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Concurso para a atribuição de Bolsas de Doutoramento Individuais 2009

Call for Individual Doctoral Grants 2009

Edital do concurso

Aberto de 27-04-2009 a 01-09-2009

Opened from 27-04-2009 to 01-09-2009

Referência
Reference
SFRH/BD/60688/2009

Data de registo
Registry date
Registado a 04-05-2009 (03:44)
Registered at 04-05-2009 (03:44)

Lacrado
Submitted
Não
No

Formulário de candidatura

Application form

Identificação do candidato

Candidate's personal information

Este quadro é editado no Sistema de Gestão e Informação da FCT (FCTSIG) na secção "**1. Dados pessoais**". No momento em que a candidatura é lacrada, será feita uma cópia desta informação para efeitos de avaliação. Embora possa continuar a actualizar os seus dados em FCTSIG, a informação recolhida referente a esta candidatura será guardada e não poderá ser alterada.

--> [Ir para o Sistema de Gestão e informação da FCT \(FCTSIG\)](#)

This table can be edited in our Management and Information System (FCTSIG) in the "**1. Personal data**" section. When you finally submit your proposal, a copy of this information will be made to be presented for avaliation. You may continue to update your data on FCTSIG, but the collected information referring to this proposal will be reserved e cannot be changed.

--> [Go to the Management and Information System \(FCTSIG\)](#)

Nome completo ●
Full name
Vasco de Matos Ferreira Mendes Neves
Número de identificação fiscal (NIF) ●
Taxpayer identification number or equivalent
209753390
Data de nascimento ●
Birth date
13-11-1978
Naturalidade (Concelho)
Birth place
Coimbra
Bilhete de identidade (ou passaporte) ●
National identity card No. (or passport)
112288170
País de Nacionalidade ●
National of
PORTUGAL
Morada de residência ●
Home address
Rua do Queimado nº31 Aradas
Código postal de residência ●
Residence zip code
3810-446
País de residência ●
Country of residence
PORTUGAL
Morada institucional ●
Work address
Rua das Estrelas
Código postal ●
Zip code
4150-762
País da morada institucional ●
Work country
PORTUGAL
Telefone (casa)
Phone number (home)
+351234429981
Telemóvel
Mobile phone
+351968474748

Sexo
Gender
M

Arquivo de Identificação
Arquivo de Identificação
Aveiro

Localidade de residência ●
City of residence
Aveiro

Localidade ●
City
Porto

Telefone (emprego)
Phone number (work)
+351226089830
Email ●
Email
vasco@ua.pt

● Informação de preenchimento obrigatório para esta candidatura
This information is required for this application

Habilitações académicas

Academic degrees

Este quadro é editado no Sistema de Gestão e Informação da FCT (FCTSIG) na secção "**2. Formação académica**". No momento em que a candidatura é lacrada, será feita uma cópia desta informação para efeitos de

avaliação. Embora possa continuar a actualizar os seus dados em FCTSIG, a informação recolhida referente a esta candidatura será guardada e não poderá ser alterada.

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Ano	Grau académico
Year	Academical Degree
2007	LICENCIATURA
Título da tese (se aplicável)	
Thesis title (if applicable)	
Quantum Dots de PbSe	
Domínio Científico	
Scientific Domain	
Física do Estado Sólido - Caracterização de Semicondutores - Espectroscopia	
Instituição que atribuiu o grau	
Institution granting the academic degree	
Universidade de Aveiro	
Classificação final	
Final program grade	
16	
Designação do curso	
Programme title	
Licenciatura em Física	
Anos curriculares	
Curricular years	
4	
Classificação	
Classification	
16	

Ano	Grau académico
Year	Academical Degree
2008	MESTRADO
Título da tese (se aplicável)	
Thesis title (if applicable)	
Abundância de Elementos em Estrelas com Planetas	
Domínio Científico	
Scientific Domain	
Astrofísica - Espectroscopia - Abundâncias Estelares - Exoplanetas	
Instituição que atribuiu o grau	
Institution granting the academic degree	
Universidade de Aveiro	
Classificação final	
Final program grade	
17	
Designação do curso	
Programme title	
Mestrado em Física	
Anos curriculares	
Curricular years	
2	
Classificação	
Classification	
17	

Actividades anteriores e situação actual em termos científicos e/ou profissionais
Previous and current scientific and/or professional activities

Este quadro é editado no Sistema de Gestão e Informação da FCT (FCTSIG) na secção "**3. Actividades anteriores**". No momento em que a candidatura é lacrada, será feita uma cópia desta informação para efeitos de avaliação. Embora possa continuar a actualizar os seus dados em FCTSIG, a informação recolhida referente a esta candidatura será guardada e não poderá ser alterada.

