INTERNATIONAL CONFERENCE

Putting A Stars into Context: Evolution, Environment and Related Stars

June 3-7, 2013
Moscow, Russia

The conference is organized and/or sponsored by:

CONFERENCE PROGRAM

JUNE 3, MONDAY

10:00-10:25	Welcome addresses	
10:25-11:00	Overview introductory talk	*John D. Landstreet*
11:00-11:30	Coffee-break	

<u>Session 1: A-star formation</u>

Chair: Elizabeth Griffin

1a: Big clouds to open clusters

11:30-12:05	Chemically peculiar tepid stars in the Milky Way and beyond	*Martin Netopil*
12:05-12:40	Elemental abundances in open cluster A-type and related stars	*Luca Fossati*
12:40-13:00	Spectral Analysis of the Early Type Members of the Open Cluster M6: Preliminary Results	*Tolgahan Kilicoglu*
13.00-14.30	Lunch	

1b. Small clouds to stars

Chair: Igor Savanov

14:30-15:05	Discs around A-type and related stars	*Vladimir Grinin*
15:05-15:25	Herschel DEBRIS survey of debris discs around A stars	*Nathalie Thureau*
15:25-16:15	Coffee break and poster viewing session	
16:15-16:50	Accretion discs around magnetic stars	*Caroline D'Angelo*
16:50-17:25	Planets around A stars	*David Mkrtichian*
17:25-17:55	Coffee break.	
18:00-20:00	Concert	

JUNE 04, TUESDAY

Chair: Nikolai Piskunov

09:30-10:05	Multiplicity of A-type and related stars	*Pierre North*
10:05-10:25	A Stars in the Context of (Long-Period) Binaries	*Elizabeth Griffin*

1c. Magnetic field generation

10:25-11:00	Magnetic fields in Herbig Ae/Be stars	*Evelyne Alecian*
11:00-11:30	Coffee break.	
11:30-12:05	Generation and evolution of stable stellar magnetic fields	*Rainer Arlt*
12:05-12:40	The protostar merger scenario of Ap star magnetic field generation	*Herbert Lau*
12:40-13:00	The rotation-binarity connection in Ap stars and its implications for the origin of their magnetic fields	*Gautier Mathys*
13:00-14:30	Lunch	

Session 2: Properties of A-type stars

Chair: Olga Pintado

14:30-15:05	Determinations of fundamental parameters of (chemically peculiar) A stars through optical interferometry	*Karine Perraut*
15:05-15:40	Recent results and current challenges in normal and chemically peculiar A-star model atmospheres	*Denis Shulyak*
15:40-16:00	Influence of Departures from LTE on Oxygen and Calcium Abundance Determination in A-K type stars	*Tatyana Sitnova*
16:00-16:50	Coffee break and poster viewing session	
16:50-17:25	Non-LTE studies of A supergiants	*Norbert Przybilla*
17:25-18:00	Simultaneous mapping of chemical abundances and magnetic field structure in Ap stars	*Theresa Lueftinger*
17:40-18:20	The study of evolutionary changes in intermediate mass magnetic CP stars across the HR diagram	*Evgeny Semenko*

JUNE 05, WEDNESDAY

Chair: Richard Monier

09:30-10:05	Element spots in HgMn stars	*Heidi Korhonen*
10:05-10:25	Elemental Abundance Analysis of The Marginal Am Star 15 Vulpecula	*Aysegul Teker*
10:25-11:00	The origin of light variability in Ap stars	*Jiří Krtička*
11:00-11:30	Coffee break.	
11:30-12:05	Vertical abundance gradients in Ap-star atmospheres	*Tatyana Ryabchikova*

Session 3: Rotation and hydrodynamics of A-type and related stars

12:05-12:40	Time-dependent diffusion and abundance stratification in A- and B-type stars (with and without mass-loss)	*John D. Landstreet*
12:40-13:00	Dragging helium out in the main sequence B-stars	*Eugenij Staritsin*
13:00-13:35	A-star rotation	*Frédéric Royer*
13:35-15:00	Lunch	

15:00 - Departure by bus for Moskva river cruise tour

15:00 – 19:00 Moskva river cruise tour

JUNE 06, THURSDAY

Chair: Jamie Matthews

09:30-10:05	Ap stars with variable rotation periods	*Zdeněk Mikulášek*

Session 4: Pulsation of A-type and related stars

10:05-10:40	A- and B-type star pulsations in the Kepler and CoRoT era: observational results	*Katrien Uytterhoeven*
10:40-11:15	|A- and B-type star pulsations in the Kepler and CoRoT era: theoretical considerations	*Hydeyuki Saio*
11:15-11:45	Coffee break	
11:45-12:05	LSD-based analysis of high-resolution stellar spectra	*Vadim Tsymbal*
12:05-12:40	Observational studies of roAp stars	*Mikhail Sachkov*
12:40-13:15	Stochastic oscillations in A-type and related stars	*Victoria Antoci*
13:15-13:35	A new class of low amplitude periodic variable A and late-B stars	*Nami Mowlavi*

13:35-15:05	Lunch	

<u>Session 5: Magnetic fields from O to early F stars</u>

Chair: Natalia Drake

15:05-15:40	Magnetic fields in O stars	*Yaël Nazé*
15:40-16:15	Magnetic fields in beta Cep, SPB and Be stars	*Markus Schoeller*
16:15-17:15	Coffee break and poster viewing session.	
17:15-17:50	Recent results and current challenges in observations of Ap/Bp star magnetic fields	*Iosif Romanyuk*
17:50-18:10	Magnetic fields of Ap stars from the full Stokes vector spectropolarimetric observations	*Naum Rusomarov*
18:10-18:30	Magnetic personalities of A stars revealed by the MOST microsat	*Jaymie Matthews*
19:00	Conference dinner	

JUNE 07, FRIDAY

Chair: Gautier Mathys

09:30-10:05	Magnetic fields in A stars besides Ap stars	*Oleg Kochukhov*
10:05-10:40	Descendants of magnetic and non-magnetic A-type and related stars	*Francois Lignieres*
10:40-11:15	Non-pulsational variability of A- and B-type stars as observed by Kepler	*Luis Balona*
11:15-11:45	Coffee break.	
11:45-12:20	X-ray emission of Ap stars and of other A stars	*Jan Robrade*
12:20-12:55	Bp star magnetospheres	*Asif ud-Doula*
12:55-14:30	Lunch	

<u>Session 6: A-stars at post-main-sequence stages</u>

Chair: Kazimierz Stepien

14:30-15:05	White dwarf magnetic fields	*Gennady Valyavin*
15:05-15:40	A supergiants in the Local Group of galaxies and beyond	*Miguel Urbaneja*

15:40-16:10	Coffee break.	
16:10-17:15	Summary talk and closing discussion	*Charles Cowley*
17:15	Conference closing	

POSTERS

P1 Alexeeva S.A., Mashonkina L.I., Non-local thermodynamic equilibrium line formation for C I - C II in the atmospheres of A-G-type stars

P2 Al-Hawi O., Bikmaev I., Melnikov S., Bikmaeva M., Sakhibullin N., Chemical composition of the sample of 15 normal and peculiar A-F-stars

P3 Butkovskaya V., Magnetic field of Vega

P4 Bychkov V.D., Bychkova L.V., Madej J., On the periodical variability of the longitudinal magnetic fields of stars

P5 Castaneda D., Deupree R.G., C.Ian Short, Internal Angular Momentum Distribution of the A5 III star α Oph

P6 Cowley C. R., Hubrig S., The spectrum and abundances of the high-latitude HAe star PDS2

P7 Drake N., Hubrig S., Schoeller M., Ilyin I., Establishing the link between HgMn and PGa stars

P8 Galeev I., Bikmaev I., Shimansky V., GSC4813-0981 is the new low-amplitude delta Scuti star with variable amplitude

P9 Gebran M., Monier R., Royer F., Microturbulence in A/Am stars

P10 Holdsworth D., Smalley B., Asteroseismology with SuperWASP - Rapidly Varying A-type Stars

P11 Hou Wen, Determination of atmospheric parameters of A-type stars for relative flux calibration

P12 Hubrig S., Schoeller M., Ilyin I., G. Lo Curto, HARPS spectropolarimetry of O and B-type stars

P13 Karitskaya E.A., Bochkarev N.G., On Possible Existence of Brightness Spots on CygX-1 Supergiant

P14 Kholtygin A.F., Hubrig S., Drake N.A., Sudnik N.P., Dushin V.V., Statistics of the magnetic fields of OBA stars

P15 Krtička J., Wind mass-loss rates in main-sequence B stars

P16 Li Yinbi, A-li Luo, Yuqin Chen, Wen Hou, A-color star classification with line index and a new continuum evaluation method

P17 Lignières, F., Jouve, L., Gastine, T., Gaurat, M., A scenario for the lower bound of Ap magnetic fields

P18 Netzer N., Radiative transfer and the dynamics of the stellar outer layers

P19 Piskunov N., Titarenko A., Ryabchikova T., Pakhomov Yu., Nizamov B., Methodology of measurements of fundamental parameters and associated uncertainties for middle and cool main-sequence stars

P20 Prvak M., Krtička J., Mikulášek Z., Lüftinger T., Liška J., Modelling of the variability of the CP star phi Dra

P21 Rojas M.M., Drake N.A., Chavero C., Pereira C.B., Kholtygin A.F., Cahuasqui J.A., Abundances for planet-hosting and debris-disk stars

P22 Royer F., Gebran M., Monier R., Hill G., Gulliver A., Adelman S., Smalley B., Pintado O., Reiners A., Normal low vsini A0-A1 stars

P23 Savanov I.S., Romanyuk I.I., Semenko E.A., Dmitrienko E.S., Long-term variability of the magnetic field of the Ap star gamma Equ

P24 Shulyak D., Paladini C., Li Causi G., Sacuto S., Kochukhov O., Interferometry of CP stars: how far can we go?

P25 Steffen M., Hubrig S., Todt H., Schoeller M., Sandin C., Hamann W.-R., Schoenberner D., Detection of weak magnetic fields in central stars of planetary nebula

P26 Wahlgren, G.M., Bohlender, D., Emission line variability in the HgMn star 11 Per

P27 Yakunin I., Wade G., Bohlender D., Marcolino W., Kochuckov O., Grunhut J., Monin D., Shultz M. & MiMeS collaboration, Magnetic Doppler Imaging of the slowly-rotating magnetic He-strong star HD 184927

P28 Yüce K., Adelman S. J., On the Properties of Non-Magnetic Peculiar B, A, and Early F Type Stars

P29 Abt H.A. Gaseous Disks Around A Stars

P30 Polosukhina N., Shulyak D., Shavrina A., Lyashko D., Drake N., .Glagolevsky Y., Kudryavtsev D., Smirnova M. Doppler Imaging mapping of four roAp stars with anomaously high Li abundance

ABSTRACTS

INVITED AND CONTRIBUTED TALKS

A-TYPE STARS, AND THEIR FRIENDS AND FAMILIES

Landstreet J.D.
Department of Physics & Astronomy, University of Western Ontario, London, ON, Canada, and Armagh Observatory, Armagh, Co. Armagh, Northern Ireland
e-mail: jlandstr@uwo.ca

The subject of A-type stars includes a wide variety of stages of stellar evolution, including pre-main sequence Herbig Ae stars, main sequence stars of roughly 1.5-3 $M_\odot$, horizontal branch A stars, massive A supergiants of 5-20 $M_\odot$, and DA white dwarfs. What such stars have in common is effective temperatures of around 7000 – 12000 K, which means that most can be studied in detail using optical and UV photometry and spectroscopy, supplemented by other wavelength bands. Many A stars exhibit a rich variety of surface chemistries, which reveal the actions of such physical effects and processes as diffusion, mass loss, convective and turbulent mixing, and magnetic fields. They are therefore excellent laboratories for studying how physics acts inside stars. This talk will recall some of the major questions which are currently of importance to the stellar physics community, and look at how A stars can help to answer them. I will particularly note advances coming from ambitious computational projects, and from powerful observational tools.

