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Stellar Atmospheres in the Gaia Era – Preface

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Preface – Stellar Atmospheres in the Gaia Era

Volume 328 (2011) of the *Journal of Physics: Conference Series* provides a record of the invited and contributed talks, and of the posters presented at the GREAT-ESF workshop entitled 'Stellar Atmospheres in the Gaia Era: Quantitative Spectroscopy and Comparative Spectrum Modelling' (`http://great-esf.oma.be`). The conference was held 23–24 June 2011 at the Vrije Universiteit Brussel, Belgium. 47 scientists from 11 countries around the world attended the workshop.

The ESA-Gaia satellite (launch mid 2013) will observe a billion stellar objects in the Galaxy and provide spectrophotometric and high-resolution spectra of an unprecedented amount of stars observed with a space-based instrument. The confrontation of these data with theoretical models will drastically advance our understanding of the physics of stellar atmospheres. New stellar populations such as previously unknown emission line stars will be discovered, and fundamental questions such as the basic scenarios of stellar evolution will be addressed with Gaia data.

The 33 presentations and 4 main discussion sessions at the workshop addressed important topics in spectrum synthesis methods and detailed line profile calculations urgently needed for accurate modelling of stellar spectra. It brought together leading scientists and students of the stellar physics communities investigating hot and cool star spectra. The scientific programme of the workshop consisted of 23 oral (6 invited) and 10 poster presentations about cool stars (first day; Comparative Spectrum Modelling and Quantitative Spectroscopy of Cool Stars), and hot stars (second day; Quantitative Spectroscopy of Hot Stars). The hot and cool stars communities use different spectrum modelling codes for determining basic parameters such as the effective temperature, surface gravity, iron abundance, and the chemical composition of stellar atmospheres. The chaired sessions of the first day highlighted new research results with spectral synthesis codes developed for cool stars, while the second day focused on codes applied for modeling the spectra of hot stars.

The workshop addressed five major topics in stellar atmospheres research:

- Spectrum synthesis codes
- Radiation hydrodynamics codes
- Atmospheric parameters, abundance, metallicity, and chemical tagging studies
- Large spectroscopic surveys
- New atomic database

The workshop presentations discussed various important scientific issues by comparing detailed model spectra to identify differences that can influence and bias the resulting atmospheric parameters. Theoretical line-blanketed model spectra were compared in detail to high-resolution spectroscopic observations. Stellar spectra computed (i.e., in the Gaia Radial Velocity Spectrometer wavelength range) with 1-D model atmosphere structures were mutually compared, but also to 3-D models from advanced radiation hydrodynamics codes. Atmospheric parameters derived from spectrum synthesis calculations