--> [Ir para o Sistema de Gestão e informação da FCT \(FCTSIG\)](#)

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Período	Cargo ou categoria	Instituição
Period	Position or category	Institution
2004	Participação no "Encontro Nacional de Estudantes de Física" (ENEF), Aveiro, 2004.	Physis
02/01/2007 a 01/07/2007	Bolsa de Iniciação Científica (BIC), na área de Espectroscopia aplicada à área de semicondutores intitulada "Optical Characterization of Quantum Dots in the Infrared". O seminário esteve integrado neste trabalho.	Universidade de Aveiro
25 a 27 Janeiro de 2007	Participação na "International School on Structural Characterization of Nanostructures" (ISSCN), Aveiro.	Universidade de Aveiro
11 a 12 Abril de 2007	Participação no "Workshop on Medical Instrumentation Signal and Imaging" (WMISI), Aveiro, 11-12 Abril de 2007.	Universidade de Aveiro

01/03/2008 a 31/08/2008	Bolsa de Iniciação Científica (BIC), na área de Astrofísica, no âmbito do projecto "Dinâmica Planetária - Entendimento da Evolução Dinâmica Sofrida pelos Planetas do Sistema Solar". O mestrado esteve integrado neste trabalho.	Universidade de Aveiro / Centro de Astrofísica da Universidade do Porto
01/08/2008 a 01/11/2008	Elaboração de um artigo intitulado "Chemical abundances of 451 stars from the HARPS GTO planet search program". Este artigo foi publicado na revista Astronomy and Astrophysics em 14/01/2009.	Universidade de Aveiro / Centro de Astronomia e Astrofísica da Universidade do Porto

1. Informações sobre a candidatura**1. Application form information****Tipo de Bolsa****Type of Fellowship**

Bolsa de Doutoramento

Doctoral Grant

Domínio Científico Principal**Main Scientific Domain**

Física

Physics

Local de realização da Bolsa**Location of fellowship activities**

Mista

Both in Portugal and Abroad

2. Endereço para correspondência**2. Mailing address information****Morada****Address**

Rua do Queimado nº 31 Aradas

Código postal**ZIP code**

3810-446

País**Country**

PORTUGAL

Telefone**Phone**

+351234429981

Email**Email**

vasco@ua.pt

Localidade**City**

Aveiro

Fax**Fax****3. Procurador do candidato****3. Candidate's representative**

(vazio)

(void)

Facultativo para o caso de bolsas totalmente no país
Optional for fellowships totally in Portugal

4. Programa de trabalho**4. Working programme****4.1. Título do programa de trabalhos****4.1. Title of the working programme**

Stellar parameters for M-dwarfs: the link to exoplanets

Domínio Científico**Scientific Domain**

Astrofísica

Data de início do programa de trabalhos**Work programme starting date**

01-10-2009

Duração (meses)**Duration (month)**

48

Data de início pretendida para a bolsa**Fellowship starting date**

01-10-2009

Duração (meses)**Duration (month)**

48

Permanência no estrangeiro com início em**Periods of permanence abroad**

01-09-2010

Duração (meses)**Duration (month)**

12

4.2. Sumário**4.2. Abstract**

This study aims at addressing the problem of the derivation of spectroscopic parameters for M-dwarf stars. The goal is to develop new tools to allow the determination of stellar parameters and chemical abundances in M-dwarfs from the analysis of their spectra. Once these parameters are derived, they will be used to study the star-planet connection and to refine the planetary parameters. The results of this ambitious project may shed new light into the processes of planet formation and evolution.