CHEMICALLY PECULIAR TEPID STARS IN THE MLKY WAY AND BEYOND

Netopil M.[1], Paunzen E.[2], Maitzen H. M.[1]
1 - Institute for Astrophysics, University of Vienna, Vienna, Austria
2 - Department of Theoretical Physics and Astrophysics, Masaryk University, Czech Republic

e-mail: martin.netopil@univie.ac.at

Δa photometry is a valuable tool to detect magnetic chemically peculiar (CP) stars in an economic way due to their characteristic flux depression at 520 nm. Our main focus of attention is to survey galactic open clusters, to identify a sufficient large number of cluster CP members. Since open clusters offer the big advantage that the parameters like the age or distance can be determined rather accurately, one can trace relations of the CP incidence with age and other properties. On the basis of about 80 open clusters covered so far with Δa photometry, we want to present such an analysis. Apart from the galactic CP representatives, we were also already able to discover them by means of Δa in another environment, the Large Magellanic Cloud. This nearby galaxy exhibits different properties than the Milky Way, which can be additionally used to investigate the favouring conditions for the formation of chemically peculiar stars.

CHEMICAL ABUNDANCE STUDIES OF CP STARS IN OPEN CLUSTERS

Fossati L.
Argelander Institut für Astronomie, University of Bonn, Bonn, Germany

e-mail: lfossati@astro.uni-bonn.de

In stellar astrophysics, the study of the atmospheres of early-type stars plays a very special role. The atmospheres of these stars display a variety of different phenomena, such as the presence of large magnetic fields, strong surface convection, pulsation, diffusion of chemical elements. In particular, about 10% of early F-, A- and late B-type stars present chemical peculiarities, which rise as a result of diffusion. A detailed study of the evolution of the chemical peculiarities as traces of diffusion processes requires the precise knowledge of stellar ages and initial chemical composition. Open clusters provide this information: 1) it is possible to assume that all cluster members have approximately the same original chemical composition and age; 2) the age of stars belonging to open clusters can be determined with much higher accuracy than for field stars. For this reason chemically peculiar stars member of open clusters have been targeted to study the evolution of the chemical peculiarities primarily to provide constraints to diffusion models. I will review the abundance studies of chemically peculiar stars in open clusters performed until now, putting their results into the broader context of stellar evolution.

SPECTRAL ANALYSIS OF THE EARLY TYPE MEMBERS OF THE OPEN CLUSTER M6: PRELIMINARY RESULTS

Kilicoglu T.[1], Monier R.[2], Fossati L.[3]
1 – Astronomy and Space Sciences Department, Ankara University, Ankara, Turkey
2 – Lagrange Laboratory, Nice University and LESIA, Nice/Paris, France
3 – Argelander Institute for Astronomy, Bonn University, Bonn, Germany
e-mail: tkilicoglu@ankara.edu.tr

We have analyzed low and high resolution spectra covering 4500 - 5840 Å of late B, A, and F type members of the open Cluster M6 (Age ~100 Myr). The spectra were obtained using the FLAMES/GIRAFFE spectrograph mounted at UT2, the 8 meter class VLT telescope. The effective temperatures, surface gravities and microturbulent velocities of the stars were derived using both photometric and spectral methods. We have also performed a chemical abundance analysis using synthetic spectra. The abundances of the elements were determined for He, C, O, Mg, Si, P, S, Ca, Sc, Ti, Cr, Mn, Fe, Ni, Zn, Y, Ba. Differences in chemical composition among main sequence stars within a given cluster are probably due to differences in their masses and other effects such as radiative diffusion, magnetic field, rotation, mixing mechanisms, mass loss, accretion and multiplicity. The early type main-sequence members of open clusters of different ages allow us to study the competition between radiative diffusion and mixing mechanisms. In this study, we discuss the star-to-star variations in chemical abundances among the members of the open cluster M6. We have compared the new results with those of clusters having similar ages.

DISKS AROUND HERBIG Ae STARS AND RELATED OBJECTS

Grinin V.
Pulkovo Astronomical Observatory, Russian Academy of Sciences, St.-Petersburg, Russia

e-mail: vgcrao@mail.ru

Circumstellar disks are formed together with the stars at the process of the gravitational collapse of protostellar clouds and play an important role during the pre-main-sequence phase of their evolution. They are responsible for the formation of jets and bi-conical outflows, and they are the reservoir of matter from which the planetary systems are formed. The main source of information about the circumstellar disks is the infrared and sub-mm regions of the spectrum. In the case of the Herbig Ae stars the observations in the visual region are also the very useful source of information about the dynamical processes in the inner regions of the disks. In this review I discuss the properties and evolution of disks around these stars and related objects in the context of possible grain growth and disk dissipation via the planet formation.

HERSCHEL DEBRIS SURVEY OF DEBRIS DISCS AROUND A STARS

Thureau N.D.[1], Greaves, J.S.[1], Matthews B.C.[2], Kennedy G.[3], Sibthorpe B.[4], Wyatt M.[3], Booth M.[2], Duchêne G.[5]
1 – School of Physics and Astronomy, University of St Andrews, Scotland
2 – Department of Physics and Astronomy, University of Victoria, Canada
3 – Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, England
4 – SRON Netherlands Institute for Space Research, Groningen, The Netherlands
5 – Astronomy Department, UC Berkeley, USA

e-mail: nt15@st-andrews.ac.uk

The Herschel DEBRIS (Disc Emission via a Bias-free Reconnaissance in the Infrared/Submillimetre) survey brings us a unique perspective on the study of debris discs around main sequence A-type stars. We have observed a sample of 89 A-stars with Herschel-PACS (Photodetector Array Camera and Spectrometer) at 100 and 160 μm. The statistical analysis of the data shows a *lower* than previously found debris disc rate. The lesser occurrence is due in part to some excess sources being resolved as background objects with the 2.5 times higher angular resolution provided by Herschel (PACS-100) relative to Spitzer (MIPS-70). We find a 3σ detection rate of 23% at blue which is similar to the debris disc rate around main sequence F/G/K-spectral type stars. Multiplicity is found to have little or no impact on the debris disc properties and disc detection rates in single and multiple systems are similar. Tight and wide binaries debris discs are found to be statistically no different than discs around single stars. No intermediate separation debris systems were detected with debris discs being found either around tight <1 AU or wide >100 AU binaries. A likely explanation is that discs in intermediate systems have evolved much faster due to the disc-companion interactions and the discs have partially or totally dissipated rendering them undetectable.

ACCRETION DISCS AROUND MAGNETIC STARS

D'Angelo C.
University of Amsterdam

e-mail: c.r.dangelo@uva.nl

In the last decade, significant advances in theoretical work (both numerical and analytical) have allowed considerable progress in our understanding of the interaction between accretion discs and strong stellar magnetic fields. This interaction leads to large-amplitude variability and spin-regulation in the star. I will review recent theoretical progress in the field, with particular discussion of a little-known accretion disc solution known as a "dead disc". In this solution, the accretion rate onto the star is very low and most mass is retained in the inner parts of the disc, allowing for enhanced spin-down of the star and unstable bursts of accretion.

PLANETS AROUND A-STARS

Mkrtichian D.
National Astronomical research Institute of Thailand

e-mail: davidmkrt@gmail.com

At present, our knowledge about planets around massive stars and A-stars in particular, is very limited. High-rotation velocities of A -stars significantly reduce the accuracy of radial velocity measurements and efficiency of the exoplanet detection. Generally we believe that the photometric transit search technique is more effective and promising for exoplanet detections in A stars. The only planet discovered among A-stars by the photometric transit technique is the WASP-33 - the planetary system with A5-type central star which exhibits short-period Delta-Scuti type pulsations. On the other hand, the Ap stars showing in average low rotation velocities, the abundance excess of the chemical elements and plenty of sharp spectral lines in their spectra are well suitable for precise radial velocity measurements with accuracy of ~1 m/s and can be effective for exoplanet detection. In my review, I will discuss issues related to the existence and detection of exoplanet in A-stars, in particular in Ap stars and will review recent exoplanet surveys and their results.

MULTIPLICITY OF A-TYPE AND RELATED STARS

North P.[1], Eyer L.[2],
1 - Laboratory of Astrophysics, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
2 - Geneva Observatory, Switzerland

e-mail: pierre.north@epfl.ch

The origin of chemically peculiar stars remains enigmatic, especially regarding their frequency among their "normal" peers. In addition to magnetic fields and rotation, multiplicity may shed light on the question. We take the census of the three kinds of surveys done so far of intermediate mass stars, either normal or chemically peculiar, magnetic or not: spectroscopic, imaging and photometric. We also consider the multiplicity of red giant stars, since many of them are descendants of A-type stars, especially through Mermilliod's radial velocity monitoring of open clusters members. We review the orbital properties of binary systems hosting chemically peculiar stars. Some specific objects of special interest are mentioned as deserving further study. Finally, the role of some binary systems composed of A-type stars as progenitors of Type Ia supernovae is emphasized, and the potentialities of future programs such as Gaia are briefly described.

A STARS IN THE CONTEXT OF (LONG-PERIOD) BINARIES

Griffin ELizabeth R.
Dominion Astrophysical Observatory, Victoria, Canada
e-mail: Elizabeth.Griffin@nrc-cnrc.gc.ca

Measuring and interpreting (modelling) the parameters of A-type stars is our prime route to the astrophysics of the large fraction of our Galaxy which is currently in that state. Unfortunately there are too many unknowns to provide a fully reliable and unambiguous understanding of the many processes and states which those stars manifest during that evolutionary stage. "External" information, such as membership of a binary system, provides at least some of those needed constraints. Cp stars are most easily recognized through having sharp lines, so RV measurements are precise, but has that property dominated the theory and the modelling? Many sharp-lined A-stars are classed as SB1, if not SB2, binaries. But how how many Cp stars have been missed, or have been mis-classified because they are not binaries but Ap, or are rotating when theory says they should not? The statistics favour a membership for such stars in quite short-period binaries, and the slow rotation that would then arise in a synchronous orbit is often cited as "the" mechanism that permits an atmosphere to settle by diffusion. The existence of Am stars in wide (long-period) binaries proves that that cannot be the case, while the samples used in the statistics may also unconsciously carry biases. Maybe we need to get back to the drawing-board?

MAGNETIC FIELDS IN THE PROGENITORS OF THE Ap/Bp STARS

Alecian E.
LESIA - Observatoire de Paris, France
e-mail: evelyne.alecian@obspm.fr

In order to understand the origin of the magnetic fields detected in the chemically peculiar Ap/Bp stars, we performed ESPaDOnS, Narval and HARPSpol spectropolarimetric surveys of their pre-main-sequence progenitors: the Herbig Ae/Be stars and the intermediate-mass T Tauri stars. I will review our results and discuss their consequences on the fossil field theory..

GENERATION AND EVOLUTION OF STABLE STELLAR MAGNETIC FIELDS

Arlt R.
Leibniz Institute for Astrophysics Potsdam, Germany
e-mail: rarlt@aip.de

While the presence of magnetic fields on low-mass stars is attributed to a dynamo process essentially driven by convective motions, the reasons for the existence of magnetic fields on intermediate-mass stars may be more subtle. In this review, we are looking into the stability of large-scale magnetic fields in radiation zones and possible mechanisms of generating them. The talk will be a compilation of puzzle pieces with facts and studies helping to take the right look at the observational evidence to favor or dismiss one or another scenario.

THE PROTOSTAR MERGER SCENARIO OF Ap STAR MAGNETIC FIELD GENERATION

Lau H.H.B.[1], Ferrario L.[2], Wickramasinghe D.T.[3], Tout Christopher A.[4], Pringle James E.[4]
1- Argelander Institute for Astronomy, University of Bonn, Auf dem Huegel 71, Germany
2 - Mathematical Sciences Institute, The Australian National University, Canberra, Australia;
3 - Mathematical Sciences Institute, The Australian National University, Canberra, Australia;
4 - Institute of Astronomy, The Observatories, Madingley Road, Cambridge, UK

e-mail: hblau@astro.uni-bonn.de

We propose that the small fraction, which increases with mass, of stars which are magnetic can be explained if towards the end of the formation process, after the stars have developed a substantial radiative envelope, a correspondingly small fraction of stars merge. Magnetic A stars may result from merging stars and owe their strong magnetism to fields generated by a dynamo mechanism as they merge. We postulate a simple dynamo that generates magnetic field from differential rotation. We limit the growth of magnetic fields by the requirement that the poloidal field stabilizes the toroidal and vice versa. While magnetic torques dissipate the differential rotation, toroidal field is generated from poloidal by an Ω dynamo. Both poloidal and toroidal fields reach a stable configuration which is independent of the size of small initial seed fields but proportional to the initial differential rotation. We pose the hypothesis that strongly magnetic stars form from the merging of two stellar objects with the highest fields generated when the merge introduces differential rotation that amounts to its critical break up velocity within the condensed object. Such mergers can also account for the lack of close binaries among these stars.