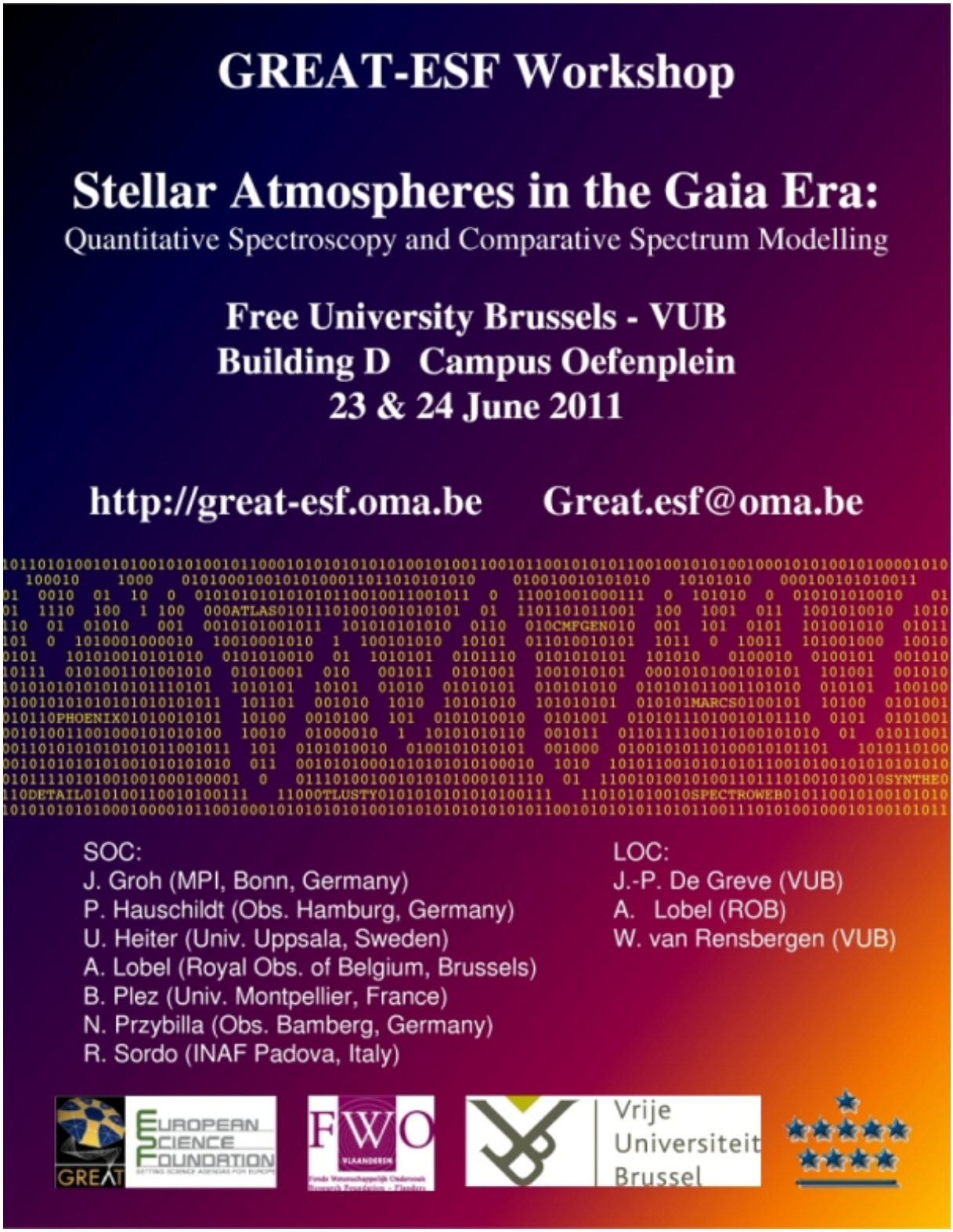
assuming Local Thermodynamic Equilibrium (LTE) were evaluated against more sophisticated non-LTE models of metal-poor stars and the extended atmospheres of giants and supergiants. The workshop presented an overview of high-resolution synthetic spectral libraries of model spectra computed with the synthesis codes. The spectral model grids will be utilized to derive stellar parameters with the Discrete Source Classifier Algorithms currently under development in the Gaia DPAC consortium (`http://www.rssd.esa.int/index.php?project=GAIA&page=DPAC_Introduction`). They are implemented for training Gaia data analysis algorithms for the classification of a wide variety of hot and cool star types; FGK & M stars, OB stars, white dwarfs, red supergiants, peculiar A and B stars, carbon stars, ultra cool dwarfs, various types of emission line stars, Be stars, Wolf-Rayet stars, etc. A substantial number of oral and poster presentations discussed different techniques for measuring the abundance of various chemical elements from stellar spectra. The presented methods utilize spectra observed with large spectral dispersion, for example for accurately measuring iron, carbon, and nitrogen abundances. These methods are important for ongoing development and testing of automated & supervised algorithms for determining detailed chemical composition in tagging studies of large (chemo-dynamical) spectroscopic surveys planned to complement the Gaia (astrometric and kinematic) census of the Galaxy.

The complete scientific programme is available at `http://http://iopscience.iop.org/1742-6596/328/1/011001`. The workshop website also offers the presentation viewgraphs (in PDF format) and some nice photographs of the talks and poster breaks `http://great-esf.oma.be/program.php`. The papers presented at the workshop and collected here have been edited by A Lobel, J-P De Greve, and W van Rensbergen. The Proceedings essentially follow the order of presentation during the conference program, divided into cool and hot stars (oral papers are followed by poster papers). It also offers a review paper about new research results presented at the conference, including a record of the main discussion sessions. 27 papers passed through the peer review process. The manuscripts were submitted before 15 September 2011 and accepted by the referees before 1 November 2011. We would like to thank the reviewers for their constructive criticism during the preparation of this Volume. It has 225 pages by 27 authors and 135 co-authors, and includes 114 color figures and 21 tables. The articles are freely available at `http://iopscience.iop.org/1742-6596/328/1`.