4.3. Estado da Arte**4.3. State of the art**

The discovery 13 years ago of an extra-solar planet orbiting the solar-type star 51 Peg (Mayor & Queloz 1995, Nature, 378,355) has encouraged the launch of numerous search programs leading to a steadily increasing number of exoplanet detections. More than 300 other planetary companions have been found to orbit dwarfs of spectral types from F to M.

The growing number of exoplanets allows the statistical analysis of their properties, as well as those of their host

stars (review by Udry & Santos 2007, ARA&A, 397,439). These studies are providing important constraints on the physical and chemical processes involved in the formation of these systems. One of the remarkable correlations that is helping to understand the processes of planet formation is related to the stars hosting planets: their chemical abundances are distinctively different from the ones found in field stars (e.g. Gonzalez 1998, A&A, 334, 221; Santos et al. 2001, A&A, 373,1019). Giant planets seem to be more easily formed around stars having a higher metal content. Although many aspects are still missing (e.g. interestingly, this correlation is likely not observed for stars orbited by Neptune or Super-Earth type planets - Sousa et al. 2008, A&A, 487,373), this conclusion supports the core-accretion model for giant planet formation (e.g. Ida & Lin 2004, ApJ, 616,567). Similarly to the metallicity, stellar mass may have a strong influence on the formation of giant planets. It is now known that the frequency of giant planets around (low-mass) M-dwarfs is considerably smaller than the one found for FGK dwarfs (e.g. Bonfils, PhD Thesis, Univ. of Geneva). A tentative correlation between stellar mass and the frequency of giant planets has been suggested (Lovis & Mayor 2007, A&A, 472, 657; Johnson et al. 2007, ApJ, 670, 833; Santos et al. 2009, A&A, 493, 309). This conclusion may be expected from the models of planetary formation (e.g. Laughlin et al. 2004, ApJ, 612, L73).

In an increasing number of cases (~50 at this moment), it has also been possible to observe the photometric signal of a planet crossing in front of the stellar disk. Together with complementary radial-velocity measurements, this so called transit measurement allows to infer the planetary mass and radius, and thus the mean density of the planet. This gives a unique possibility to probe the internal structure of these worlds. The comparison between the observed masses and radii with theoretical models of the mass-radius relation are giving the first insight into the composition of extra-solar planets (e.g. Guillot 2005, Annu. Review of Planetary Science, 33, 493).

4.4. Objectivos

4.4. Objectives

Measuring M-dwarf metallicities from their spectra is a difficult task and a strong disagreement exists in the literature (e.g. Bonfils et al. 2005, A&A, 442,635; Woolf & Wallerstein 2006, PASP, 118,218; Bean et al. 2006, ApJ, 653,65; Johnson & Apps 2009, ApJ, in press). As the spectral subtype increases, the atmospheres of these cool stars contain increasingly abundant diatomic and triatomic molecules. These components have complex and extensive absorption band structures, which eventually leave no continuum points in the spectrum. The line-by-line spectroscopic analysis used for hotter stars therefore becomes impossible for late-M dwarfs, and a full spectral synthesis must be used. Besides the practical complexities of that approach, the atmospheric models do not yet reproduce the details of high resolution spectra (mostly due to limitations of their molecular opacity databases).

The objectives of the present project are to overcome the above mentioned difficulties. We thus propose to:

- Derive precise and uniform spectroscopic parameters for M-dwarf stars (in particular their effective temperature and chemical abundances).
- Use the results to make statistical studies of the star-planet connection, and to derive better parameters for M-dwarfs with transiting planets.

4.5. Descrição detalhada

4.5. Detailed description

Stellar parameters and extra-solar planets: the analysis of M-dwarfs

Determining metallicity of M-dwarfs is of prime importance. First, the very-low-mass M-dwarfs are small, cool and faint, but they dominate the Galaxy by number, and even by total mass. Any realistic model of the Galaxy therefore needs an excellent description of this faint component. Over the last decade stellar models of very-low-mass stars (VLMS) have made great strides, but still have to use some incomplete or approximate input physics (Chabrier & Baraffe 2000, ARA&A, 38, 337).

