

INTEGRATION OF SYNTHETIC SPECTRA AND SEDs IN THE VIRTUAL OBSERVATORY

Example of the POLLUX database

<http://pollux.graal.univ-montp2.fr>

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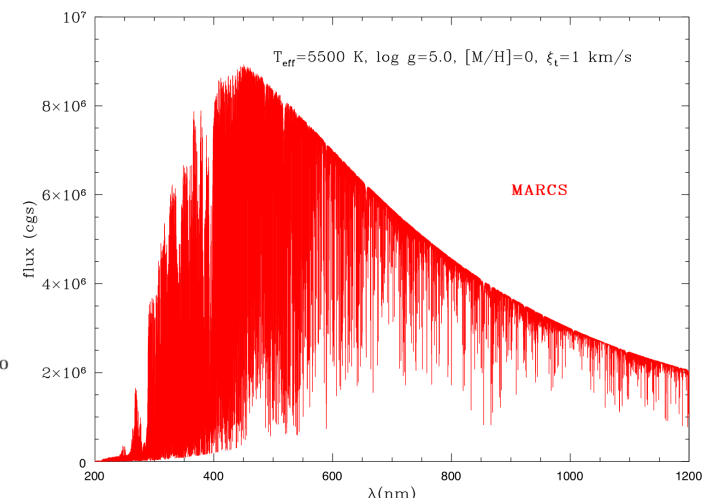
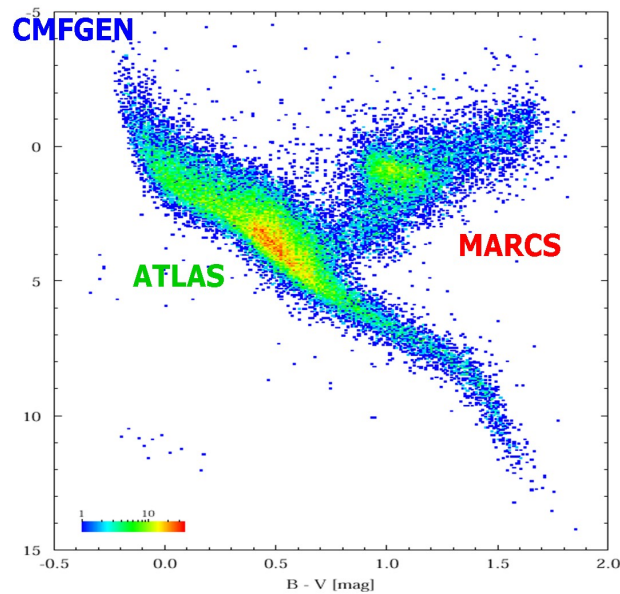
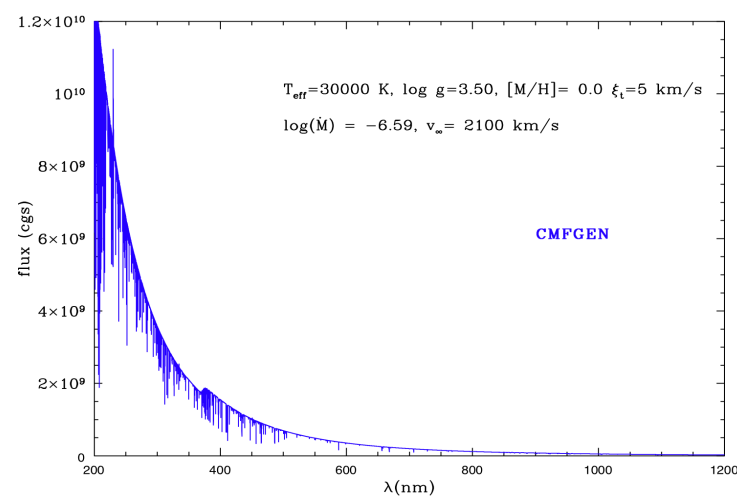
POLLUX in June 2007 – Test phase in progress

High-resolution synthetic stellar spectra and SEDs covering a large portion of the colour-magnitude diagram in terms of spectral types.