We would like to express our gratitude for the financial support from the European Science Foundation and the Research Foundation - Flanders. We thank the Vrije Universiteit Brussel for making the meeting and poster rooms freely available during the conference. We specially thank Mrs. Merel Fabré for assistance with the workshop organization and administration at the VUB. We thank the Royal Observatory of Belgium for help with conference grants management, transportation, and administration. We are grateful to all the workshop participants for their valuable contributions and active discussions which made the conference very successful indeed.

Alex Lobel
Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium
E-mail: Alex.Lobel @ oma.be alobel @ sdf.lonestar.org
Web: `http://alobel.freeshell.org`
Jean-Pierre De Greve
Walter van Rensbergen
Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium
Editors
Brussels, October 2011.

CONFERENCE POSTER



SCIENTIFIC COMMITTEE
Jose Groh (Germany)
Peter Hauschildt (Germany)
Ulrike Heiter (Sweden)
Alex Lobel (Belgium)
Bertrand Plez (France)
Norbert Przybilla (Germany)
Rosanna Sordo (Italy)

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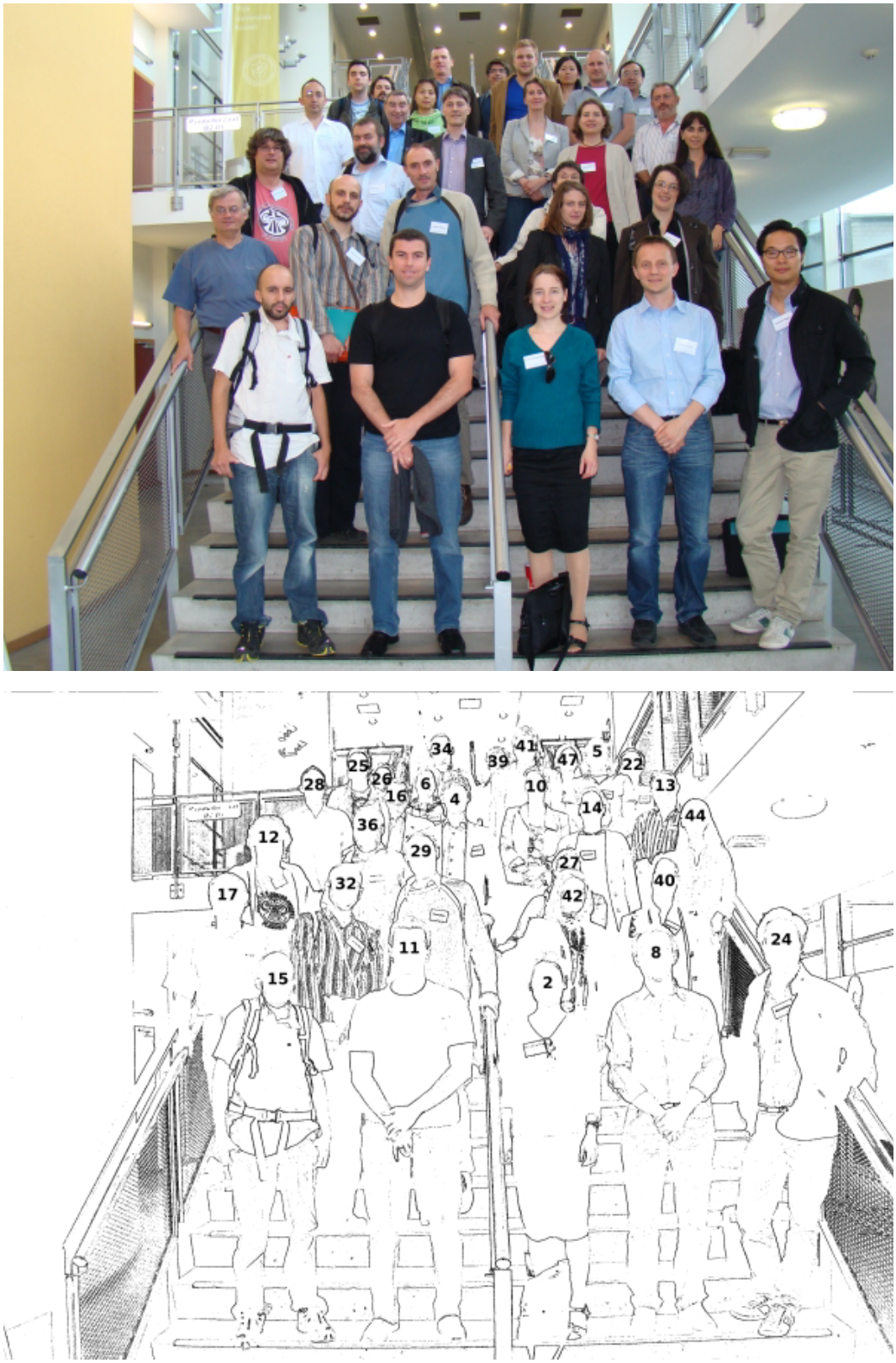
CONFERENCE PHOTOGRAPH (23 June 2011)



