

CAUP's Astronomical Instrumentation and Surveys

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[This is a transversal activity to the two science teams.]

Key Objectives

- Strengthen the collaborations for Instrumentation development and participation in large surveys;
- Optimize the current competences;
- Identify new strategic competences;

Current projects in development in CAUP / by CAUP members

Institutional Participation

- EUCLID
- ESPRESSO
- CHEOPS
- GAIA-ESO Survey

Individual Participation

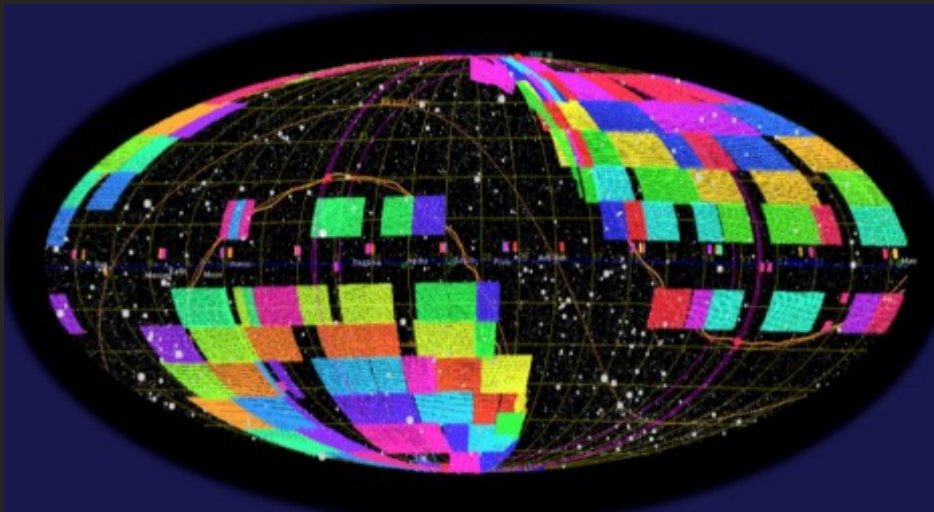
- HARPS-North
- SPIROU



The Euclid Mission

[Contact person: António da Silva]

- Euclid is the M2 ESA cosmic vision mission (Launch date: 2020)
- The primary goal is to map the geometry and evolution of the dark universe.
- CAUP is Euclid Affiliated Institute, since Jan. 2012; National Euclid Consortium Board



The Euclid Mission

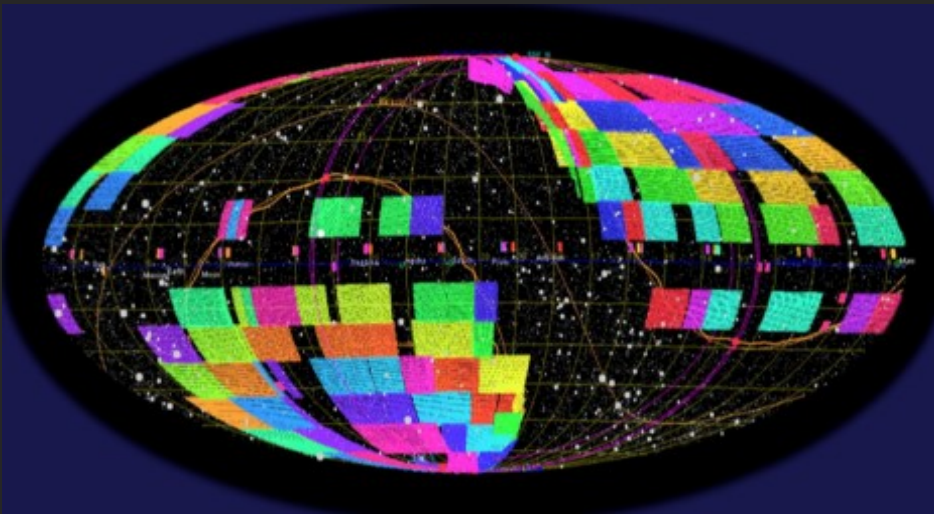
[Contact person: António da Silva]

Portugal contracted contribution to Euclid Consortium

CAUP's technical contribution

Deliver a series of mission survey simulations tools and models (mission survey definition)

- Survey Implementation, algorithm definition and software development
- Algorithm definition and implementation validation



