

SPACEINN.EU WP3.X

# VO asteroseismic model services within Seismic+

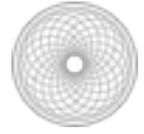
Prepared for: SPACEINN WP3 Meeting, Title

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October 16, 2013

Proposal number: 1





# Model data services

## Description

Two model services are presented in this document as part of the WP3 tasks and deliverables:

1. Toucan: a VO portal for asteroseismic models
2. CAUP modelling service (M. Bazot)

## Toucan

Toucan (former VOTA) is a web-based virtual observatory service that manages model collections and performs online asteroseismic functions, including graphics. It includes model queries by stellar physic parameters (e.g. effective temperature, gravity, metallicity, etc.), by modelling structure /physics parameters (mixing length alpha, overshooting, rotational mixing, etc.), and by asteroseismic parameters (frequency, large separation, small separation, etc.).

### Toucan products

Models, model selections, model properties, online comparison, theoretical seismic indices, model collections (private/public), online asteroseismology (graphic tools), etc.).

### Model types

toucan is constructed to work with any asteroseismic model (structure + associated oscillations). No distinction by pulsation type. Requirements are related to homogeneity in order to sign-up a data collection into the service.

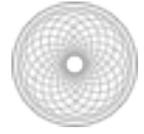
### Organization

toucan works with data collections shared by Toucan-nodes, i.e. institutions, groups, or equivalent which have signed-up with Toucan and share their model data. This requires the data to be VO compliant and fulfil Toucan requirements. The first external node to be linked in Toucan will be the CAUP node, which will provide asteroseismic models representative of solar-type stars.

Within Seismic+, Toucan will offer such data collections.

### Connection with other VO services

toucan is being updated to link to external databases (e.g. KASOC, CoRoT db, etc.) in order to import data to be used in the service (e.g. as constraints). This is not yet



implemented but this can be done through Seismic+. We propose to WP3 to discuss the possibility of using this Seismic+ module (a kind of redirection to Seismic+) when this service is required in Toucan.

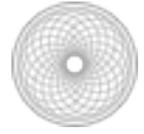
Currently the possibility of integrating VisiVO graphic tools capabilities in Toucan is being explored. Answer in 3-4 weeks.

### **Connection with other WP3 sub-packages**

In addition to the obvious connection with the Seismic+ development package (which may include the link with external databases), Toucan may also collaborate with the **seismic indices** sub-package.

We propose to fully integrate Toucan in Seismic+, but keeping it completely independent, i.e. in symbiosis regime. Conditions (technical and manpower) are to be discussed within WP3.

The **strengths** of this task are described above, however not that the main **weakness** corresponds to the **manpower**. Currently Toucan is being developed with a small portion of software engineer time within the Spanish Virtual Observatory (SVO). The integration and development of Toucan within Seismic+ would require a full-time software engineer, or at least some additional support. An engineer trained in some Toucan features is currently available, but funding is necessary.



## CAUP modelling service (M. Bazot, M. Monteiro)

The grid of stellar models has two main functions:

- Archiving
- Data base for stellar modelling

### Archiving

This activity consists in setting up a database that could link to stellar models already used in published articles. This function can add to scientific transparency by allowing to check claimed results directly on the original computed models. It also has the potential to increase the scientific feedback of any given stellar physics study. By being able to explore already optimized models to extents far larger than what is allowed in the article format, one can possibly discover interesting features on which to build new scientific studies.

The requirements for this aspect of the database are the following:

- Flexibility
- Documentation

The first requirement implies that, in order to obtain a database with a significant amount of models, one cannot expect to obtain files already put in a common format (see below). This especially true if the database includes stellar models computed before the set up of SPACE-INN database. In practical terms, this means that the archive part of the database might consist in either files stored internally or links to external database and/or public storage servers on which the models may already be archived.

The second requirement is thus to provide clear and comprehensive documentation for each of the potential file one may encounter through these links. In the framework of WP3, CAUP is offering to manage this activity, which will consist in:

- Searching for models that could be archived on the database. This will be done on one hand by contacting through mailing lists the researchers in the area. On the other hand, we will browse the existing archives (ADS, astro-ph,...) for studies in stellar physics whose results could be stored in the database.
- Verifying the documentation available for the stored models. If necessary, we might work with the authors to work on a documentation.



## **Pending questions.**

### ***KASOC database of stellar models?***

The other function of the stellar model data base is to provide grids for stellar modelling. These can be used to obtain rapidly stellar physical characteristics and/or exploring the space of stellar parameters.

This part of the work is more tentative. On one hand, the principle is quite straightforward, on the other many logistical questions are to be answered.

### ***Targeted audience***

We can distinguish two main categories: stellar physicist, non-stellar physicists. It is not certain that the first ones require the set up of such grids since they already have access to stellar evolution codes and that their works often focus on testing new physics, and hence would require the computation of new grids. Other are more interested in testing parameter estimation methods, which do not always require grids.

The second category is potentially much more interested by grids as an end product of stellar physics that they can insert in their own studies. However, it is difficult to evaluate precisely what are the needs for the SPACE-INN grid in general. The needs can be very specific (dense M-star grids, red giants,...), and it is not clear what should be the main effort in order to expand the grid beyond the classical main-sequence sun-like stars (often useful for planetary physics).

Furthermore, it is not clear how “bleeding edge” should be the included physics in the stellar models. An important drawback of grids of stellar models is that they might quickly become outdated. This is a problem one has to consider. The management of this database of stellar models can be assured at CAUP, the storage capacities required still have to be evaluated precisely, in order to determine whether or not we can provide the corresponding hardware.