THE ROTATION-BINARITY CONNECTION IN Ap STARS AND ITS IMPLICATIONS FOR THE ORIGIN OF THEIR MAGNETIC FIELDS

Mathys G.
Joint ALMA Observatory & European Southern Observatory, Santiago, Chile

e-mail: gmathys@eso.org

In recent years, growing evidence has been collected for the existence of a number of dependences between rotation rate, magnetic field strength and structure, and binary orbital properties, of Ap stars. One of the most recent and intriguing results suggests the existence of a connection between rotation and orbital periods in Ap binaries. I shall discuss the nature of this connection and its potential implications for the origin of the magnetic fields of Ap stars.

DETERMINATIONS OF FUNDAMENTAL PARAMETERS OF (CHEMICALLY PECULIAR) A STARS THROUGH OPTICAL INTERFEROMETRY

Perraut K.
UJF-Grenoble 1 / CNRS-INSU, Institut de Planetologie et d'Astrophysique de Grenoble (IPAG) UMR 5274, Grenoble, F-38041, France
e-mail: karine.perraut@obs.ujf-grenoble.fr

Direct measurement of stellar diameters is fundamental for determining properties of stars, in particular the linear radius and the effective temperature. These properties provide the link between theory of stellar structure and evolution to model atmospheres. For nearby, main-sequence stars, whose distances are well known, the angular diameters are difficult to measure due to their small sizes compared to their evolved counterparts. Recently, high angular resolution provided by long-baseline optical interferometry has enabled the photospheric disks of such nearby stars to be resolved. These measurements have provided clues for studying the physical processes at play in the A stars (like convection, rotation, pulsations). I will briefly explain the principle of long-baseline interferometry and present the recent studies based on the determination of fundamental parameters of A stars. I will also emphasize the great interest in combining interferometry and asteroseismology for the pulsating A stars.

RECENT RESULTS AND CURRENT CHALLENGES IN NORMAL AND CHEMICALLY PECULIAR A-STAR MODEL ATMOSPHERES

Shulyak D.
Goettingen University, Germany
e-mail: denis.shulyak@gmail.com

Stars of spectral type A provide a powerful observational ground for understanding of radiative processes that take place in stellar atmospheres. Modern models are calibrated to match observed characteristics of selected benchmark stars, and then used to derive atmospheric (T_{eff}, *log g*, abundances) and fundamental (R, M, L) parameters of other stars of similar spectral types. Although all modern models seem to match normal stars pretty well, a real challenge comes from chemically peculiar (CP) stars. These stars have non-solar chemical abundances which can not be described by simple solar-scaled patterns. More than that, chemical elements are often found to be non-uniformly distributed in the star atmospheres creating chemical spots and depth-dependent abundance stratification. Finally, CP stars host strongest magnetic fields among non-generate objects. Together with peculiar abundances, these fields can noticeably modify opacity and spectra appearance which then makes most of model calibrations irrelevant for these stars. In this talk I will summarize where do we stand in the never-lasting competition between models and observations and make prospects for future research.

INFLUENCE OF DEPARTURES FROM LTE ON OXYGEN AND CALCIUM ABUNDANCE DETERMINATION IN A-K TYPE STARS

Sitnova T., Mashonkina L., Ryabchikova T.
Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia
e-mail: sitnova@inasan.ru

Comprehensive model atoms for O I and Ca I-Ca II were applied to evaluate an influence of the departures from LTE on O and Ca abundance determinations for a wide range of spectral types. Non-LTE leads to large negative non-LTE abundance corrections for the infrared O I 7771-5Å triplet lines, while the non-LTE correction does not exceed 0.05 dex in absolute value for O I lines in the visible spectral range for main-sequence stars. For Ca II, the sign and magnitude of non-LTE correction depends on the line and stellar parameters. As a test of the used non-LTE methods, O and Ca abundances were derived for a few A-type stars with well determined stellar parameters. It was found that non-LTE largely removes the difference in abundance between the infrared O I 7771-5 Å and visible O I lines obtained under the LTE assumption. For example, for Vega, this difference reduces from 1.17 dex in LTE down to 0.14 dex in non-LTE. The remaining discrepancy can only be removed, when electron-impact excitation rates of Barklem (2007) are scaled by a factor of 1/4. For each investigated star, the non-LTE calcium abundances determined from lines of the two ionization stages Ca I and Ca II are consistent within the error bars, in contrast with the LTE case where (Ca I – Ca II) amounts to -0.13 to +0.14 dex for different stars. The non-LTE abundance corrections were calculated for a number of oxygen and calcium lines in a grid of model atmospheres.

NON-LTE STUDIES OF A-TYPE SUPERGIANTS

Przybilla N.
Institute for Astro- and Particle Physics, Univ. of Innsbruck
e-mail: norbert.przybilla@uibk.ac.at

The tenuous atmospheres of A-type supergiants are hotbeds for non-LTE physics. An overview of recent achievements in quantitative analyses of high-resolution spectra of Galactic A-type supergiants at optical and near-IR wavelengths is given, with a focus on the nature and extent of the non-LTE effects. Their impact on the determination of atmospheric and fundamental stellar parameters, and elemental abundances for about a dozen chemical species is characterized. Finally, implications for the evolutionary status of A-type supergiants are discussed.

SIMULTANEOUS MAPPING OF CHEMICAL ABUNDANCES AND MAGNETIC FIELD STRUCTURE IN Ap STARS

Lueftinger T.
Institute of Astrophysics, Faculty of Earth Sciences, Geography and Astronomy, University of Vienna, Austria
e-mail: theresa.rank-lueftinger@univie.ac.at

Magnetic Ap stars represent about 1\percent to 5\percent of the upper main sequence stars and exhibit highly ordered, very stable and often very strong magnetic fields. They frequently show both, brightness- and spectral line profile variations synchronised to stellar rotation, which are believed to be produced by atomic diffusion operating in the stars' atmospheres, that are stabilized by the strong magnetic fields. In recent years, with the development and the application of the Doppler- (DI) and magnetic Doppler imaging (MDI) technique and the availability of high precision spectroscopic and spectropolarimetric data, it has became possible to map chemical abundances and magnetic field structures of Ap stars in more and more detail and based on full Stokes vector observations. Here I will review the state-of-the-art in understanding Ap star spots and their relation to magnetic fields, the development of Doppler- and magnetic Doppler imaging into one of the most powerful astrophysical remote sensing methods and the physics of Ap stars atmospheres we can deduce from the simultaneous mapping of magnetic field structure and chemical abundances.

THE STUDY OF EVOLUTIONARY CHANGES IN INTERMEDIATE MASS MAGNETIC CP STARS ACROSS THE HR

Semenko E.
Special Astrophysical Observatory of the RAS, Nizhny Arkhyz, Russia
e-mail: esemenko@gmail.com

Using our own and published results of CP stars study we consider evolutionary changes of the value and the structure of stellar magnetic field and their physical properties. Spectroscopic and spectropolarimetric searches of the new magnetic Ap/Bp stars led us to the discovery of weak magnetic field on the surface of some late Bp stars. Detailed analysis of these stars (of about 2-3 solar mass) shows the clear differences from the group of evolved magnetic Ap stars that characterized by magnetic fields with simple configuration, slow rotation and significant lack of rear-earth elements.

ELEMENT SPOTS IN HgMn STARS

Korhonen H.
Centre for Star and Planet Formation, Univ.ersity of Copenhagen, Denmark
e-mail: heidi.korhonen@nbi.ku.dk

A fraction of late B-type stars, the so-called HgMn stars, exhibit enhanced absorption lines of certain chemical elements, notably Hg and Mn, combined with an underabundance of He. For about a decade now the elements with anomalously high abundances in HgMn stars are known to be distributed inhomogeneously over the stellar surface. Temporal evolution of these elemental spots have been reported in few HgMn stars, first secular evolution of the mercury spots in alpha And, and recently also a fast evolution of yttrium and strontium spots in HD 11753. The fast evolution of spots in HD 11753 is combined with a slower change in the overall abundance of the affected elements. In this talk I will review what is known of elemental spots in HgMn stars and their secular and fast temporal evolution.

ELEMANTAL ABUNDANCE ANALYSIS OF THE MARGINAL Am STAR 15 VULPECULA

Teker Yelkenci A.F.[1], Adelman S.J.[2]
1 – Department of Physics, Istanbul Kultur University, Istanbul 34156, Turkey
2 – Department of Physics, The Citadel, Charleston, SC 29409, USA
e-mail: a.teker@iku.edu.tr

In this work, high quality spectral analysis of the marginal Am star 15 Vul (A4 III) is established. High dispersion (2.4 Å mm^{-1}) and high S/N (≥200) spectrograms with wavelength coverage of 3824-8979Å are obtained with the 1.22-m Dominion Astrophysical Observatory telescope's coude spectrograph. We used REDUCE to rectify the exposure. The spectra are measured using the fix parameter mode of VLINE program. Radial velocity of 15 Vul is determined as -22.94 ±0.11 km/s and the rotational velocity estimate is 10 km/s. 3600 stellar lines of 52 species are identified in the observed spectrum of 15 Vul. Stellar parameters are calculated using ATLAS9 LTE plane-parallel model atmospheres, synthetic spectra from SYNTHE and ionization equilibrium from Fe I and Fe II lines. Elemental abundance analysis is accomplished using WIDTH9 with high quality atomic data.The effective temperature of the star is determined as T_{eff}=7825 K and surface gravity as $lg\ g$=3.45, while ξ=2.70 km/s is adopted for microturbulence velocity. Our analysis indicates that the atmosphere of 15 Vul has a mixture of underabundant and overabundant elements. The results are discussed and compared to literature.

THE ORIGIN OF LIGHT VARIABILITY IN Ap STARS

Krtička J., Mikulášek Z., Zverko J., Prvák M.
Masaryk University, Brno, Czech Republic
e-mail: krticka@physics.muni.cz

The most typical light variability found in Ap stars is the rotational one. It has long been anticipated that the origin of this type of the light variability consists in the rotationally modulated flux redistribution in the surface abundance spots. The redistribution is caused by bound-bound (line) and bound-free (continuum) transitions of various elements, especially helium, silicon or iron. With advent of detailed abundance maps, complete atomic data, and detailed model atmospheres it became possible to reliably simulate the rotational light variability. This is demonstrated on an example of several CP stars. We generalize these results and discuss the importance of individual elements in dependence on the effective temperature. We emphasize he importance of light curve prediction for the test of surface abundance maps and the atomic data.

VERTICAL ABUNDANCE GRADIENTS IN Ap-STAR ATMOSPHERES

Ryabchikova T.
Institute of Astronomy RAS, Pyatnitskaya 48, 119017 Moscow, Russia
e-mail: ryabchi@inasan.ru

I present a review of the theoretical and observational studies of abundance stratification in the atmospheres of late A - early B stars. It includes observational evidences of abundance stratification in classical magnetic Ap stars as well as in Am, HgMn and bright horizontal branch (BHB) stars and a comparison between the theory and observations. Special attention will be given to the effects of vertical abundance inhomogeneities on the atmospheric structure, that helps in explanation of different observed phenomena like photometric bumps and gaps observed for BHB stars in globular clusters. Another important application of chemically stratified atmospheres is connected with the study of pulsations in cool Ap stars (roAP) where different abundance distribution of groups of elements naturally explains the observed distribution of the pulsational amplitudes and phases across the atmosphere.

TIME-DEPENDENT DIFFUSION AND ABUNDANCE STRATIFICATION IN A AND B STARS

Landstreet J. D
Department of Physics & Astronomy, University of Western Ontario, London, ON, Canada, and Armagh Observatory, Armagh, Co. Armagh, Northern Ireland
e-mail: jlandstr@uwo.ca

Probably the most powerful probe of the various physical effects and processes occurring in A stars is the resulting chemical peculiarities. It has been known for decades that the peculiar and often exotic surface chemistry of many A stars is the result of the competition between diffusion and other effects, such as mixing and mass loss, or the presence of a magnetic field. It is such interactions that make the atmospheric chemistry such a good probe of internal stellar physical processes. In recent years great progress has been achieved in the realism of computations aimed at predicting the surface chemistry of A stars as a result of diffusion, coupled with other processes, and responding to a variety of outer boundary conditions. It is becoming possible to study diffusion as a time-dependent process, and also to compare predictions in detail to stellar observations. This talk will survey some of the impressive progress.