Data generated using the MARCS/TURBOSPECTRUM and CMFGEN/CMF_FLUX codes for stellar atmospheres modelling / spectral synthesis.

First release outside VO with dedicated visualization tool and retrieval function

Further developments : on-the-fly convolution, VO orientation => **TSAP** needed



Example of description of searchable entries in the POLLUX database

Actual data : λ , F_{rel} , F_{norm}

Searchable input parameters : T_{eff} , $\log g$, metallicity + abundances

name	ucd	unit	datatype	description
Code1	meta.id;meta.ref;meta.software		Long	Code used for model atmosphere [+ curation = Code1.doc : description origin, version, author, physics....]
Filename	meta.id		Long	model atmosphere filename
Teff	phys.temperature.effective	K	Int	effective temperature (MA parameter)
logg	phys.gravity	log(cm/s2)	Float	base 10 logarithm of the surface gravity (MA parameter)
mass	phys.mass	M_sun	Float	mass in solar mass unit (MA parameter)
Lum	phys.luminosity	L_sun	Int	luminosity in solar luminosity unit (MA parameter)
TURBVEL	phys.velociy.microTurb	km/s	Float	microturbulence velocity (MA parameter)
Code2	meta.id;meta.ref;meta.software		Long	Code used for spectral synthesis [+ curation = Code2.doc : description origin, version, author, physics....]
TURBVEL_Vmin	phys.velociy.microTurb;arith	km/s	Float	minimum microturbulence velocity (SS parameter)
TURBVEL_Vmax	phys.velociy.microTurb;arith	km/s	Float	maximum microturbulence velocity (SS parameter)
METALLIC_SSHR	phys.abund.Fe phys.abund.Z	dex	Float	abundance of iron (SS parameter-MARCS data) or of heavy elements (SS parameter-CMFGEN data)
ALPHA_SSHR	phys.abund	dex	Float	abundance of alpha elements (SS parameter) relative to iron in a logarithmic scale based on the sun
Carbon	phys.abund	dex	Float	abundance of Carbon (relative to iron)
Oxygen	phys.abund	dex	Float	abundance of Oxygen (relative to iron)
Nitrogen	phys.abund	dex	Float	abundance of Nitrogen (relative to iron)
R_PROCESS_SSHR	phys.abund	dex	Float	abundance of r-process elements (relative to iron)
S_PROCESS_SSHR	phys.abund	dex	Float	abundance of s-process elements (relative to iron)
Column1	em.wl;em.opt	nm	Float	wavelength in air (SSHR) [+ precision="6" width="10"]
Column2	meta.modelled		Float	wavelength in vacuum (SED)
Column3	meta.modelled	erg/cm^2/s/A (?)	Float	flux (or intensity) relative to continuum absolute flux (or intensity) [+ precision="8" width="20"]

How to publish these data in the VO ?

VO protocol to access observed spectra (SSAP) built around coordinates / real objects

⇒ not applicable to theoretical data

Main concerns for theoretical spectra :

- ⌘ existence of a protocol allowing dialog with the database

TSAP proposed by ESAC-SVO

need “how to” to implement this protocol – need for validation

- ⌘ existence of adapted/dedicated semantics

Theory semantics IVOA technical note 9/9/2006

implication for the semantics related to stellar modelling (interior+atmospheres)

- ⌘ existence of applications able to exploit the theoretical data

VOSpec, SVO-LAEFF Theoretical Data Server

need more basic application that would query the database with TSAP and forward a list of available spectra that can be retrieved

POLLUX Team propositions

Theory Semantics – Stellar physics and stellar spectra

Abundance definition ambiguity (mass fractions or bracket abundances ?)

Refine the definition of existing descriptors (reference solar abundances, ...)

Need for additional descriptors characteristic of stellar physics modelling (convection, clumping, macro-turbulence, ...)

Need to push the creation of new UCDs branches for better tracking of the metadata origin (examples : P model , Q model.stellar.atmosphere, Q model.stellar.evol)

Science / Use Cases

Building of spectral libraries for population synthesis

Determination of stellar parameters via comparison of observed and synthetic spectra

Missing Applications

Retrieval application for theoretical spectra in various VO-compliant databases