CONFERENCE PARTICIPANTS

1. Teresa Aparicio Villegas	Instituto de Astrofisica de Andalucia, Granada, Spain
2. Maria Bergemann	Max Planck Institute for Astrophysics, Garching, Germany
3. Ronny Blomme	Royal Observatory of Belgium, Brussels
4. Thomas Dall	European Southern Observatory, Garching, Germany
5. Alex de Koter	University of Amsterdam, The Netherlands
6. Yanping Chen	University of Groningen, The Netherlands
7. Andrea Chiavassa	Université Libre de Bruxelles, Belgium
8. Remo Collet	Max Planck Institute for Astrophysics, Garching, Germany
9. Jean-Pierre De Greve	Vrije Universiteit Brussel, Belgium
10. Nadiya Gorlova	University of Leuven, Belgium
11. Jose Groh	Max Planck Institute for Radioastronomy, Bonn, Germany
12. Peter Hauschildt	Observatory of Hamburg, Germany
13. Artemio Herrero	Instituto de Astrofisica de Canarias, Spain
14. Ulrike Heiter	University of Uppsala, Sweden
15. Anthony Hervé	University of Liège, Belgium
16. Leo Houziaux	Royal Academy of Belgium, Brussels
17. Rene Hudec	Academy of Sciences, Czech Republic
18. Alain Jorissen	Université Libre de Bruxelles, Belgium
19. Andreas Korn	University of Uppsala, Sweden
20. Pavel Koubsky	Astronomical Institute Ondřejov, Czech Republic
21. Alex Lobel	Royal Observatory of Belgium, Brussels
22. Ali Luo	National Astronomical Observatory, Beijing, China
23. Laurent Mahy	University of Liège, Belgium
24. Zazralt Magic	Max Planck Institute for Astrophysics, Garching, Germany
25. Jesús Maldonado	Universidad Autónoma de Madrid, Spain
26. Thomas Masseron	Université Libre de Bruxelles, Belgium
27. Josephina Montalban	University of Liège, Belgium
28. David Montes	Universidad Complutense de Madrid, Spain
29. Thierry Morel	University of Liège, Belgium
30. Pieter Neyskens	Université Libre de Bruxelles, Belgium
31. Fernanda Nieva	Max Planck Institute for Astrophysics, Garching, Germany
32. Giancarlo Pace	University of Porto, Portugal
33. Elena Pancino	INAF – Observatory of Bologna, Italy
34. Bertrand Plez	University of Montpellier, France
35. Norbert Przybilla	Observatory of Bamberg, Germany
36. Andreas Quirrenbach	Observatory of Heidelberg, Germany
37. Alejandra Recio-Blanco	Observatoire de la Côte d'Azur, France
38. Luca Sbordone	Max Planck Institute for Astrophysics, Heidelberg, Germany
39. Sergio Simon Diaz	Instituto de Astrofisica de Canarias, Spain
40. Rosanna Sordo	INAF – Observatory of Padova, Italy
41. Frans Arjen Stap	University of Amsterdam, The Netherlands
42. Marica Valentini	University of Liège, Belgium
43. Griet Van de Steene	Royal Observatory of Belgium, Brussels
44. Sophie Van Eck	Université Libre de Bruxelles, Belgium
45. Walter van Rensbergen	Vrije Universiteit Brussel, Belgium
46. Nicholas Walton	University of Cambridge, United Kingdom
47. Jiannan Zhang	National Astronomical Observatory, Beijing, China

GREAT-ESF WORKSHOP

STELLAR ATMOSPHERES IN THE GAIA ERA:

QUANTITATIVE SPECTROSCOPY AND COMPARATIVE SPECTRUM MODELING

Thu 23 June 2011

Quantitative Spectroscopy and Comparative Spectrum Modeling of Cool Stars

09:00 Welcome & Practical info by VUB Local Organizing Committee

Session 1: (Chair A. Korn)

09:10 U. Heiter: *Comparative Modelling of the Spectra of Cool Giants*

09:40 P. Hauschildt: *The PHOENIX Model Atmosphere Package*
10:20 M. Bergemann: *Non-LTE Line Formation of Fe-peak Elements and Application to Large-scale Stellar Surveys*

10:40 Coffee break & Poster viewing
11:10 R. Collet: *The StaggerGrid Project: a Grid of 3D Model Atmospheres for High-precision Spectroscopy*
11:30 T. Aparicio Villegas: *Stellar Physics with the ALHAMBRA Photometric System*

11:50 A. Quirrenbach: *Spectroscopic Instrumentation in the GAIA Era*

12:10 Discussion Session I

12:30 Lunch at VUB restaurant

Session 2: (Chair U. Heiter)

13:30 B. Plez: *Model Atmospheres and Spectra for Cool Stars: Comparisons of MARCS and Other Brands of Models*
14:10 R. Sordo: *Libraries of Synthetic Spectra in the Gaia Mission*

14:50 A. Recio-Blanco: *Automatic Stellar Spectra Parametrisation in the IR Ca II Triplet Region*

15:20 Coffee break & Poster viewing
15:50 G. Pace: *The Metallicity Scale of Dwarf and Giant Stars*
16:10 N. Gorlova: *Abundance Analysis of Post-AGB Stars*
16:30 D. Montes: *High-resolution Spectroscopy of FGK Nearby Stars: Stellar Parameters and Chemical Tagging*
16:50 Discussion Session II

17:15 Poster viewing until **18:00**

GREAT-ESF WORKSHOP

STELLAR ATMOSPHERES IN THE GAIA ERA:

QUANTITATIVE SPECTROSCOPY AND COMPARATIVE SPECTRUM MODELING

Fri 24 June 2011

Quantitative Spectroscopy of Hot Stars

09:00 Practical info by VUB Local Organizing Committee

Session 3: (Chair A. de Koter)

09:10 N. Przybilla: *A Comprehensive Test of Common Hydrostatic LTE and non-LTE Model Atmosphere/Line-formation Codes for Quantitative Spectroscopy of Early-type Dwarfs and Giants*
09:50 N. Walton: *VAMDC: The Virtual Atomic and Molecular Data Centre*
10:10 T. Dall: *Modelling Rotating Geometrically Distorted Stars with Inhomogeneous Surface Features*
10:30 Coffee break & Poster viewing
11:00 F. Nieva: *High-precision Stellar Parameter and Abundance Determinations of OB Dwarfs and BA Supergiants*
11:20 R. Hudec: *Tests of Simulated Gaia Bp/Rp Spectra with LDS (Low Dispersion Spectroscopy) Photographic Sky Surveys*
11:40 R. Blomme: *Hot Stars in the Gaia-ESO Public Survey*

12:00 Discussion Session III

12:20 Lunch at VUB restaurant

Session 4: (Chair A. Herrero)

13:30 J. Groh: *Modeling the Wind and Photosphere of Massive Stars with the Radiative Transfer Code CMFGEN*
14:10 S. Simon-Diaz: *The IACOB Project (WP3: Quantitative Spectroscopic Analysis of Galactic OB stars)*
14:30 Coffee break & poster viewing (removing of posters from 15:00)

15:10 A. de Koter: *The VLT-FLAMES Tarantula Survey*
15:30 Y. Chen: *XSL: The X-Shooter Stellar Library*

15:50 Discussion Session IV

16:10 Summary of Workshop (A. Lobel)
16:40 Workshop closing and Farewell by VUB LOC

GREAT-ESF WORKSHOP

STELLAR ATMOSPHERES IN THE GAIA ERA:

QUANTITATIVE SPECTROSCOPY AND COMPARATIVE SPECTRUM MODELING

23 & 24 June 2011

Posters and coffee are in the Mandela Room of VUB Building Q at street level.