DRAGGING HELIUM OUT IN THE MAIN SEQUENCE B STARS

Staritsin E.I.
Astronomical Observatory, Ural Federal University, Yekaterinburg, Russia
e-mail: Eugenij.Staritsin@usu.ru

Observed process of surface helium enrichment through the main sequence phase of B-stars evolution is analyzed on the base of current hydrodynamic model of matter mixing in rotating star's interior. The current model of matter mixing includes the following processes: turbulent entrainment, meridional circulation, shear turbulence and semiconvection. The model of matter mixing describes the transport of chemicals and angular momentum in the vertical direction in the rotating star's interior. It is shown that during the first half of MS evolution the shear turbulence transports the hydrogen mass from the outer parts of the star into the layer with a variable chemical composition. As a result the condition for semiconvection appears in those layers. Semiconvection transports hydrogen from the layer with a variable chemical composition into the convective turbulent region during the second half of MS evolution. Therefore hydrogen is transported from the turbulent envelope through the layers with variable chemical composition to the convective turbulent region. Helium is transported in the opposite direction from the convective turbulent region to the turbulent envelope. The calculated helium enhancement during second half of MS evolution looks like observable one.

A-TYPE ROTATOR PROPERTIES

Royer F.
GEPI-Observatorie de Paris
e-mail: frederic.royer@obspm.fr

We discuss the measurement of rotational velocities, and the different samples available for A-type stars. The distributions of rotational velocities, their evolution with time and link with chemical peculiarities are reviewed. Effects of gravity darkening and differential rotation are also detailed.

Ap STARS WITH VARIABLE ROTATIONAL PERIODS

Mikulášek Z.[1], Krtička J.[1], Henry G.W.[2], Janík J.[1], Žižňovský J.
1 - Masaryk University, Brno, Czech Republic
2 - Tennessee State University, Nashville, Tennessee, USA
e-mail: mikulas@physics.muni.cz

The majority of magnetic chemically peculiar (mCP) stars exhibit periodic light, magnetic, radio, and spectroscopic variations that can be adequately explained by the model of a rigidly rotating main-sequence star with persistent surface structures. Nevertheless, there are a few quite diverse mCP stars whose rotation periods vary on timescales of decades while the shapes of their phase curves remain unchanged. Alternations in the rotational period variations, suspected in the case of CU Vir and V901 Ori, bring further new insight into this theoretically unexpected phenomenon. We propose that dynamic interactions between a thin, outer magnetically-confined envelope, broken by the stellar wind, with an inner, faster rotating stellar body are able to explain the observed rotational variability.

A- AND B-TYPE STAR PULSATIONS IN THE KEPLER AND COROT ERA: OBSERVATIONAL RESULTS

Uytterhoeven K.
Instituto de Astrofisica de Canarias, Spain
e-mail: katrien@iac.es

The CoRoT and Kepler space missions have opened a golden era in the field of asteroseismology. The precise and long-term uninterrupted photometric time series from space allow the detection of low-amplitude frequencies, often revealing hundreds of pulsation frequencies in a single star. I will present an overview of the most remarkable observational results for A- and B-type pulsators. For these more massive pulsators on the Main Sequence it has become clear that complementary ground-based observations play a very important role in the interpretation of the space data. Moreover, the observational results often pose challenges for the current pulsational models.

A- AND B-TYPE STAR PULSATIONS IN THE KEPLER AND COROT ERA: THEORETICAL CONSIDERATIONS

Saio H.
Astronominal Institute, Graduate School of Science, Tohoku University, Sendai, Japan
e-mail: saio@astr.tohoku.ac.jp

Among A-type main-sequence variables, pulsations of δ Sct and γ Dor variables are driven around the HeII ionization zone, while H-ionization zone and strong magnetic fields seem to play roles in the excitation of high-order p-modes in rapidly oscillating Ap (roAp) stars. Pulsations in B-type variables, β Cephei and slowly pulsating B (SPB) stars are excited by the κ-mechanism at the Fe-opacity bump at T~1.5×10^5K. In addition, the strange-mode instability seems responsible for the excitation of pulsations in luminous AB-supergiants α Cygni variables). We discuss various excitation mechanisms for pulsations in A- and B-type variables stars, and the property of pulsations including asteroseismological potential of these variables.

LSD-BASED ANALYSIS OF HIGH-RESOLUTION STELLAR SPECTRA

Tsymbal V. [1], **Tkachenko A.**[2], **Van Reeth T.**[2]
1 – Tavrian National University, Simferopol, Ukraine
2 –*Institute of Astronomy, KU Leuven, Belgium*
e-mail: vadim@starsp.org

We present a generalization of the method of Least-squares deconvolution (LSD), a powerful tool for extraction of high SNR average line profiles from stellar spectra. A generalization of the method is done by extending it towards the multiprofile LSD and by introducing a possibility for correction of the line strengths from the initial mask. We illustrate the new approach on two example cases: detection of asteroseismology signatures from low SNR spectra of single stars and disentangling of spectra of multiple stellar objects. The analysis to be applied to the spectra obtained with the 2-m class telescopes in the course of (spectroscopic) ground-based support for the space missions like CoRoT and Kepler. The required SNR of the data is usually rather high and lower class telescopes can successfully compete with their more advanced associates when a technique allowing for a remarkable increase of SNR in stellar spectra exists. Since the LSD profiles have a potential for reconstruction of the common to all included spectral lines shape, it should have practical application particularly to faint stars observed with the 2-m class telescopes and showing remarkable LPVs in their spectra.

OBSERVATIONAL STUDIES OF roAp STARS

Sachkov M.
Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia
e-mail: msachkov@inasan.ru

Rapidly oscillating Ap (roAp) stars being high-overtone, low degree p-mode pulsators belong at the same time to chemically peculiar magnetic A stars. The classical asteroseismic analysis i.e. frequency analysis, of these stars was based until recently mainly on photometric observations both ground-based and space-based. The significant progress has been achieved by uninterrupted, ultra-high precision data using the Kepler, COROT, MOST satellites. Unusual pulsational characteristics of these stars caused by interplay between short vertical length of pulsation waves and strong chemical stratification offer an examination of the upper roAp atmospheres in more detail than is possible for any star but the Sun by using spectroscopic observations. Over the last decade the study of roAp stars has changed drastically from an observational viewpoint by the time resolved, high spectral resolution spectroscopic studies. Here I review results of recent studies that utilize roAp unique properties to map pulsation atmosphere geometry using interpretation of line profile variation as well as ultra precise space photometry

STOCHASTIC OSCILLATIONS IN A-TYPE AND RELATED STARS

Antoci V.
Stellar Astrophysics Centre, Department of Physics and Astronomy, Aarhus University, Denmark

e-mail: antoci@phys.au.dk

There is strong evidence from different types of observations suggesting convective motions in the very outer envelopes of A-type and early F-type stars. Also theoretical models predict that stars situated in the lower part of the classical instability strip should have shallow but still effective and turbulent convective envelopes to excite solar-like oscillations. Going to the more massive B-type stars the convection in the very outer layers disappears, however there are still convective regions throughout the star which are suggested to stochastically excite pulsations. In this talk I will give an overview over the recent observations and discuss pulsators such as δ Scuti, γ Doradus, rapidly oscillating Ap, β Cephei and the Slowly Pulsating B-type stars in the context of solar-like oscillations.

A NEW CLASS OF LOW AMPLITUDE PERIODIC VARIABLE A AND LATE-B STARS

Mowlavi N., Barblan F., Saesen S., Eyer L.
Observatoire de Geneve, Universite de Geneve, Geneva, Switzerland
e-mail: Nami.Mowlavi@unige.ch

We present a potentially new class of periodic variable A and late-B stars, with amplitudes between 1 and 4 mmag and periods from ~0.1 and ~0.7 days for the majority of them. They have been discovered following a 7-year ground-based photometric monitoring campaign of the open cluster NGC3766. The new class of variable stars is located in the Herzsprung-Russel diagram on the main-sequence between the delta Scuti and the Slowly Pulsating B stars, a region where no sustained pulsation is predicted by standard models. The origin of this mysterious class of variables is unknown, but may be related to the interaction between pulsation and stellar rotation. Those findings complement results published from CoRoT data that support a similar claim. We present the characteristics of these new variable stars as found from our multi-band monitoring campaign.

MAGNETIC FIELDS IN O-STARS

Nazé Y.
Univ. of Liege, Belgium
e-mail: naze@astro.ulg.ac.be

In the past, magnetic fields were often alluded to when peculiarities were detected in early-type stars, but this assertion could not be tested due to a lack of definite detections. Over the last decade, the situation completely changed thanks to high-quality spectropolarimetry: large-scale, organized (generally dipolar) magnetic fields with strength between 0.1 and 10kG were detected in dozens of OB stars, including 10 O-stars (half of them being Of?p stars). Such magnetic fields interact with the stellar winds of these hot stars, with strong impact on the observed variability and X-ray emission.

MAGNETIC FIELDS IN β Cep, SPB, AND Be STARS

SchoellerM. et al.
European Southern Observatory, Germany

e-mail: mschoell@eso.org

Recent observational and theoretical results emphasize the potential significance of magnetic fields for structure, evolution, and environment of massive stars. Depending on their spectral and photometric behavior, the upper main-sequence B-type stars are assigned to different groups, such as beta Cephei stars and slowly pulsating B (SPB) stars, He-rich and He-deficient Bp stars, Be stars, BpSi stars, HgMn stars, or normal B-type stars. All these groups are characterized by different magnetic field geometry and strength, from fields below the detection limit of a few Gauss up to tens of kG. In this talk, I will give an overview about what we have learned during the last years about magnetic fields in beta Cep, SPB, and Be stars.

RECENT RESULTS AND CURRENT CHALLENGES IN OBSERVATIONS OF Ap/Bp STAR MAGNETIC FIELDS

Romanyuk I.I.
Special Astrophysical Observatory, Nizhny Arkhyz, Russia

e-mail: roman@sao.ru

We present a survey of observational data on the magnetic fields and physical parameters of CP stars for the past 10-15 years. Analysis of new high-precision observation data allows detecting such subtle phenomena as pulsations of brightness and radial velocities of stars, vertical stratification of chemical elements in their atmospheres. A relationship was found between weal anomalies in the energy distribution in the continuum and the magnetic field strength. This relationship was successfully used for search for new magnetic CP stars. An analysis of the Stokes Q and U parameter profiles in the spectral lines has shown that these observation can be described under the assumption of the field of complex topology (for example for star HD 37776) which can not be represent in the form of low order multipoles. We found large vertical gradient from the lines formed at different optical depth in the stellar atmospheres that is one more of the current challenges for theory of magnetic CP stars.

MAGNETIC FIELDS OF Ap STARS FROM THE FULL STOKES VECTOR SPECTROPOLARIMETRIC OBSERVATIONS

N. Rusomarov, O. Kochukhov, N. Piskunov
Department of Physics and Astronomy, Uppsala University, Sweden
e-mail: naum.rusomarov@physics.uu.se

Current knowledge about stellar magnetic fields relies almost entirely on circular polarization observations. Few objects have been observed in all four Stokes parameters. The magnetic Ap star HD 24712 (DO Eri, HR1217) was recently observed in the Stokes IQUV parameters with the HARPSpol instrument at the 3.6-m ESO telescope. The resulting spectra have dense phase coverage, resolving power $>10^5$, and S/N ratio of 300-600. These are the highest quality full Stokes observations obtained for any star other than the Sun. From these data we computed mean line profiles and determined magnetic observables from low-order moments of these profiles. We measured the mean longitudinal magnetic field with an accuracy of 5-10 G and obtained precise net linear polarization measurements. We combined and net linear polarization measurements and determined parameters of the dipolar magnetic field topology. Combining available measurements we improved the rotational period. The analysis of all measurements showed no evidence for a significant radial magnetic field gradient. We present preliminary results from magnetic Doppler imaging of HD24712. This analysis is the first step towards obtaining detailed 3D maps of magnetic fields and abundance structures for HD 24712 and other Ap stars that we currently observe with HARPSpol.

