

# Dr Sergiy Shelyag

ARC Future Fellow

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## PERSONAL INFORMATION:

PhD award date: 07/2004

Date of birth: 27 February 1979

Citizenship: British

Place of birth: Kharkiv, Ukraine

## EDUCATION:

- 2001-2004, PhD in Physics and Astronomy (Georg-August University, Göttingen, Germany) *"Spectropolarimetric diagnostics of magneto-convection simulations of the solar photosphere"*
- 1999-2000, MSc (specialist) diploma (Department of Space Radio Physics and Radio Astronomy, Kharkiv National University, Ukraine) *"Evolution of galaxies and clusters of galaxies in the merging model"*
- 1995-1999, BSc diploma (Department of Space Radio Physics and Radio Astronomy, Kharkiv National University, Ukraine) *"Hypernova remnants and the strong explosion theory"*

## EMPLOYMENT HISTORY:

- 2013-current: ARC Future Fellow (Level 1, senior lecturer), Monash Centre for Astrophysics, School of Mathematical Sciences, Monash University, Clayton, Victoria, Australia.
- 2013-current: Visiting research fellow. Astrophysics Research Centre, School of Mathematics and Physics, Queen's University, Belfast, UK.
- 2012-2013: Postdoctoral Research Fellow, Leverhulme Research Grant, named postdoc. Astrophysics Research Centre, School of Mathematics and Physics, Queen's University, Belfast, UK.
- 2009-2012: Postdoctoral Research Fellow, Astrophysics Research Centre, School of Mathematics and Physics, Queen's University, Belfast, UK.
- 2005-2009: Postdoctoral Research Associate, Department of Applied Mathematics, School of Mathematics and Statistics, Sheffield University, UK.
- 2004-2005: Max Planck Society short-term Postdoctoral Researcher, Max Planck Institute of Solar System Research, Katlenburg-Lindau, Germany.

## TEACHING EXPERIENCE:

- 2005-2009, the University of Sheffield (UK). Regular tutorials and problem classes for medium groups (20-30) of 1<sup>st</sup> and 2<sup>nd</sup> year undergraduate students in a variety of Applied Mathematics and Mathematical Modeling courses, 2-6 hours per week.
- 2013-2014, Monash University (Australia). Sun and Stars (M4111 (2013), M44011 (2014)) honours course lecturer (12 lectures, developed myself), small groups (3-15 students).

- 2015, Monash University (Australia). Computational visualization and numerical hydrodynamics, M43071, 24 lectures (developed myself in collaboration with Dr Alina Donea)
- Member of Monash Institute of Graduate Research (MIGR); MIGR accredited supervisor (Level 1).
- I currently supervise one PhD student at Monash University (Damien Przybylski) and assist in supervision of two PhD students at Queen's University Belfast (A. Reid, R. Hewitt, H. Cegla (completed), P. Keys (completed), P. Crockett (completed)).
- Supervised final year undergraduate project student (2012, Aaron Reid, 2013 Geddes Prize for the best undergraduate project in Physics, Queen's University, Belfast; The Undergraduate Award).
- Supervised student projects at Advanced Summer Schools in Solar Physics (2006, 2007, 2009). Best student project prize, Junhan Kim (2009).

## REFEREEING:

I acted as a referee for Astronomy & Astrophysics, The Astrophysical Journal, Solar Physics and MNRAS (2007-2015) and as a referee for Discovery Projects, Future Fellowships and DECRA awards of Australian Research Council (2013, 2014).

## GRANTS AND AWARDS:

Funding:

- Monash-Warwick Alliance, Seed Fund (2014-2015). AU\$9450 + GB£6803.
- ARC Future Fellowship (2012). AU\$571852 for 4 years.
- Named Postdoctoral Research Fellow, Research Project Grant "Towards detecting Earth-like Alien Worlds", Leverhulme Trust, UK (2012). GB£137716 for 3 years project.
- "Simulations and radiative diagnostics of turbulence and wave phenomena in the magnetized solar photosphere" Royal Society International Travel Grant (GB£1000) to attend "Dynamical processes in space plasmas" meeting, Israel (2010).
- Max Planck Society PhD Fellowship (2001). Independent three year funding for PhD research project (EUR45000), international student fee waiver and conference travel expenses.
- "Small Scale Structures and Collapses in Hydrodynamic Type Models", INTAS grant (2002). Co-participant, total grant amount US\$15000.

Facilities:

- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", NCMAS 2015 round, computational time allocation: NCI rajjin 300kSU
- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", NCMAS 2015 round, computational time allocation: iVEC magnus 1.8MSU
- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", ASTAC 2015 Q1-Q2 round, computational time allocation: Swinburne gSTAR 500kSU
- "Numerical modelling of solar photospheric magnetic activity", MASSIVE, 2014-2015, computational time allocation: MASSIVE 120kSU
- "Investigating the acoustic and radiative properties of sunspots", ASTAC 2014 Q3-Q4 round, computational time allocation: Swinburne gSTAR 500kSU, co-participant, PI D. Przybylski.
- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", ASTAC 2014 Q3-Q4 round, computational time allocation: NCI rajjin 450kSU
- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", MONASH LIEF 2014 Q1-Q2 round, computational time allocation: NCI rajjin 70kSU
- "Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere", ASTAC 2014 Q1-Q2 round, computational time allocation: Swinburne gSTAR 300kSU

- “Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere”, ASTAC 2013 Q3-Q4 round, computational time allocation: NCI rajin 550kSU
- “Numerical modelling of solar photospheric magnetic activity”, MASSIVE, 2013-2014, computational time allocation: MASSIVE 30kSU
- “The formation and evolution of photospheric magnetic bright points”, 12 days observational time, Dunn Solar Telescope, NM, USA, 2013, in collaboration with Queen’s University, Belfast, UK.