A new high resolution spectrograph for the VLT

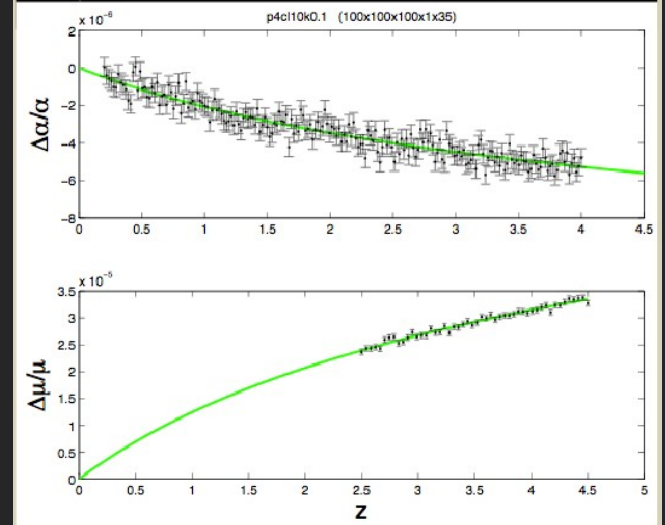
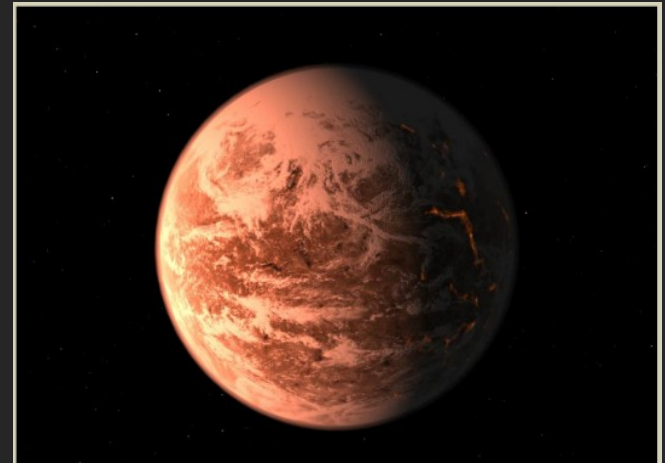


The GTO time assignment reflects the main scientific drivers

- Search for Earth-like planets orbiting solar-type stars; [80%]
- Variability of physical constants; [10%]
- Targets of Opportunity; [10%]

CAUP's people involved:

- Nuno C. Santos
- Mario João Monteiro
- Manuel Monteiro [Coudé Train Control Software]
- Pedro Figueira [Data Reduction Software]
- Sérgio Sousa [Data Analysis Software]



A new high resolution spectrograph for the VLT



Instrument Control Software [Manuel Monteiro]

- Coudé Train control software

Contribution/Tools

- Design and implementation of the ESPRESSO CT Control Electronics, based on ESO VLT Software;
- Definition of software interfaces for the telescope control software environment

Data Reduction Software [Pedro Figueira]

- Transformation of the raw data collected by ESPRESSO into science-quality reduced data

Contribution/Tools

- Algorithm design for the different Pipeline Reduction modules with emphasis on the definition of the procedure for the radial velocity precise derivation;



A new high resolution spectrograph for the VLT



Data Analysis Software (DAS) [Sérgio Sousa]

- ESPRESSO will be first VLT Instrument with dedicated DAS.

Contribution/Tools

- Equivalent Width determination for weak absorption lines in stellar spectra;
- Quick estimation of temperature and $[Fe/H]$ for solar type stars.



CHEOPS

(CHaracterising ExOPlanets Satellite)



Status:

Selected by ESA for study as the first S-class mission!

Goal:

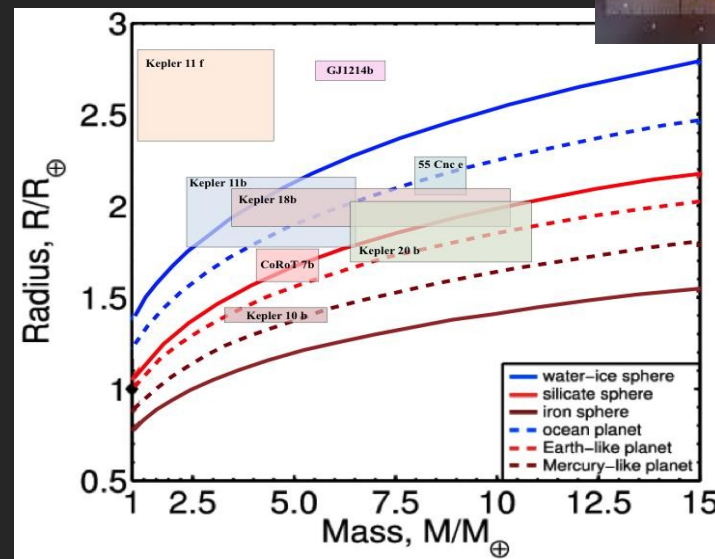
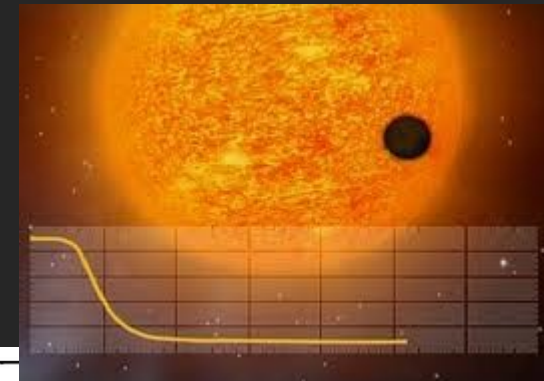
- Characterization of transiting exoplanets around known bright and nearby host stars

Contribution for the mission:

- Data Reduction Workpackage
- Board Representative
- Science Team

CAUP's people involved:

- Nuno C. Santos
- Marco Montalto
- Pedro Figueira
- Sérgio Sousa



GAIA-ESO Survey

[Contact person: Sérgio Sousa]



What is the GAIA-ESO Survey?

Instrument

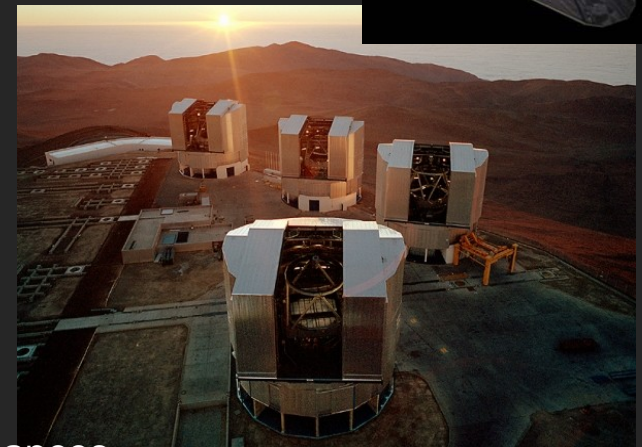
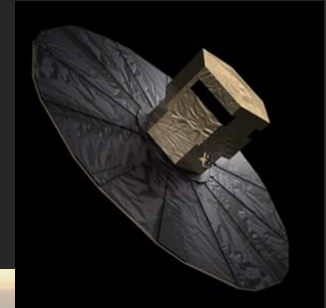
- Survey employs the VLT FLAMES instrument for high quality spectroscopy (UVES and GIRAFFE)

Goals

- This survey will provide the first homogeneous overview of the distributions of kinematics and chemical element abundances in the Galaxy;
- Complementarity with the ESA Gaia mission;

Contribution to the Survey

- Analysis of FGK stars observed with UVES
 - Determination of stellar parameters and chemical abundances.
- Analysis of Pre Main Sequence stars:
 - Stellar parameters, Stellar activity, Veiling, Lithium abundances...



Summary

CAUP's Competences for instrument development

Data Reduction Software

- Spectroscopy;
- Photometry.

Calibration and precise Radial Velocities

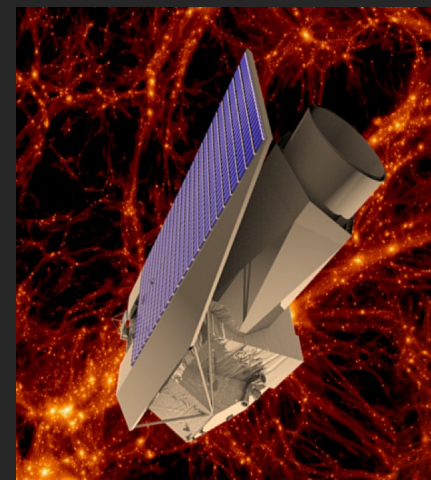
- Visible + Infra-red Spectrographs.

Data Analysis Software

- Advanced Pipeline products.

Instrumental Components Control Software

Development of optimization algorithms/software and survey implementation scenarios



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