

# SSP models in the VO framework



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The theory interest group in the International Virtual Observatory Alliance (IVOA) has the goal of ensuring that theoretical data and services are taken into account in the IVOA standards process. In this poster we present some of the efforts carried out by this group to include Evolutionary Synthesis Models in the VO framework. In particular we present the VO tool PGos3, developed by the Spanish Virtual Observatory and the INAOE (Mexico) that includes most of public SSP models in the VO framework (e.g. VOSpec). I will also present the problems related with the inclusion of synthesis models in the VO framework and I will try to encourage people in the meeting to join the IVOA theory working group, where the data model of synthesis models (the way how synthesis models must be described) have to be defined.

## What is the VO?

Where is the "system"?  
 Does it mean operative system? NO, it means a working environment, just like KDE, Gnome or Windows

The Virtual Observatory is a **system** that allows astronomers to interrogate multiple data centers in a seamless and transparent way, which provides new powerful **analysis and visualization tools** within that system, and which gives data centers a standard framework for **publishing and delivering services using their data**. This is made possible by **standardization of data and metadata**, by standardization of **data exchange methods**, and by the use of a **registry**, which lists available services and what can be done with them.

... but it says "their data"...  
 Does it mean using "analysis tools" with data from different machines and formats whatever the operating system?  
**YES!!**

The long term vision is not one of a fixed specific software package, but rather one of a **framework** which enables data centers to provide competing and co-operating data services, and which enables software providers to offer a variety of compatible analysis and visualization tools and user interfaces. The first priority for the VO projects worldwide is to develop the standardized framework, which will allow such **creative diversity**

Ok, so it is needed a more general standard than FITS, since it should also include data which are not in FITS (but the standard also should include FITS, that is already common in most observatories)...  
 ... and something that describes the data themselves (**metadata**)...  
 ... and to establish the communication between machines...  
 ... and "yellow-pages" for search resources...

International Virtual Observatory  
 International Virtual Observatory Alliance Guidelines for Participation. R. J. Hanisch and P. J. Quinn 2003-07-01  
<http://www.ivoa.net/pub/info/VOA-participation-Jul03.pdf>  
 See also 2006 version: <http://ivoa.net/Documents/latest/VOAParticipation.html>

## IVOA (http://www.ivoa.net)

The International Virtual Observatory Alliance (IVOA) was formed in June 2002 with a mission to facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory.

This is the web page with current IVOA activities, working and interest groups. In color are marked the groups related with synthesis models activities (see also IVOA Roadmap for an explanation of the color code used).

Welcome to the IVOA TWiki!

This is the web-based collaboration area of the International Virtual Observatory Alliance

Main topics:

- Who is Who?
- Events
- Reports & Minutes
- Forums
- Technical Milestones

Working Groups:

- Discovery
- Standards & Processes
- Interest Group
- Analysis
- VO Event
- VO Query Languages
- GGF Astro-RG
- Grid & Web Services
- VOTable
- Data Curation & Preservation

List of Initial working Draft documents (version < 1.0): InitialWorkingDrafts

<http://www.ivoa.net> → Community

## IVOA Roadmap

<http://ivoa.net/pub/info>

Create protocols for interoperability: Registry, ID4L, VO query, Grid & Web services

Standardize the data themselves

Generate Databases in a standard scheme (images, spectra, catalogues, ...) VOTable, UC, DAL, Semantics, Data Model

Apply & Roll Standards Test Techniques

Euro VO P. Queen Workshop on VO Standards and Systems for Data Centres and Large Projects 2005

## Step 1: Databases SSP access in the VO

SSP VO services:

- AstroGrid: CE/Astrogrid (common execution architecture) <http://www.2.astronigrid.org/>
- Pegase-HR server (only SED): <http://vo.obspm.fr/cgi-bin/stapi/pegasehr.pl>
- PGos3 (only SED): Ready: Galaxev (BC03), Pegase & Pegase-HR, Galax, StarG, StarG-Xray, In preparation: Galax, Starburst99, Vazdekis models, Maraston models, Buzzoni models. <http://vo.inaoep.mx/pgos3/index.php/>

SSP related VO services:

Only access to SED atmosphere models via SVO & PGos3  
 NO isochrone access at the moment (except via VizierR)  
 NO access to results different than the SED

## Step 1: Databases SSP pending issues

VO: machine-to-machine communication  
 No a priori information can be assumed

**Mandatory:** Define what a synthesis model is (unique definition):  
 Input Parameters:  
 Atmosphere models -> Metallicity, resolution, ...  
 Evolutionary tracks (still without VO data model) -> Metallicity, age, Stellar birth-rate (IMF + SFH + Number stars formed) still without UCD

Outputs:  
 SED (VOTable) + model dispersion: Error model not implemented in VO  
 Tables of colors...  
 Chemical evolution (still without UCD...)

**Highly recommended:** Include technical documentation (interpolation scheme, isochrone synthesis or fuel consumption theorem algorithms...)

**YOUR HELP IS NEEDED!!**

## Step 2: Interoperability SSP in applications

ONLY VO

A general protocol for access data different than image or spectra is needed

VOSpec <http://esvo.esa.int/vospec/>

- PEGASE server using TSAP
- PGos3 server using TSAP

## Step 3: Science cases Example in PGos3

What is PGos3?

- Cooperative tool in VO framework (P.I.: Elena Terlevich & Miguel Cerviño)
- Repository of theoretical SSPs
- same format (Votables)
- same tools
- "democratic" choices (sb99, pegase, sed@...)

Why? (part of a long term project: P.I.: Aurelio López & Roberto Terlevich)

- Fitting observational data to SSP models
- Analysis of observed data

Each balloon represents different databases or applications accessible from the VO.

## Step 3: Science cases (II) Example of SSP selection in PGos3

Select Theoretic Data

PGos3 is being developed through the combined efforts of different countries. They are:

- Germany: Evolutionary tracks, Metallicity Range, Stellar mass (range), Evolutionary phase, Metallicity Range, Color (range), Metallicity Range, Spectral Resolution, Stellar mass (range), Color, Temperature, Luminosity
- Spain: Evolutionary tracks, Metallicity Range, Stellar mass (range), Evolutionary phase, Metallicity Range, Color (range), Metallicity Range, Spectral Resolution, Stellar mass (range), Color, Temperature, Luminosity
- Mexico: Evolutionary tracks, Metallicity Range, Stellar mass (range), Evolutionary phase, Metallicity Range, Color (range), Metallicity Range, Spectral Resolution, Stellar mass (range), Color, Temperature, Luminosity

Searching Data base

Found

Relative Values

yes no