |
| +model_atmosphere: string |
| +code2: string            |
| +version2: string         |
| +author2: string          |
| +teff: float              |
| +logg: float              |
| +...                      |



# ProvSAP parameters



| Parameter      | Values                                             | Description                                                                                                      |
|----------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| ID             | qualified ID                                       | a valid qualified identifier for an entity, activity or agent (can occur multiple times)                         |
| DEPTH          | 0,1,2,..., ALL                                     | number of relations to be followed or ALL for everything, independent of the relation type                       |
| RESPONSEFORMAT | PROV-N,<br>PROV-JSON,<br>PROV-XML,<br>PROV-VOTABLE | serialisation format of the response                                                                             |
| DIRECTION      | <u>BACK</u> , FORTH                                | BACK = track the provenance history, FORTH = explore the results of activities and where entities have been used |
| MEMBERS        | true (1) or <u>false</u> (0)                       | if true/1, retrieve and track members of collections                                                             |
| STEPS          | true (1) or <u>false</u> (0)                       | if true/1, retrieve and track steps of activityFlows                                                             |
| AGENT          | true (1) or <u>false</u> (0)                       | if true/1, explore all relations for agents, i.e. find out what an agent is responsible for                      |
| MODEL          | <u>IVOA</u> or W3C                                 | compatibility of the serialization to the IVOA or W3C provenance data model                                      |

Multiple ID  
spectra ids only

DEPTH: 0,1,...,ALL (one is items with one relation? )