MAGNETIC PERSONALITIES OF A STARS REVEALED BY THE MOST MICROSAT

Jaymie Matthews, Chris Cameron J.
University of British Columbia, Canada
e-mail: matthews@astro.ubc.ca

Canada's MOST (Microvariability & Oscillations of STars) space telescope has opened new windows on the natures of pulsating magnetic A-F (roAp) stars and rapidly rotating magnetic B stars through continuous ultraprecise time-series photometry spanning weeks and months. Can asteroseismology reveal the magnetic field strength and geometry *beneath* the photosphere of an A star? Can we see turbulent mixing in a thin surface convection zone in early A-type stars through ultraprecise photometry? Do even earlier-type rapidly rotating stars serve as magnetohydrodynamic laboratories that can give us insights into magnetic A stars? The answers to these three questions are “yes” and I'll explain how MOST observations and analyses have made those positive answers possible.

MAGNETIC FIELDS IN A STARS BESIDES Ap STARS

Kochukhov O.
Uppsala University, Sweden
e-mail: oleg.kochukhov@physics.uu.se

In this talk I will review ongoing efforts to understand the incidence of magnetism in intermediate-mass stars that are different from the magnetic Ap stars. This includes the search of magnetic fields in chemically peculiar stars of the Am and HgMn types as well as in normal A and late-B stars. I will discuss different techniques to detect weak stellar magnetic fields using spectropolarimetric and high-resolution spectroscopic observations and present a critical evaluation of the recent detections of fields in non-Ap stars. Special attention will be given to clarifying the question of the presence of magnetic fields in HgMn stars and assessing recent detections of very weak magnetic fields in Sirius and Vega. The latter detections are confirmed by independent observations of different teams and probably signify the discovery of a new type of magnetic field generation process operating in intermediate-mass stars. On the other hand, claims of the magnetic field detections in HgMn stars remain controversial, and some of the most precise magnetic field searches conducted for these objects rule out the presence of fields stronger than a few G. These findings have important implications for the understanding of the origin of evolving chemical spots on the surfaces of HgMn stars.

DESCENDANTS OF MAGNETIC AND NON-MAGNETIC A-TYPE AND RELATED STARS

Lignières F., Aurière M., Konstantinova-Antova R. et al.
Institut de Recherche en Astrophysique et Planetologie, France
e-mail: francois.lignieres@irap.omp.eu

We have studied the magnetic field of about 50 active and non-active single G-K-type red giants by means of spectropolarimetry, and we have significantly Zeeman-detected 30 giants. A close study of the 17 giants with known rotational period shows that the measured magnetic field strength is correlated to the rotation, in particular to the Rossby number. For 13 of these giants, with rotational periods between 5 and 180 days, the magnetic field strength is measured between 15 G and 2 G. Since the inferred Rossby numbers are between 0.08 and 1.5, the magnetic field can be of dynamo origin, possibly of α- ω type. 4 giants for which the magnetic field is measured to be outstandingly strong with respect to the rotational period or the evolutionary state are identified as probable Ap-star-descendants. In addition to Pollux, 3 bright giants which were not known as active before this study, are Zeeman-detected with magnetic field strength being at the sub-gauss level. In this talk we will detail the results of our study and emphasize the incidence of the Ap-star-descendants along the red giant branches.

NON-PULSATIONAL VARIABILITY OF A- AND B-TYPE STARS AS OBSERVED BY KEPLER

L. A. Balona
South African Astronomical Observatory, South Africa
e-mail: lab@saao.ac.za

Kepler photometry shows that most non-pulsating A-type stars vary with periods typical of the expected rotation periods. The periodogram is simple and usually consists of a peak and its harmonic with amplitudes typically smaller than 50 ppm. We presume that the variation is rotational modulation caused by spots or some other co-rotating obscuration. This is supported by the distribution of equatorial velocities derived from the photometric periods. From the broadening of the peaks in the periodogram, we estimate that differential rotation in A-type stars is very similar to that in the Sun. Flares on A-type stars have been recently discovered in Kepler data. We show that such flares cannot be attributed to a late-type companion but must originate on the A star itself or an interaction between the A star and a close companion. We also discuss activity in B-type stars and argue that Be stars, in particular, are magnetically active. We present a simple model which explains all major characteristics of Be stars.

X-RAYS FROM A STARS - CORONAE AND WIND-SHOCKS

J. Robrade
Hamburger Sternwarte, Germany
e-mail: jrobrade@hs.uni-hamburg.de

I will review the X-ray properties of A stars and discuss their X-ray generating mechanisms. A-type stars bridge the regimes of cool and hot stars and they exhibit diverse phenomena that are of great interest in high-energy astrophysics. Notably, among A stars we find the hottest magnetically active stars as well as the coolest wind-shock stars; in the domain of later A-type stars X-ray emission is mainly related to coronae, while in Ap/Bp stars the magnetically channeled wind-shock model is applicable. I present results obtained from XMM-Newton and Chandra observations and discuss similarities and differences of the X-ray emission in the various types of A stars.

Bp STAR MAGNETOSPHERES

Asif ud-Doula
Penn State Worthington Scranton, USA
e-mail: auu4@psu.edu

Massive OB stars possess strong stellar winds driven by radiation. With the advent of the so called MiMeS collaboration, an increasing number of these hot stars have been confirmed to have global magnetic field. Such magnetic fields can have significant influence on the dynamics of these stellar winds which can be characterized by a single dimensionless parameter called “wind magnetic confinement”, η_* defined essentially as the ratio of magnetic field to wind kinetic energies. For values of $\eta_*<1$, the influence of the field on the wind is small. But for $\eta_*>1$, the field can substantially alter the wind dynamics leading to even confinement of the wind. In particular, for chemically peculiar Bp stars because of the combination of relatively low mass and very high magnetic field (of order kG) the values of $\eta_*\sim10^6$ or so, leading to trapped wind within its magnetosphere. In this presentation, I will discuss how such magnetospheres in massive stars can be modeled numerically.

WHITE DWARF MAGNETIC FIELDS - A REVIEW

Valyavin G.
Special Astrophysical Observatory, Nizhnij Arkhyz, Russia
e-mail: gvalyavin@sao.ru

Studies of white dwarf (WD) stars is of fundamental importance for the understanding of stellar and galactic evolution, as WDs represent the final evolutionary stage of more than 90\% of all stars. Nowadays, we believe that the general properties and evolution of WDs are fairly well understood. However, there are several important problems that still need to be properly addressed; especially those connected with the group of about 200 isolated magnetic white dwarfs (MWDs). The most important problems are associated to problems of origin and evolution of this group of stars. It is currently believed, that magnetic white dwarfs (MWDs) are descended from magnetic MS stars (mainly from magnetic Ap/Bp stars). There are, however, arguments that this point of view may be wrong and the question about origin of MWDs is still open to debate. This review will present the history of MWDs, their properties, what is known and still unknown about them.

PROBING THE NEARBY UNIVERSE WITH A-TYPE SUPERGIANT STARS

Urbaneja M.A.
Institute for Astronomy, University of Hawaii
e-mail: urbaneja@ifa.hawaii.edu

A-type supergiant stars are intrinsically the brightest non-transient stars at visual light, with absolute magnitudes reaching -9 mag. Because of their high luminosities, the can be individually studied in galaxies up to 10 Mpc with current multi-object spectroscopic facilities. The quantitative spectral analysis of low resolution spectra of individual A supergiants provides accurate stellar parameters and chemical composition. They are ideally suited to study young populations in their host galaxies, and to be used to determine metallicity gradients, interstellar extinction, reddening laws and distances. We will summarize recent results on the quantitative spectral analysis of A supergiants in galaxies of the Local Group and beyond.

POSTERS

P 1

NON-LOCAL THERMODYNAMIC EQUILIBRIUM LINE FORMATION FOR C I – C II IN THE ATMOSPHERES OF A-G-TYPE STARS

Alexeeva S.A., Mashonkina L.I.
Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia
e-mail: alexeeva@inasan.ru

Classical LTE analysis finds a discrepancy in abundances determined from different lines of C I, as well as a violation of the ionization equilibrium between C I and C II in the atmospheres of A and late B type stars. We present a new comprehensive model atom for C I-C II designed to investigate line formation for C I and C II based on the non-local thermodynamic equilibrium (non-LTE). Our carbon model atom includes 305 energy levels, namely, 239 levels of C I, 66 levels of C II and the ground state of C III. Fine structure splitting was taken into account. As a test and first application of the C I-C II model atom, carbon abundances are determined on the basis of classical plane-parallel model atmospheres for the Sun and Vega (A0 V).

P2

CHEMICAL COMPOSITION OF THE SAMPLE OF 15 NORMAL AND PECULIAR A-F-STARS

Al-Hawi O., Bikmaev I., Melnikov S., Bikmaeva M., Sakhibullin N.
Department of Astronomy and Geodesy, Kazan Federal University, Kazan, Russia

e-mail: omaralsamarrai@yahoo.com

We present results of spectroscopic study of group for 15 peculiar and normal A-F stars (T_{eff} = 6000-9000 K). High-resolution spectra (*R*=50000, 4000-8500 Å) have been obtained by Coude-echelle spectrometer of 1.5-meter Russian-Turkish joint optical telescope (RTT-150). Chemical abundance patterns have been obtained for stars with narrow lines (V*sin i* < 30 km/s) on the base of Kurucz model atmospheres. Main sequence A-stars with effective temperatures of 7500-9000 K show overabundances of elements heavier than iron and deficiency of some lighter elements. F-supergiant stars show abundances similar to the solar ones. These results support the idea that chemical peculiarities disappear in the atmospheres A-stars after star leaves the main sequence.

P3

MAGNETIC FIELD OF VEGA

Butkovskaya V.
Crimean Astrophysical Observatory, Nauchny, Ukraine
e-mail: itbiz@mail.ru

Two main scenaria are usually proposed to explain the origin of stellar magnetic fields. The first one supposes a fossil nature of the magnetic field. The second scenario implies the generation of the magnetic field through dynamo processes within the convective core or in the radiative layers. The first model is generally used to account for the strong time-stable magnetic fields of chemically-peculiar stars, the second one is used to explain the magnetic fields of early normal stars. Lignieres et al.(2009), Petit et al.(2010), and Alina et al. (2011) claimed the detection of a weak effective magnetic field (less then 1 G) on Vega. Petit et al. (2010) reported the short-term evolution of the polarized signatures with a period of 0.732 day supposed by them as the rotational period of the star. Alina et al. (2011) noted the stability of Vega's weak magnetic field over the 3 years of observation (2008-2010). Butkovskaya et al. (2011) confirmed the long-term 21-years variability of Vega, but found no periodic variation of the longitudinal magnetic field of Vega (within mean error 2.6 G) with the 21-year period. We present here the results of spectropolarimetric study of Vega during about 40 nights in 1997-2012.

P4

ON THE PERIODICAL VARIABILITY OF THE LONGITUDINAL MAGNETIC FIELDS OF STARS

Bychkov V.D. [1]**, Bychkova L.V.**[1]**, Madej J.**[2]**,**
1 – Special Astrophysical Observatory of the Russian Academy of Sciences (SAO RAS), Russia
2 – Warsaw University Observatory, Al. Ujazdowskie 4, 00-478 Warszawa, Poland
e-mail: vbych@sao.ru

Actually there exist 218 stars with measured phase curves of the longitudinal (effective) magnetic field Be). In that group 172 objects are classified as magnetic chemically peculiar stars (mCP). Remaining objects are late-type stars (including solar-type stars, T Tau stars, red dwarfs etc.), also pulsating Î² Cep type and slowly pulsating B stars (SPB stars), young Ae/Be Herbig stars and also stars with planets. In this paper we present a brief review of behavior of the longitudinal magnetic field Be among stars of different types. This paper also presents various types of relations between Be and the rotational phase and estimated values of parameters of the observed magnetic variability for each type of stars.