M-dwarf metallicities have also become relevant in the context of planet formation around very low mass stars (VLMS). Several planets have been discovered orbiting these kind of objects, and a few transit signatures have also been detected. The lowest mass exoplanets found so far have been identified orbiting these kind of objects. The derivation of accurate metallicities for M-dwarfs with planets is thus extremely important if we want to fully understand the process of planet formation, and if a complete characterization of the planets is wanted.

An unprecedentedly large quantity of high quality spectra is now available from current planet searches. More and more extremely high quality data will be produced by instruments in the near future. These data, together with the expected number of new planet discoveries, will allow to explore in great detail the correlations between the presence of planets and the properties of their host stars.

For planets in which a photometric transit signal has been detected, the accurate derivation of the planetary properties (mass, radius, and mean density) also depends on the knowledge about the stellar parameters (e.g. mass, radius). It is thus extremely important to derive uniform (homogeneous) and accurate values for the effective temperature, chemical abundance, and surface gravity of stars with transiting planets (see e.g. Torres et al. 2008, ApJ, 677, 1324). These can then be used together with detailed stellar evolutionary models in order to obtain precise stellar masses and radii.

For M-dwarfs, however, the derivation of accurate parameters is not an easy task. Several metallicity scales exist, and no consensus about the best estimate has yet been reached (see e.g. Bonfils et al. 2005, A&A, 442,635; Woolf & Wallerstein 2006, PASP, 118,218; Bean et al. 2006, ApJ, 653,65; Maness et al. 2007, PASP, 119, 90; Martinache et al. 2009, ApJ, 695, 1183; Johnson & Apps 2009, ApJ, in press). Given the high number of neptune-like planets that are being discovered orbiting these objects, it is urgent to find a solution to this problem.

In this project we propose to address this particular issue, namely the derivation of accurate spectroscopic parameters for M-dwarf stars. The goal is to develop new tools to allow the determination of stellar parameters and chemical abundances in M-dwarfs from the analysis of their spectra. Once these parameters are derived, they will be used to study the star-planet connection and to refine the planetary parameters. The results of this ambitious project may shed new light into the processes of planet formation and evolution.

To achieve this goal, we propose to:

- > Use already available spectra of FGK dwarfs in binary systems where the secondary star is an M-dwarf (also with available spectra) to characterize the chemical abundances of the M-dwarf.
- > Use the derived values, together with the M-dwarf spectra, to study spectral regions that may be particularly sensitive to variations in the chemical abundances for these stars.
- > Update atomic and molecular line-lists to allow for a better computation of synthetic spectra for cool stars
- > Use atmospheric models for cool stars together with radiative transfer codes, to produce a library of synthetic spectra for cool M-dwarfs.
- > Submit telescope time proposals (ESO and other) to obtain high resolution spectra of M-dwarfs in different spectral ranges (optical and infra-red).
- > Compare theoretical and observational spectra of M-dwarfs to derive their parameters, including metallicity and chemical abundances.
- > Use the derived values to derive better planetary parameters for the orbiting planets, and to study the star-planet relation.

This work includes a number of challenging steps that should give us a new insight on how to derive chemical abundances and stellar parameters for M-dwarfs.

4.6. Anexos**4.6. Attachments**

Nome Name	Tamanho Size
--------------	-----------------

4.7. Referências**4.7. References**

Mayor & Queloz 1995, Nature, 378,355
 Udry & Santos 2007, ARA&A, 397,439
 Gonzalez 1998, A&A, 334, 221
 Santos et al. 2001, A&A, 373,1019
 Sousa et al. 2008, A&A, 487,373
 Ida & Lin 2004, ApJ, 616,567
 Bonfils, PhD Thesis, Univ. of Geneva
 Lovis & Mayor 2007, A&A, 472, 657
 Johnson et al. 2007, ApJ, 670, 833
 Santos et al. 2009, A&A, 493, 309
 Laughlin et al. 2004, ApJ, 612, L73
 Guillot 2005, Annu. Review of Planetary Science 33, 493
 Bonfils et al. 2005, A&A, 442,635
 Woolf & Wallerstein 2006, PASP, 118,218
 Bean et al. 2006, ApJ, 653,65
 Johnson & Apps 2009, ApJ, in press
 Chabrier & Baraffe 2000, ARA&A, 38, 337
 Torres et al. 2008, ApJ, 677, 1324
 Maness et al. 2007, PASP, 119, 90
 Martinache et al. 2009, ApJ, 695, 1183