RESPONSEFORMAT: PROV-N, PROV-JSON, PROV-XML, PROV-VOTABLE, SVG

DIRECTION: BACK only

MEMBERS: no coll defined

STEPS: no workflow defined

AGENT: true or false

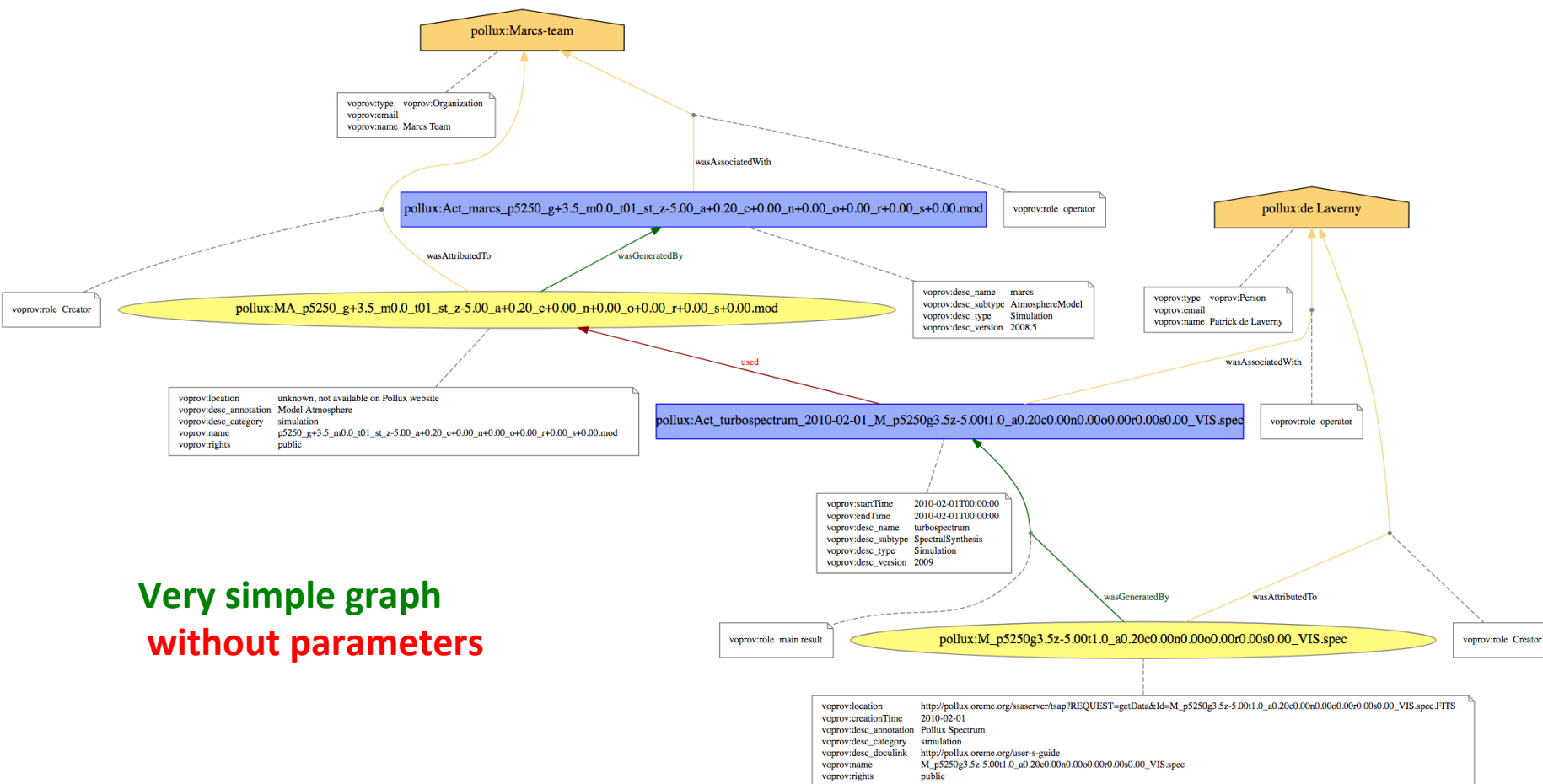
MODEL: with voprov prefix



# ProvSAP SVG



[http://pollux.oreme.org/vo/provsap?id=M\\_p5250g3.5z-5.00t1.0\\_a0.20c0.00n0.00o0.00r0.00s0.00\\_VIS.spec.FITS&RESPONSEFORMAT=SVG&DEPTH=ALL&AGENT=true](http://pollux.oreme.org/vo/provsap?id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS&RESPONSEFORMAT=SVG&DEPTH=ALL&AGENT=true)