P5

INTERNAL ANGULAR MOMENTUM DISTRIBUTION OF THE A5 III STAR α OPH

Castaneda D., Deupree Robert G. and C. Ian Short
1 – Institute for Computational Astrophysics and Department of Astronomy and Physics Saint Mary's University, Canada
e-mail: castaned@ap.smu.ca

Previous calculations found that the α Oph spectral energy distribution (SED) in the ultraviolet and visual could be fit by locally plane parallel model atmospheres using surface parameters produced by a two dimensional (2D) stellar hydrodynamic and evolution code. The rotating model used was assumed to rotate uniformly, something unlikely to be true because the star is in the late stages of core hydrogen burning. We have extended this study to include the calculation of line profiles and to include 2D differentially rotating models. In these models the rotation rate increases inward at a rate up to that expected for a model evolved with locally conserved angular momentum (except for the convective core) from a uniformly rotating model on the Zero Age Main Sequence. We find that the differences between the SEDs and line profiles among these rotating models are quite small, and that only significantly more accurate observations than are currently available would allow discrimination of the rotation law of this star.

P6

THE SPECTRUM AND ABUNDANCES OF THE HIGH-LATITUDE HAe STAR PDS2

C. R. Cowley[1], S. Hubrig[2]
1 – University of Michigan, USA
2 – Leibniz-Institut für Astrophysik, Potsdam (AIP), Germany
e-mail: cowley@umich.edu

PDS2 (CD -53 251) is listed in Simbad as a T-Tauri type star, although more recent investigators have called it a Herbig Ae star (Pogodin, et al. 2012, AN, 333, 594). It has a modest magnetic field (Hubrig, et al. 2009, A&A, 502, 283, Wade, et al. 2007, MNRAS, 376, 1145) and H_α, He D_3, and 10830 show variable emissions. Its Galactic latitude, -64°, puts it some 46° from the closest star-forming cloud (Sartori, et al. 2010, AJ, 139, 27). The star is cool enough that the Balmer profiles provide an excellent guide to the effective temperature, nearly independent of the surface gravity. We find T_{eff} = 6500K from H_γ and H_δ. PDS2 is unreddened, or mildly reddened ($A_V \sim 0.27$), and has a distance of some 250 pc. Weak Fe I lines give lg(Fe/N_{tot}) independent of *lg(g)*. Strong Fe I lines then give the ξ_t, whence Fe II gives *log(g)*. We find [Fe/N_{tot}] = -4.58 ± 0.12 using 10 lines with NIST accuracies B or better; ξ_t = 2.1, and *lg(g)* = 3.75±0.25. The spectrum and abundances of this star are very similar to those of Procyon. Our analysis is based on X-shooter, and two averaged sets of 9 archival HARPS spectra.

P7

ESTABLISHING THE LINK BETWEEN HgMn AND PGa STARS

Drake N.[1], Hubrig S.[2], Schoeller M.[3], Ilyin I.[2]
1 – Sobolev Astronomical Institute, St. Petersburg State University, Russia
2 – AIP, Germany
3 – ESO, Germany

e-mail: natalia.drake.2008@gmail.com

We discuss most recent spectroscopic and spectropolarimetric observations of a few stars representative of the groups of HgMn and PGa stars. A high-spectral- resolution study of abundances, line profile variability, and their longitudinal magnetic fields disclose a remarkable similarity between these two groups.

P8

GSC4813-0981 IS THE NEW LOW-AMPLITUDE DELTA SCUTI STAR WITH VARIABLE AMPLITUDE

Galeev I., Bikmaev I., Shimansky V.
Department of Astronomy and Geodesy, Kazan Federal University, Kazan, Russia

e-mail: ibikmaev@yandex.ru

GSC4813-0981 was discovered in 2003 by the Russian-Turkish 1.5-m optical telescope (RTT-150) as a low-amplitude delta Scuti-type variable star. Variations amplitude is 0.018-0.027 magnitudes in a different bands and the period is 48.5 minutes. On the base of middle-resolution spectra obtained at the Zeiss-1000 telescope of SAO RAS basic fundamental parameters of the stars atmosphere were determined (T_{eff} =8700 K, $lg\,g$=3.95, [Fe/H]=0, M=1.7 $M_{\odot}$, R=2.3 $R_{\odot}$). Using a ten-years (2003-2013) dataset of BVR CCD observations obtained at RTT150, we have performed a temporal analysis for long term variations. We found that the amplitude of the variability changes: during 2003-2008 it was decreasing up to 0.005 mag, and in 2012-2013 the amplitude has increased to 0.02 mag.

P9

MICROTURBULENCE IN A/Am Am/Fm STARS

Gebran M.[1], Monier R.[2], Royer F.[3], Lobel A.[4], Blomme A.[4]
1 – Deptю of Phys. and Astron., Notre Dame Univ.-Louaize, PO Box 72, Zouk Mikael, Lebanon
2 – LESIA/CNRS UMR 8109, Observatoire de Paris – Université Pierre et Marie Curie – Université Paris Denis Diderot, 5 place Jules Janssen, 92190 Meudon, France
3 – GEPI/CNRS UMR 8111, Observatoire de Paris – Université Paris Denis Diderot, 5 place Jules Janssen, 92190 Meudon, France
4 – Royal Observatory of Belgium, Ringlaan 3, B--1180 Brussels, Belgium

e-mail: mgebran@ndu.edu.lb

A programme to observe several A dwarfs in open clusters of various ages and in the field was initiated several years ago. In this work we present the current status of microturbulent velocity for A and F dwarfs. We have performed high resolution high signal-to-noise spectroscopy of stars well distributed in mass along the Main Sequence. Microturbulent velocities are derived iteratively by fitting grids of synthetic spectra calculated in LTE to observed spectra of 61 A field stars,

55 A and 58 F in open clusters (Pleiades, Coma Berenices, Hyades and the Ursa Major moving group). We compared our results to recent works and found a good agreement with their analytical formulation for the standard microturbulence. Our results show a broad maximum for microturbulent velocities in the range A5V to about A9V and a decrease (to ~1 km/s) for cooler and hotter stars as indicated in Smalley (2004).We also present a comparison to first science results of Lobel et al. (2013) for the Gaia-ESO Public Spectroscopic Survey.

P10

ASTEROSEISMOLOGY WITH SuperWASP - RAPIDLY VARYING A-TYPE STARS

Holdsworth D., Smalley B.
Keele University, UK

e-mail: d.l.holdsworth@keele.ac.uk

Asteroseismology with SuperWASP - Rapidly Varying A-type Stars The ground-based searches for transiting exoplanets have produced a vast amount of high-quality time-resolved photometric data of many millions of stars. One of the leading ground-based surveys is the SuperWASP project. We present the results of an investigation of over 1.5 million A-type stars in the search for high-frequency pulsations using SuperWASP photometry. We are able to detect pulsations down to the 0.5 milli-magnitude level in the broad-band photometry. This has enabled the discovery of several rapidly oscillating Ap stars, over 200 δ Scuti stars with frequencies above 50 d^{-1}, and some sdB stars. Such a large number of results allows us to statistically study the frequency overlap between roAp and δ Scuti stars.

P11

DETERMINATION OF ATMOSPHERIC PARAMETERS OF A-TYPE STARS FOR RELATIVE FLUX CALIBRATION

Wen Hou.
Key Laboratory of Optical Astronomy, National Astronomical Observatories, Chinese Academy of Sciences, Beijing, 100012, China

e-mail: whou@bao.ac.cn

The LAMOST (Large Sky Area Multi-Object fiber Spectroscopic Telescope) is a Chinese national scientific research facility operated by National Astronomical Observatories. It has two major components: the LAMOST ExtraGAlactic Survey (LEGAS) and the LAMOST Experiment for Galactic Understanding and Exploration (LEGUE), covering much of the northern sky. The data set of LAMOST pilot survey has been released by August 2012, including 319,000 spectra and the catalog of their parameters. Among these data, about 28 thousand stars are classified as A-type stars which can be used for relative flux calibration. The Energy of A type star concentrates in short wavelength, which are able to overcome the low efficiency of LAMOST spectra in the blue band. In order to relatively calibrate the flux of LAMOST spectra, it is significant for us to precisely measure the atmospheric parameters of A-type stars. In this paper, we use a method of weighted template fitting to obtain the parameters of A type stars of LAMOST. The model library of synthetic spectra is based on the Kurucz's codes offered by U. Munari (2008). Before the determination of atmospheric parameters, we also consider the effect of LAMOST instruments on both the spectra lines and atmospheric parameters of A type stars.

P12

HARPS SPECTROPOLARIMETRY OF O AND B-TYPE STARS

Hubrig S.[1], Schoeller M.[2], Ilyin I.[3], G. Lo Curto[2]
1 – Leibniz-Institut fuer Astrophysik Potsdam (AIP), Germany
2 – ESO, Germany
3 – AIP, Germany

e-mail: mschoell@eso.org

Our knowledge of the presence and the strength of magnetic fields in massive O and B-type stars remains very poor. Recent observations indicate that the presence of magnetic fields is responsible for a wide range of phenomena observed in massive stars, such as chemical peculiarity, periodic UV wind-line variability, cyclic variability in H_α and He II λ4686 Å, excess emission in UV-wind lines, and unusual X-ray emission. However, the strength of the detected magnetic fields and their geometry (described by the magnetic obliquity beta) differ from one star to the other, making it difficult to establish relationships with available multiwavelength diagnostics. In our poster we present new magnetic field measurements in a number of O and B-type stars observed with HARPS in spectropolarimetric mode.

P13

ON POSSIBLE EXISTENCE OF BRIGHTNESS SPOTS ON CYG X-1 SUPERGIANT

Karitskaya E.A.[1], Bochkarev N.G.[2]
1 – Institute of Astronomy of the Russian Academy of Sciences, Moscow, Russia,
2 – P.K. Sternberg Astronomical Institute, Moscow State University, Moscow, Russia
e-mail: karitsk@sai.msu.ru

We consider the impact of recently detected magnetic field of O9.7 Iab supergiant component of Cyg X-1 X-ray binary system on its atmosphere. We show the magnetic pressure to be comparable with that of the stellar atmosphere matter pressure, which should lead to formation of bright spots on the surface of the star. We have used the simplest estimation of magnetic force influence on Cyg X-1 optical component atmosphere structure and brightness of the spots near magnetic poles. The upper estimation of their brightness contrast (25%) is obtained. We show that the expected spots may be observed both photometrically and spectroscopically. Possibility of magnetic field diagnostics through observation of the spots is briefly considered.

P14

STATISTICS OF THE MAGNETIC FIELDS OF OBA STARS

Kholtygin A.F.[1], Hubrig S.[2], Drake N.A.[1], Sudnik N.P.[1], Dushin V.V.[1]
1 – Astronomical Institute of the Saint-Petersburg University
2 – Leibniz-Institut für Astrophysik Potsdam (AIP), An der Sternwarte 16, 14482 Potsdam, Germany
e-mail: afkholtygin@gmail.com

Statistics of OBA stars magnetic fields Based on data from recent measurements of magnetic fields of the OBA stars we studied the statistical properties of their magnetic fields. As one of the statistically significant characteristics of the magnetic field we use the average effective magnetic field of the star . The distribution function f() of magnetic fields and magnetic fluxes of OBA stars is investigated. The function f() has a power-law dependence on the with an index of about 2-3 and a fast drop at = 100-200 G. The connection between the existence of the magnetic field of the star and its enrichment in nitrogen and silicon is also studied. It is proposed that in addition to general global magnetic field of OBA stars, several compact regions with strong local magnetic fields can exist.

P15

WIND MASS-LOSS RATES IN MAIN-SEQUENCE B STARS

Krtička J.
Masaryk University, Brno, Czech Republic
e-mail: krticka@physics.muni.cz

We predict wind mass-loss rates in main-sequence B stars. These predictions are calculated from our NLTE radiatively driven wind models. The main-sequence mass-loss rate strongly depends on the stellar effective temperature. For the hottest B stars the mass-loss rate amounts to $10^{-9} M_{\odot} \text{year}^{-1}$, while for the coolest ones the mass-loss rate is by four orders of magnitude lower. Main sequence B stars with effective temperatures lower than about 15000 K (later than the spectral type B5) do not have any homogeneous line-driven wind. The wind mass-loss rate also strongly depends on the chemical composition. The mass-loss rate may both increase or decrease with increasing abundance, depending on whether the emergent flux redistribution is significant or not. We discuss the implications of our models for the rotational braking, filling the magnetosphere of Bp stars and for chemically peculiar stars.

