ESTA

Development of Task 2
Hares-and-Hounds

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Objectives

For this task it is proposed that global constraints on a few stellar cases are provided, in a *hare-and-hounds* type of exercise, so that the **"best" models** are produced by the hounds to reproduce the model constraints indicated by the hare(s).

The goal is to established the range of possible solutions provided by different codes and selections of the physics when the **same "observational" case** is being modeled.

Consequently it may help us to estimate the uncertainty on the characterisation of a star when real cases are study with the tools available.

The Hare(s)

Ideally, we should have (at least) one "observational" case defined by each code:

ASTEC
CESAM
CLÉS
FRANEC
GARSTEC
STAROX
TGEC

Each case will be numbered and the source (code) kept secret from everyone in order to avoid prejudices.

Each case would correspond to a full evolution model (adhoc changes to the resulting model should be avoided), calculated with the best or preferred physics of the model builder, simulating one specific star.

Surprises and/or non-standard physics should be allowed as long as they have been integrated in the calculation of the evolution.

The "observations"

The data made available for each case would include a **subset** of the following:

- **Stellar parameters:**
  - luminosity,
  - mass,
  - radius,
  - effective temperature.
- **Composition:**
  - surface metallicity,
  - mixture (?).
- **Seismic data:**
  - frequency separations (with a clear definition),
  - individual frequencies (with mode parameters).

The set of values to be provided for each case will be selected by the Hare.

No "observational" uncertainties would be added at this stage as we are trying to evaluate the range of possible solutions for a precisely defined set of stellar parameters. The effect of observational uncertainties would be determined within another exercise if deemed necessary.

Each case will be sent to the coordinator of the task and should include:

- set of **"observational" parameters** [*public*]
- the **model data and description** [*secret*]
- the **evolutionary sequence** [*secret*]

All *public* information will be available at the ESTA webpage.

The Hounds

Everyone with tools for producing models and frequencies is asked to join by trying to characterize some (or all) of the targets.

All *Hares* should become *Hounds*! (but not to hunt themselves...)

Each *Hound* will produce her/his "best" models for the proposed targets by **fitting the observational parameters to within 1%**.

The proposed solution, to be sent to the coordinator, should include:

- the **model data and a list of the physics adopted**,
- the **evolutionary sequence**.

The *Hare* is hunted when the following quantities **fit the original model within 5%**:

- **central temperature and density**,
- **sound speed differences**.

Calendar

It is important that the major sources of discrepancies between codes are addressed before we start this task. Consequently the proposed calendar is:

- ***Hares* produce the targets**: November 2005
- the **targets are presented** in ESTEC (CoRot Week 9): December 2005
- the *Hounds* **try to reproduce the targets**: January-March 2006
- **first evaluation of the hunt** is produced: April 2006
- the **final results are presented** in CoRoT Week 10: May 2006

The outcome of this exercise should:

- quantify the **range of possible solutions**,
- characterize the range for the **physics of acceptable solutions**,
- provide clues on where we should concentrate the **development of seismic tools to discriminate equally valid model solutions**.

Postscript

The task described here is not intended to test the effect of observational uncertainties but solely to evaluate the dependence of the interpretation of the seismic data on the evolution code being used.

Part of the work included in the exercise proposed here has already been developed in a different exercise by the "*Data Analysis*" Team (T. Appourchaux) in order to define the best targets for the Seismology Programme of CoRoT.

Consequently it has been agreed that this exercise should have a lower priority. The effort in the near future should concentrate on the frequency comparison.