**Very simple graph**  
**without parameters**





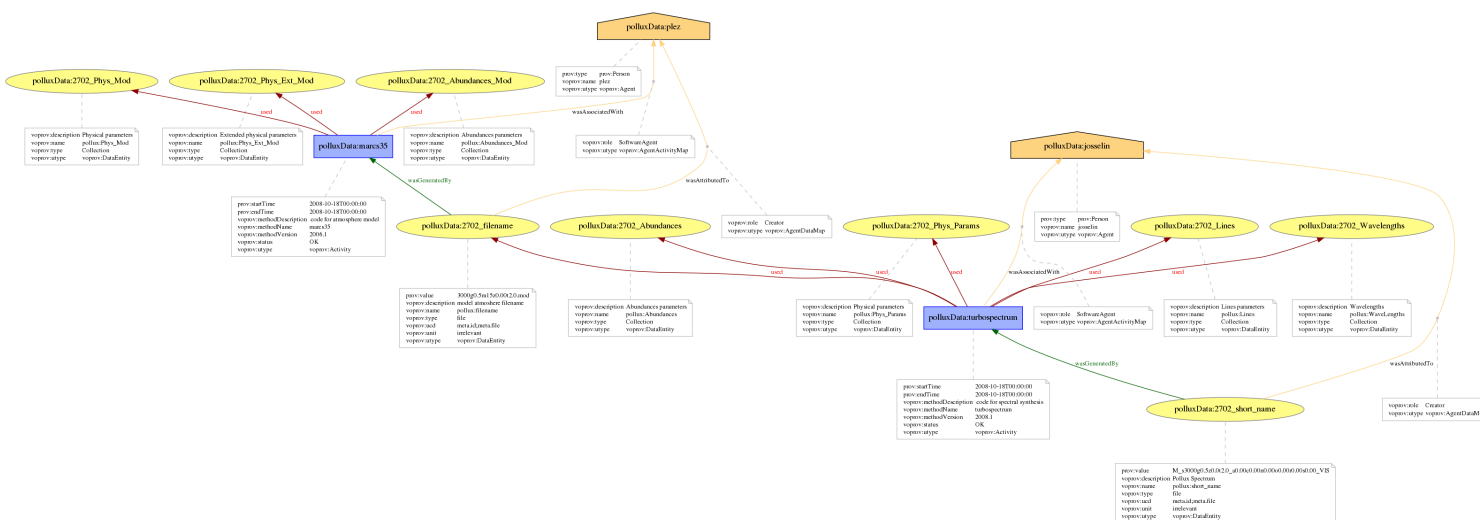
# ProvSAP SVG



Test example

EASY READABLE if not too many parameters

NOT EASY READABLE or PROBLEM if too many parameters





# ProvSAP PROV-N



[http://pollux.oreme.org/vo/provsap?  
id=M\\_p5250g3.5z-5.00t1.0\\_a0.20c0.00n0.00o0.00r0.00s0.00\\_VIS.spec.FITS  
&RESPONSEFORMAT=PROV-N&DEPTH=ALL&AGENT=true](http://pollux.oreme.org/vo/provsap?id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS&RESPONSEFORMAT=PROV-N&DEPTH=ALL&AGENT=true)

```
entity(pollux:M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec,  
[voprov:desc_annotation="Pollux Spectrum",  
voprov:name="M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec",  
voprov:rights="public", voprov:desc_doculink="http://pollux.oreme.org/user-s-guide",  
voprov:creationTime="2010-02-01", voprov:location="http://pollux.oreme.org/ssaserver/  
tsap?  
REQUEST=getData&Id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS",  
voprov:desc_category="simulation"])  
  
activity(pollux:Act_turbospectrum_2010-02-01_M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r  
0.00s0.00_VIS.spec, 2010-02-01T00:00:00, 2010-02-01T00:00:00,  
[voprov:desc_name="turbospectrum", voprov:desc_type="Simulation",  
voprov:desc_version="2009", voprov:desc_subtype="SpectralSynthesis"])  
wasGeneratedBy(pollux:M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec,  
pollux:Act_turbospectrum_2010-02-01_M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00  
_VIS.spec, -, [voprov:role="main result"])  
agent(pollux:de Laverny, [voprov:email="", voprov:type="voprov:Person",  
voprov:name="Patrick de Laverny"])  
wasAttributedTo(pollux:M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec,  
pollux:de Laverny, [voprov:role="Creator"])
```



# ProvSAP PROV-JSON



[http://pollux.oreme.org/vo/provsap?  
id=M\\_p5250g3.5z-5.00t1.0\\_a0.20c0.00n0.00o0.00r0.00s0.00\\_VIS.spec.FITS  
&RESPONSEFORMAT=PROV-JSON&DEPTH=ALL&AGENT=true](http://pollux.oreme.org/vo/provsap?id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS&RESPONSEFORMAT=PROV-JSON&DEPTH=ALL&AGENT=true)

```
{  
  "entity": {  
    "pollux:M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec": {  
      "voprov:desc_category": "simulation",  
      "voprov:desc_annotation": "Pollux Spectrum",  
      "voprov:creationTime": "2010-02-01",  
      "voprov:desc_doculink": "http://pollux.oreme.org/user-s-guide",  
      "voprov:location": "http://pollux.oreme.org/ssaserver/tsap?  
REQUEST=getData&Id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS",  
      "voprov:rights": "public",  
      "voprov:name": "M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec"  
    },  
    "pollux:MA_p5250_g+3.5_m0.0_t01_st_z-5.00_a+0.20_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod": {  
      "voprov:name": "p5250_g+3.5_m0.0_t01_st_z-5.00_a+0.20_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod",  
      "voprov:location": "unknown, not available on Pollux website",  
      "voprov:desc_category": "simulation",  
      "voprov:rights": "public",  
      "voprov:desc_annotation": "Model Atmosphere"  
    }  
  }  
},  
..
```



# ProvSAP PROV-VOTABLE



<http://pollux.oreme.org/vo/provsap?>

[id=M\\_p5250g3.5z-5.00t1.0\\_a0.20c0.00n0.00o0.00r0.00s0.00\\_VIS.spec.FITS](http://pollux.oreme.org/vo/provsap?id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS)

[&RESPONSEFORMAT=PROV-VOTABLE&DEPTH=ALL&AGENT=true](http://pollux.oreme.org/vo/provsap?id=M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec.FITS&RESPONSEFORMAT=PROV-VOTABLE&DEPTH=ALL&AGENT=true)

```
<TABLE name="Entity" utype="voprov:Entity">
  <FIELD arraysize="*" datatype="char" name="id" ucd="meta.id" utype="voprov:Entity.id"/>
  <FIELD arraysize="*" datatype="char" name="name" ucd="meta.title" utype="voprov:Entity.name"/>
  <FIELD arraysize="*" datatype="char" name="rights" ucd="" utype="voprov:Entity.rights"/>
  <FIELD arraysize="*" datatype="char" name="desc_annotation" ucd="meta.description"
utype="voprov:EntityDescription.annotation"/>
  <FIELD arraysize="*" datatype="char" name="desc_doculink" ucd="meta.ref.url"
utype="voprov:EntityDescription.doculink"/>
  <DATA>
    <TABLEDATA>
      <TR>
        <TD>pollux:M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec</TD>
        <TD>M_p5250g3.5z-5.00t1.0_a0.20c0.00n0.00o0.00r0.00s0.00_VIS.spec</TD>
        <TD>public</TD>
        <TD>Pollux Spectrum</TD>
        <TD>http://pollux.oreme.org/user-s-guide</TD>
      </TR>
      <TR>
        <TD>pollux:MA_p5250_g+3.5_m0.0_t01_st_z-5.00_a+0.20_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod</TD>
        <TD>p5250_g+3.5_m0.0_t01_st_z-5.00_a+0.20_c+0.00_n+0.00_o+0.00_r+0.00_s+0.00.mod</TD>
        <TD>public</TD>
        <TD>Model Atmosphere</TD>
        <TD></TD>
      </TR>
    </TABLEDATA>
  </DATA>
</TABLE>
```



# Pollux Provenance Status



Thank you for your attention

**Any questions?**