Posters:

P1 S. Van Eck: *A Grid of MARCS Model Atmospheres for S Stars*

P2 T. Morel: *Using CoRoT and Kepler Targets as Benchmarks for Spectroscopic Analyses of Cool Stars*

P4 J. Maldonado: *Spectroscopic Properties of Stars with Circumstellar Debris Discs*

P5 A. Chiavassa: *3-D Hydrodynamical Model Atmospheres: A Tool to Correct Radial Velocities and Parallaxes*

P6 L. Mahy: *A Quantitative Study of the O Stars in NGC 2244*

P7 F. A. Stap: *Quantitative IR Spectroscopy of Massive Stars*

P8 J. Zhang: *Stellar Parameter Estimation for the LAMOST Survey*

P9 P. Koubsky: *Gaia RVS Spectroscopy of Be Stars*

P10 P. Neyskens: *Abundance Patterns in S-type AGB Stars to Set Constraints on Nucleosynthesis and Stellar Evolution Models*

P11 A. Jorissen: *Chemically Tagging the Hyades Stream: Does it Partly Originate from the Hyades Cluster?*

G12 ESA: *Gaia Mission Overview*

G13 ESA: *The Gaia Spacecraft and Instruments*

G14 ESA: *From Observation to Catalogue*

G15 ESA: *Data Processing and Analysis Consortium*

G16 ESA: *Gaia's Scientific Rewards*

G17 ESA: *Industrial Involvement in the Gaia Spacecraft*

PARTICIPANTS

NAME	EMAIL
A	
Teresa Aparicio Villegas	terenz AT iaa.es
B	
Maria Bergemann	mbergema AT mpa-garching.mpg.de
Ronny Blomme	Ronny.Blomme AT oma.be
C	
Yanping Chen	yanping AT astro.rug.nl
Andrea Chiavassa	achiavas AT ulb.ac.be
Remo Collet	remo AT mpa-garching.mpg.de
D	
Thomas Dall	tdall AT eso.org
Jean-Pierre De Greve	jpdgreve AT vub.ac.be
Alex de Koter	A.deKoter AT uva.nl
G	
Nadya Gorlova	nadya AT ster.kuleuven.be
Jose Groh	jgroh AT mpifr-bonn.mpg.de
H	
Peter Hauschildt	yeti AT hs.uni-hamburg.de
Ulrike Heiter	ulrike.heiter AT physics.uu.se
Artemio Herrero	ahd AT iac.es
Anthony Hervé	herve AT astro.ulg.ac.be
Leo Houziaux	leo.houziaux AT ulg.ac.be
Rene Hudec	rene.hudec AT gmail.com
J	
Alain Jorissen	Alain.Jorissen AT ulb.ac.be
K	
Andreas Korn	andreas.korn AT physics.uu.se

Pavel Koubsky koubsky AT sunstel.asu.cas.cz

L
Alex Lobel alobel AT sdf.lonestar.org
Ali Luo lal AT lamost.org

M
Zazralt Magic magic AT mpa-garching.mpg.de
Laurent Mahy mahy AT astro.ulg.ac.be
Jesus Maldonado jesus.maldonado AT uam.es
Thomas Masseron thomas.masseron AT ulb.ac.be
Josefina Montalban j.montalban AT ulg.ac.be
David Montes dmg AT astrax.fis.ucm.es
Thierry Morel morel AT astro.ulg.ac.be

N
Pieter Neyskens pieter.neyskens AT ulb.ac.be
Fernanda Nieva fnieva AT mpa-garching.mpg.de

P
Giancarlo Pace gpace AT astro.up.pt
Elena Pancino elena.pancino AT oabo.inaf.it
Bertrand Plez bertrand.plez AT univ-montp2.fr
Norbert Przybilla Norbert.Przybilla AT sternwarte.uni-erlangen.de

Q
Andreas Quirrenbach A.Quirrenbach AT lsw.uni-heidelberg.de

R
Alejandra Recio-Blanco arecio AT oca.eu

S
Sergio Simon-Diaz ssimon AT iac.es
Rosanna Sordo rosanna.sordo AT oapd.inaf.it
Frans Arjen Stap frans.stap AT student.uva.nl

V
Marica Valentini valentini AT astro.ulg.ac.be

Griet Van de Steene gsteene AT oma.be
Sophie Van Eck svaneck AT astro.ulb.ac.be
Walter van Rensbergen wvanrens AT vub.ac.be

W
Nicholas Walton naw AT ast.cam.ac.uk

Z
Jiannan Zhang jnzhang AT lamost.org