P16

A-COLOR STAR CLASSIFICATION WITH LINE INDEX AND A NEW CONTINUUM EVALUATION METHOD

Yinbi Li, A-li Luo, Yuqin Chen, Wen Hou
National Astronomical Observatories, Chinese Academy of Sciences, Beijing, China
e-mail: ybli@bao.ac.cn

The calculating of pseudo continuum of low-resolution spectra is important and essential in spectral analysis, such as calculating the physical parameters and the line index. In previous work, the evaluation accuracy of pseudo continuum is easily affected by the strong line in spectra. In addition, in traditional methods, we are unable to simultaneously obtain the spectral line information when evaluate the pseudo continuum. In the paper, we proposed a new method to measure the pseudo continuum for A-colored stars. This new method fits the spectral line profile and local continuum for each strong Balmer line at first, and then calculate the global pseudo continuum with these local continuums and regions without strong spectral lines. In addition, we also calculate line index for each strong spectral line with this accurate pseudo continuum evaluation method, and classify the A-colored stars of LAMOST with their spectral line information obtained by above methods.

P17

A SCENARIO FOR THE LOWER BOUND OF AP MAGNETIC FIELDS

Lignières, F., Jouve, L., Gastine, T., Gaurat, M.
Institut de Recherche en Astrophysique et Planetologie, France
e-mail: francois.lignieres@irap.omp.eu

We investigate a scenario to explain the lower bound to the magnetic fields of Ap stars and the two orders of magnitude magnetic desert among A-type stars (Auriere et al. 2007, 2010). A bifurcation between stable and unstable large scale magnetic configurations in differentially rotating stars is advanced to explain this apparent magnetic dichotomy. Here we present 2D numerical simulations designed to determine the maximum toroidal field produced by the winding-up of a dipolar field in a freely differentially rotating star. The stability of such configurations against the Tayler instability is discussed and compared with the observed lower bound of Ap magnetic fields. Results of the first numerical simulations of the 3D Tayler instability will also be shown.

P18

RADIATIVE TRANSFER AND THE DYNAMICS OF THE STELLAR OUTER LAYERS

Netzer N.
ORT Braude College, Israel
netzer@braude.ac.il

A method of solving the equations of radiative transfer for spherical stars is presented. The process was developed originally for stellar outflows of red giants, but then was extended to any spherically symmetric system, including early type stars. The equations of radiative transfer are coupled with the dynamical equation, where the radiation field in the stellar atmosphere is expanded as a Legendre series. Then, if one knows the opacity of the stellar atmosphere for a wide range of wavelengths, one can calculate the dynamics of the stellar wind. The opacity may stem from spectral lines or from dust absorption and scattering.

P19

METHODOLOGY OF MEASUREMENTS OF FUNDAMENTAL PARAMETERS AND ASSOCIATED UNCERTAINTIES FOR MIDDLE AND COOL MAIN-SEQUENCE STARS

Piskunov N.[1], Titarenko A.[2], Ryabchikova T.[3], Pakhomov Yu.[3], Nizamov B.[2]
1 – Uppsala University, Sweden
2 – Sternberg Astronomical Institute, MSU, Russia
3 –Institute of Astronomy, RAS, Moscow, Russia
e-mail: 2chlaidze@gmail.com

We performed study of a representative group of main-sequence stars in the temperature range of 5000 K to 10000 K in order to test our methodology for determination of fundamental parameters and assesment of associated uncertainties. The selected stars have reasonable well-established parameters. We also use a homogenious set of observations with singnal-to-noise ratio above 200 and resolving power of 60000. Here we present all steps of our method from selection of spectral intervals and atomic/molecular data to determination of effective temperatures, surface gravities and metallicities.

P20

MODELLING OF THE VARIABILITY OF THE CP STAR φ DRA

Prvak M.[1], Krtička J.[1], Mikulášek Z.[1], Lüftinger T.[2], Liška J.[1]
1 – Masaryk University, Brno, Czech Republic
2 – Universität Wien, Austria
e-mail: prvak@physics.muni.cz

φ Draconis is one of the brightest known CP stars. We model the SED variability of this star using the horizontal distribution of chemical elements in the stellar atmosphere derived from abundance maps. These elements cause redistribution of the energy from the short-wavelength part of the UV spectrum to longer wavelengths. We compute a grid of LTE model atmospheres and synthesize a theoretical light curve. The results obtained from our computations are in a good agreement with the observed variability of the star.

P21

ABUNDANCES FOR PLANET-HOSTING AND DEBRIS-DISK STARS

Rojas M.M.[1], Drake N.A.[1,2], Chavero C.[3], Pereira C.B.[2], Kholtygin A.F.[1], Cahuasqui J.A.[1]
1 – Saint-Petersburg State University, Russia,
2 – National Astronomical Observatory, Rio-de-Janeiro, Brazil,
3 – Cordoba Astronomical Observatory, Argentina
e-mail: natalia.drake.2008@gmail.com

We present an analysis of the element abundances of planet-hosting stars and of stars with debris-disks based on high-resolution spectra obtained with the FEROS echelle spectrograph and the 2.2 m ESO telescope at La Silla, Chile. The atmospheric parameters and the abundance pattern of the program stars are determined. A comparison of abundance of planet-hosting, debris-disk, and field stars is also given.

P22

NORMAL LOW *v sin i* A0-A1 STARS

Royer F.[1], Gebran M.[2], Monier R.[3], Hill G.[4], Gulliver A.[5], Adelman S.[6], Smalley B.[7], Pintado O.[8], Reiners A.[9]
1 – GEPI Observatoire de Paris, France
2 – Notre Dame University-Louaize, Lebanon
3 – Laboratoire Lagrange - Université de Nice Sophia Antipolis, LESIA - Observatoire de Paris
4 – University of Auckland, New Zealand
5 – Brandon University, Canada
6 – The Citadel, SC, USA
7 – Keele University, UK
8 – INSUGEO, CONICET, Argentina
9 – Universität Göttingen, Germany
e-mail: frederic.royer@obspm.fr

Royer et al. (2007) showed that the distribution of rotational velocities for A0-A1 stars is bimodal although all known peculiar and/or binary stars had been excluded from their sample. We present here the preliminary results of the abundance analysis for 47 A0-A1 “normal” main sequence stars selected with *v sin i* slower than 65 kms. A hierarchical classification based on these abundances allowed to identify new CP stars and confirm the normal spectrum for about 40% of the sample. This clean sample of low *v sin i* normal A0-A1 stars will be used to search for intrinsic slow rotators.

P23

LONG-TERM VARIABILITY OF THE MAGNETIC FIELD OF THE Ap STAR γ EQU

Savanov I.S.[1], Romanyuk I.I. [2], Semenko E.A.[2], Dmitrienko E.S.[3]
1 – Institute of Astronomy RAS, Moscow, Russia
2 – Special Astrophysical Observatory RAS, Russia
3 – Sternberg Astronomical Institute, MSU, Moscow, Russia

e-mail: isavanov@inasan.ru

We present the analysis of the long-term variability of the magnetic field of the roAp star γ Equ. Measurements of the stellar magnetic field were compiled from the literature as well as obtained with the 6-m optical telescope of the Special Astrophysical Observatory (Russia). All available data were used for the estimations of the properties of long-term magnetic variations.

P24

INTERFEROMETRY OF CP STARS: HOW FAR CAN WE GO?

Shulyak D., Paladini C., Li Causi G., Sacuto S., Kochukhov O.

e-mail: denis@astro.physik.uni-goettingen.de

Interferometry is a very powerful observational technique known in astronomy for many decades. Its application to main-sequence (MS) stars, however, is still limited to only brightest objects because of limitations of modern interferometric facilities. In this work we aim to explore the application of interferometry to a special class of MS stars known as chemically peculiar (CP) stars. These stars often possess strong magnetic fields and show a pronounced spectral and photometric variability. This variability is explained by the surface chemical abundance inhomogeneities, which are nowadays successfully mapped using an indirect Doppler Imaging technique. Interferometry thus has a potential to naturally resolve such spots in single stars, providing unique complementary information about spots sizes and contrasts. By means of numerical experiments we derive the actual interferometric requirements essential for the CP stars research, namely for the determination of sizes and positions of chemical spots. We also explore what kind of information can already be obtained with the use of only currently available instruments.

P25

DETECTION OF WEAK MAGNETIC FIELDS IN CENTRAL STARS OF PLANETARY NEBULA

Steffen M.[1], Hubrig S.[1], Todt H.[2], Schoeller M.[3], Sandin C.[1], Hamann W.-R.[2], Schoenberner D.[1]

1 – Leibniz-Institut fuer Astrophysik Potsdam (AIP), Germany
2 – Universitaet Potsdam, Germany
3 – ESO, Germany

e-mail: mschoell@eso.org

One of the major open questions regarding the formation of Planetary Nebulae (PNe) concerns the origin of their non-spherical, often axisymmetric shape. Stellar rotation in combination with magnetic fields is an attractive alternative to the more popular binary hypothesis, but very little is known so far about the rotation rates and surface magnetic fields of the central stars of PNe. In principle, the role of magnetic fields in shaping PNe may be verified or disproven by empirical evidence, i.e. by measuring the magnetic field in a representative sample of central stars. First reports claiming the detection of kG magnetic fields in two central stars of PNe (Jordan et al. 2005) could not be confirmed by improved analysis methods (Jordan et al. 2012) or new measurements (Leone et al. 2011). We report here about our own survey of a sample of 12 central stars using observations with FORS2. In four of the central stars, we detected weak but significant magnetic fields of a few 100 Gauss. In all cases, we observe a significant spectrum variability that is interpreted as the signature of stellar rotation on a time scale of the order of days or less. An order-of-magnitude estimate shows that, for such high rotation rates, the presence of stellar magnetic fields of a few hundred Gauss may well be responsible for shaping the prominent PNe IC418 and NGC2392.

P26

EMISSION LINE VARIABILITY IN THE HgMn STAR 11 PER

Wahlgren G.M.[1] Bohlender, D.[2]
1 – Catholic University of America, Washington DC, USA
2 – NRC Herzberg Institute of Astrophysics, Victoria, Canada

e-mail: glenn.m.wahlgren@nasa.gov

High spectral resolution observations of the HgMn star 11 Per (HD 16727, B7p) have revealed variability in weak emission lines of Mn II multiplet 13 (6120 – 6135 Å). Observations were obtained on three epochs (JD 2455549.728, 2455555.800, 2455560.693) with the CFHT ESPaDOnS instrument during December 2010, and are complemented with an earlier epoch (JD 2452514.623) NOT SOFIN observation and a spectrum obtained with the CFHT Gecko instrument (JD 2451420.641, presented in Wahlgren & Hubrig (2000), A&A 362, L13). The intrinsically strongest line, 6122.434 Å, is a simple emission line on JD 5549 and JD 5560, while on JD 1420, 2514, 5555 its appearance is that of a P Cyg profile with the absorption component on its red side. We suggest that the variability may be rotationally modulated. For main sequence stars of spectral type B5 to B9, the stellar radius ranges from 7 to 2.5 solar radii, respectively, which along with an upper limit of the rotational velocity (v = v $sin(i)$ = 5 km/s, Wahlgren & Hubrig) for 11 Per implies a range in the rotation period of approximately 70 to 25 days. High resolution spectral observations obtained at a higher cadence are needed to determine whether rotation is the cause of the variability, along with the rotation period.

P27

MAGNETIC DOPPLER IMAGING OF THE SLOWLY-ROTATING MAGNETIC He-STRONG STAR HD 184927

Yakunin I., Wade G., Bohlender D., Marcolino W., Kochuckov O., Grunhut J., Monin D., Shultz M. & MiMeS collaboration

e-mail: elias@sao.ru

Using data obtained with ESPaDOnS at the 3.6-m Canada-France-Hawaii Telescope we have employed a an extensive new timeseries of Stokes I and V spectra to investigate the physical parameters, chemical abundances distributions and magnetic field topology of the slowly-rotating (9.5 d) He-strong star HD 184927. In this poster we will present the derived physical parameters of the star and the results of Magnetic Doppler Imaging of the Stokes I and V profiles. Large wings of helium lines can be described only in assumption of presence of a large (60 degree radius) very helium-rich spot (N(He)/N(H) = 2) at the positiveve pole. Additionally, notwithstanding reports of strong modulation of wind-sensitive UV C IV and S IV resonance lines, we are unable to detect any modulation of the H_α profile attributable to a stellar magnetosphere, despite the very high signal-to-noise ratio of our observations.