5. Condições de acolhimento**5. Host conditions****5.1. Instituicao de Acolhimento 1****5.1. Host Institution****Unidade de I&D****Unidade de I&D**

Centro de Astrofísica da Universidade do Porto

5.1. Instituicao de Acolhimento 2**5.1. Host Institution**

Laboratoire d'Astrophysique de Grenoble (LAOG)

Departamento**Department****Morada****Address**

Laboratoire d'Astrophysique - Observatoire de Grenoble, BP 53

Código postal**Localidade****Zip code****City**

F-38041

GRENOBLE Cédex 9 (France)

País**Country**

FRANCE

Telefone**Email****Phone Number****Email**

+330476514788

5.2. Instituição que confere o grau**5.2. Institution granting the degree****Nacionalidade da instituição que confere o grau****Nationality of the institution granting the academic degree**

Portuguesa / Portuguese

Instituição que confere o grau**Institution granting the academic degree**

Universidade do Porto / Faculdade de Ciências

Morada**Address**

Rua do Campo Alegre, s/n

Código postal**Zip code**

4169-007

Localidade**City**

PORTO

Telefone**Phone Number**

220402000

email**email**

pos.graduacao@fc.up.pt

Fax
fax

5.3 Orientadores
5.3 Supervisors

Nome Completo do orientador
Supervisor's full name
Nuno Miguel Cardoso Santos
Instituição
Institution
Centro de Astrofísica da Universidade do Porto

Co-orientador(es) (max. 2)
Co-supervisor(s) (max. 2)

Nome Completo do co-orientador
Co-supervisor's full name
Xavier Marie Delfosse
Instituição
Institution
Laboratoire d'Astrophysique de Grenoble

Nome Completo do co-orientador
Co-supervisor's full name
Jorge Luis Melendez Moreno
Instituição
Institution
Centro de Astrofísica da Universidade do Porto

6. Cartas de recomendação
6. Reference letters

Nome
Name
Nuno Miguel Cardoso Santos
Instituição
Institution
Centro de Astrofísica da Universidade do Porto
Ficheiro
File
[recomenda_vasco_FCT.pdf](#)
(Carta aberta)

Nome
Name
Xavier Delfosse
Instituição
Institution
Laboratoire d'Astrophysique de Grenoble
Ficheiro
File
[lettre_xd.pdf](#)
(Carta aberta)

Nome
Name
Alexandre Carlos Morgado Correia
Instituição
Institution
Universidade de Aveiro
Ficheiro
File
ok
(Carta fechada)

7. Bolsas anteriores
7. Previous fellowships

Ano de conclusão
Year of completion
2008
Instituição
Institution
Fundação Calouste Gulbenkian
Período
Period
01/03/2008 a 31/08/2008

Ref. da Bolsa
Fellowship Ref.
n/a (BIC)

Ano de conclusão
Year of completion
2007

Ref. da Bolsa
Fellowship Ref.
n/a (BIC)

Instituição
Institution
Universidade de Aveiro
Período
Period
02/01/2007 a 01/07/2007

8. Actividade Profissional
8. Professional activity

Tenciona manter alguma actividade profissional durante o período da bolsa?
Do you intend to maintain any professional activity during the fellowship period?
Não
No

9. Graus académicos
9. Academic degrees

Grau académico
Academic degree
Mestrado
(Master with thesis / MSc with thesis)

Descrição do grau
Degree description
Mestrado em Física (Bolonha)

Ramo: Ramo científico

Situação Status	Data de conclusão Completion date	Classificação final Final classification or grade
Concluído	18-07-2008	17
Ficheiro File mestrado.pdf		

Grau académico
Academic degree
Licenciatura
(BSc, 4 or more years / Medical School / Law School)

Descrição do grau
Degree description
Licenciatura em Física

Ramo: Ramo científico

Situação Status	Data de conclusão Completion date	Classificação final Final classification or grade
Concluído	12-09-2007	16
Ficheiro File licenciatura.pdf		



Financiamento do Fundo Social Europeu e de fundos nacionais do MCTES



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