P28

ON THE PROPERTIES OF NON-MAGNETIC PECULIAR B, A, AND EARLY F TYPE STARS

Yüce K., Adelman S. J.
1 – Ankara University, Faculty of Science, Department of Astronomy and Space Sciences, Ankara, Turkey
2 – Department of Physics, The Citadel, 171 Moultrie Street, Charleston, SC 29409, USA
e-mail: kyuce@ankara.edu.tr

The analyses of high dispersion high signal-to-noise spectra enable stellar astronomers to infer many physical and chemical properties of stars. In light of progress made in the last 10 years, we summarize our analyses of spectra of main sequence band peculiar B, A, and early F stars in the optical region performed using the technique of fine analyses. Our primary interest in studying the chemical composition of individual stars is to understanding the details of the abundances in light of the theories which predict deviations from solar abundances. Although most recent abundance studies have used fine analyses, it is likely that in the future more studies will use spectrum synthesis techniques. Thus we also review what has been accomplished and what problems spectrum synthesis will help solve.

P29

GASEOUS DISKS AROUND A STARS

Abt H.A.
Kitt Peak National Observatory, Tucson, AZ,USA
e-mail: abt@noao.edu

We learned that about one-quarter of the A stars with $V \sin i \geq 200$ km s^{-1} have narrow lines of Ti II and Ca II. They are not interstellar lines because some arise from highly excited states. The narrow lines do not occur in stars with smaller inclinations, so they are due to thin disks, not shells. The lines come and go on scales of decades. There are many such lines in their IUE spectra (λλ2000-3100 Å). Stars without disks occur inside and outside the Local Interstellar Bubble but generally ones with disks do not occur within the bubble. A working model is that stars in the dense ISM accrete gas that cannot reach the photospheres of rapidly rotating stars and form disks, but in regions of low ISM densities, their stellar winds drive them away. Preliminary data indicate that stars do not have both inner gaseous disks and outer debris disks.

P30

DOPPLER IMAGING MAPPING OF FOUR roAp STARS WITH ANOMAOUSLY HIGH Li ABUNDANCE

Polosukhina N., Shulyak D., Shavrina A., Lyashko D., Drake N., .Glagolevsky Y., Kudryavtsev D., Smirnova M.
e-mail: npolo2007@ukr.net

We present the results of the Doppler Imaging of two roAp stars HD 12098 and HD 60435 showing strong and variable Li i lines in their spectra. High-resolution spectra were obtained with the 6m BTA telescope, Russia, and HARPS and VLT/UVES telescopes at ESO, Chile. We derived the surface abundance distribution of the lithium and some REE elements and analyzed correlation between the position of the high Li-abundance spots and magnetic field. We compare our results with previously obtained Doppler Imaging mapping of two CP2 stars, HD 83668 and HD 3980, and discuss the common properties of the “'Li spots” location on the surfaces of magnetic chemically-peculiar A-type stars.

List of Participants

	Name	Institute	E-mail	pages
1	Abt Helmut A. (*in absentia*)	Kitt Peak National Observatory, USA	abt@noao.edu	8,41
2	Alecian Evelyne	Observatoire de Paris, France	evelyne.alecian@obspm.fr	4,14
3	Alexeeva Sofya	Institute of Astronomy RAS, Russia	alexeeva@inasan.ru	7,29
4	Al-Hawi Omar	Kazan Federal University, Russia	omaralsamarrai@yahoo.com	7,29
5	Antoci Victoria	Aarhus University. Denmark	antoci@phys.au.dk	6,23
6	Arlt Rainer	Leibniz-Institut für Astrophysik, Germany	rarlt@aip.de	4,14
7	Avagyan Slavik	State Engineering University, Armenia	slavikavagyan@yahoo.com	
8	Balona Luis	South African Astronomical Observatory, South Africa	lab@saao.ac.za	6,27
9	Bikmaev Ilfan	Kazan Federal University, Russia	ibikmaev@yandex.ru	7, 7, 29, 32
10	Bochkarev Nikolai	SAI MSU, Russia	boch@sai.msu.ru	8,35
11	Butkovskaya Varvara	Crimean Astrophysical Observatory, Ukraine	itbiz@mail.ru	7,30
12	Bychkov Victor	Special Astrophysical Observatory RAS, Russia	vbych@sao.ru	7,30
13	Castaneda Diego	Saint Mary's University, Canada	castaned@ap.smu.ca	7,31
14	Cowley Charles	University of Michigan, USA	cowley@umich.edu	7,7,31
15	D'Angelo Caroline	University of Amsterdam, the Netherlands	c.r.dangelo@uva.nl	3,13
16	Drake Natalia	Saint Petersburg State University, Russia	natalia.drake.2008@gmail.com	6,7,8,8,8,32, 35,37,41
17	Fossati Luca	Argelander Institut fur Astronomie, Germany	fossati1511@gmail.com	3,11,11
18	Galazutdinov Gazinur	Universidad Catolica del Norte, Chile	runizag@gmail.com	
19	Gebran Marwan	Notre-Dame University Louaize, Lebanon	mgebran@ndu.edu.lb	7,8,33,38
20	Griffin Elizabeth	Dominion Astrophysical Observatory, Canada	Elizabeth.Griffin@nrc-cnrc.gc.ca	3,4,14
21	Grinin Vladimir	Pulkovo Astronomical Observatory, RAS, Russia	vgcrao@mail.ru, grinin@gao.spb.ru	3,12
22	Gruzinov Andrei	New York University, USA	ag92@nyu.edu	
23	Holdsworth Daniel	Keele University, UK	d.l.holdsworth@keele.ac.uk	7,33
24	Hou Wen	National Astronomical Observatories, CAS, China	whou@bao.ac.cn	7,8,34,36
25	Karitskaya Eugenia	Institute of Astronomy RAS, Russia	karitsk@sai.msu.ru	8,35
26	Kholtygin Alexander	Saint Petersburg State University, Russia	afkholtygin@gmail.com	8,8,35,37
27	Kilicoglu Tolgahan	Ankara University, Turkey	tkilicoglu@ankara.edu.tr	3,11

28	Kochukhov Oleg	Uppsala University, Sweden	oleg.kochukhov@physics.uu.se	6,8,8,25,26,39,40
29	Korhonen Heidi	University of Copenhagen, Denmark	heidi.korhonen@nbi.ku.dk	5,18
30	Krtička Jiri	Masaryk University, Czech Republic	krticka@physics.muni.cz	5,8,8,19,21,35,37
31	Kudryavtsev Dmitry	Special Astrophysical Observatory RAS, Russia	dkudr@sao.ru	
32	Landstreet John	University of Western Ontario, Canada	jlandstr@uwo.ca	3,5,10,20
33	Lau Ho Bun	University of Bonn, Germany	hblau@astro.uni-bonn.de	4,15
34	Li Yinbi	National Astronomical Observatories, CAS, China	ybli@bao.ac.cn	8,36
35	Lignières Fran3ois	Institut de Recherche en Astrophysique et Planetologie, France	francois.lignieres@irap.omp.eu	6,8,26,36
36	Lüftinger Theresa	University of Vienna, Austria	theresa.rank-lueftinger@univie.ac.at	4,8,18,37
37	Mashonkina Lyudmila	Institute of Astronomy RAS, Russia	lima@inasan.ru	7,17,29
38	Mathys Gautier	JAO/ESO, Chile	gmathys@eso.org	4,6,15
39	Matthews Jaymie	University of British Columbia, Canada	matthews@astro.ubc.ca	5,6,25
40	Mikulášek Zdenek	Masaryk University, Czech Republic	mikulas@physics.muni.cz	5,8,19,21,37
41	Mkrtichian David	NARIT, Thailand	davidmkrt@gmail.com	3,13
42	Monier Richard	Universite de Nice and LESIA (Meudon), France	Richard.Monier@unice.fr	75,,8,11,33,38
43	Mowlavi Nami	Geneva University, Switzerland	Nami.Mowlavi@unige.ch	6,23
44	Nazé Yaël	University of Liege, Belgium	naze@astro.ulg.ac.be	6,23
45	Netopil Martin	University of Vienna, Austria	martin.netopil@univie.ac.at	3,10
46	Netzer Nathan	ORT Braude College, Israel	netzer@braude.ac.il	8,36
47	North Pierre	Ecole Polytechnique Federale de Lausanne, Switzerland	pierre.north@epfl.ch	4,13
48	Pakhomov Yury	Institute of Astronomy RAS, Russia	pakhomov@inasan.ru	8, 37
49	Perraut Karine	IPAG/CNRS/UJF, France	karine.perraut@obs.ujf-grenoble.fr	4,16
50	Pintado Olga	INSUGEO-CONICET, Argentina	olga.pintado@gmail.com, opintado@conicet.gov.ar	4,8,38
51	Piskunov Nikolai	Uppsala University, Sweden	Piskunov@astro.uu.se	4,8,25,37
52	Polosukhina Nina	Crimean Astrophysical Observatory, Ukraine	npolo2007@ukr.net	8,41
53	Prvak Milan	Masaryk University, Czech Republic	prvak@physics.muni.cz	8,19,37
54	Przybilla Norbert	University of Innsbruck, Austria	norbert.przybilla@uibk.ac.at	4,17
55	Punanova Anna	Institute of Astronomy RAS, Russia + UrFU Russia	PunanovaAnna@gmail.com	
56	Robrade Jan	Hamburger Sternwarte, Germany	jrobrade@hs.uni-hamburg.de	6,27
57	Romanyuk Iosif	Special Astrophysical Observatory RAS, Russia	roman@sao.ru	6,8,24,38
58	Royer Frédéric	GEPI - Observatoire de Paris, France	frederic.royer@obspm.fr	5,7,8,20,33,38

59	Rusomarov Naum	Uppsala University, Sweden	naum.rusomarov@physics.uu.se	6,25
60	Ryabchikova Tatiana	Institute of Astronomy RAS, Russia	ryabchik@inasan.ru	5,8,17,19,37
61	Sachkov Mikhail	Institute of Astronomy RAS, Russia	msachkov@inasan.ru	6,22
62	Saio Hideyuki	Tohoku University, Japan	saio@astr.tohoku.ac.jp	5,21
63	Samus Nikolay	Institute of Astronomy RAS, Russia	samus@sai.msu.ru	
64	Savanov Igor	Institute of Astronomy RAS, Russia	isavanov@inasan.ru	3,8,38
65	Schoeller Markus	European Southern Observatory, Germany	mschoell@eso.org	6,7,8,8,24, 32,34,39
66	Semenko Evgeny	Special Astrophysical Observatory RAS, Russia	esemenko@gmail.com	4,8,18,38
67	Shulyak Denis	Goettingen Universityб Germany	denis@astro.physik.uni-goettingen.de	4,8,8,16,39, 41
68	Sitnova Tatyana	Institute of Astronomy RAS, Russia	sitnova@inasan.ru	4,17
69	Staritsin Eugenij	Ural Federal University, Russia	Eugenij.Staritsin@usu.ru	5,20
70	Stepien Kazimierz	Warsaw University Observatory, Poland	kst@astrouw.edu.pl	7
71	Thureau Nathalie	University of St Andrews, Scotland	nt15@st-andrews.ac.uk	3,12
72	Titarenko Anastasia	Moscow State University	2chlaidze@gmail.com	8,37
73	Tsymbal Vadim	Tavrian National University, Ukraine	vadim@starsp.org	6,22
74	ud Doula Asif	Penn State Worthington Scranton, USA	auu4@psu.edu	6,27
75	Urbaneja Miguel	University of Hawaii, USA	urbaneja@ifa.hawaii.edu	7,28
76	Uytterhoeven Katrien	Instituto de Astrofisica de Canarias, Spain	katrien@iac.es	5,21
77	Valyavin Gennady	Special Astrophysical Observatory RAS, Russia	gvalyavin@sao.ru	7,28
78	Wahlgren Glenn (*in absentia)*	Catholic University of America, USA		8,40
79	Weiss Werner	University of Vienna, Austria	werner.weisse@univie.ac.at	
80	Yakunin Ilya	Special Astrophysical Observatory, RAS Russia	elias@sao.ru	8,40
81	Yelkenci Aysegul	Istanbul Kultur University, Turkey	a.teker@iku.edu.tr	5,19
82	Yüce Kutluay	Ankara University, Turkey	kyuce@ankara.edu.tr	8,41