#### **MEMBERSHIPS:**

- Monash Institute of Graduate Research (MIGR)
- Astronomical Society of Australia

#### **RESEARCH INTERESTS:**

My main research interests and experience concentrate on large-scale mathematical modelling of physical processes, computational fluid dynamics and magnetohydrodynamics (MHD), numerical radiative transport, solar physics, and astrophysical plasma physics. Currently I am one of the few scientists successfully working on development and use of realistic MHD simulations and detailed radiative transport diagnostics in solar physics. During my 10-year research career I took a major part in development of two numerical MHD codes, which are extensively used by myself and other groups. Based on the existing codes, I developed a “toolbox” for spectropolarimetric studies of radiation in the simulated models. This allows direct comparison between the simulations of the solar atmosphere and modern high-resolution observations. A number of highly significant results emerged from this cross-disciplinary approach of linking basic photospheric plasma parameters with the properties of emerging radiation. These include: discovery of magnetic nature and physical mechanisms of photospheric bright points and analysis of their statistical properties; reproduction of basic helioseismic properties using forward modeling; determination of the effects of magnetic fields and sub-photospheric flows on the properties of acoustic waves in the sub-photosphere; analysis of the effect of seeing conditions on spectropolarimetric properties of radiation; discovery of a new magnetic vorticity generation mechanism in photospheric magnetic flux concentrations.

#### **REFERENCES can be requested from:**

Prof. P.S. Cally  
 School of Mathematical Sciences  
 Monash University  
 Clayton  
 3800 Victoria  
 Australia  
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Prof. M. Mathioudakis  
 School of Mathematics and Physics  
 Queen’s University Belfast  
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Prof. M. Schüssler  
 Max-Planck Institute for Solar System Research  
 Justus-von-Liebig-Weg 3  
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 Germany  
 Phone: +49 551 384 979 469  
 Email: schuessler@mps.mpg.de

## LIST OF PUBLICATIONS

H-index 18; total number of citations >1000. Since 2009: H-index 16; number of citations >700 (24/01/15; source – Google Scholar)

### PUBLICATIONS IN REFEREED JOURNALS

1. Przybylski, D.F., **Shelyag, S.**, Cally, P.S. Spectropolarimetrically accurate magneto-hydrostatic sunspot model for forward modelling in helioseismology. *ApJ*, accepted, 2015.
2. Moradi, H., Cally, P.S., Przybylski, D., **Shelyag, S.** Directional time-distance probing of model sunspot atmospheres. *MNRAS*, accepted, 2015.
3. Reid, A., Mathioudakis, M., Scullion, E., Doyle, J.G., **Shelyag, S.**, Gallagher, P. Ellerman Bombs with Chromospheric Jets: Cause and Effect. *ApJ*, accepted, 2015.
4. Kuridze, D., Henriques, V., Mathioudakis, M., Erdélyi, R., Zaqarashvili, T.V., **Shelyag, S.**, Keys, P.H., Keenan, F.P. Dynamics of Rapid Redshifted/Blueshifted Excursions in the Halpha. *ApJ*, 802, 26, 2015.
5. **Shelyag, S.** Spectro-polarimetric simulations of the solar limb: absorption-emission Fe I 6301.5Å and 6302.5Å line profiles and bidirectional flows. *ApJ*, 801, 46, 2015.
6. **Shelyag, S.**, Przybylski, D. Centre-to-limb spectro-polarimetric diagnostics of simulated solar photospheric magneto-convection: signatures of photospheric Alfvén waves. *PASJ*, 66, 9, 2014. **(3 citations)**
7. Hewitt, R., **Shelyag, S.**, Mathioudakis, M., Keenan, F.P. Plasma properties and Stokes profiles during the lifetime of a photospheric magnetic bright point. *A&A*, 565, 84, 2014. **(3 citations)**
8. Nelson, C.J., **Shelyag, S.**, Mathioudakis, M., Doyle, J.G., Madjarska, M.S., Uitenbroek, H., Erdélyi, R. Ellerman bombs – evidence for magnetic reconnection in the lower solar atmosphere. *ApJ*, 779, 125, 2013. **(3 citations)**
9. **Shelyag, S.**, Cally, P.S., Reid, A., Mathioudakis, M. Alfvén waves in simulations of solar photospheric vortices. *ApJL*, 776, 4, 2013. **(15 citations)**
10. Zharkov, S., **Shelyag, S.**, Fedun, V., Erdélyi, R., and Thompson, M.J. Photospheric high-frequency acoustic power excess in sunspot umbra: signature of magneto-acoustic modes. *AnGeo*, 31, 1357, 2013.
11. Morton, R.J., Verth, G., Fedun, V., **Shelyag, S.**, Erdélyi, R. Evidence for the Photospheric Excitation of Incompressible Chromospheric Waves. *ApJ*, 768, 17, 2013. **(23 citations)**
12. Keys, P.H., Mathioudakis, M., Jess, D.B., **Shelyag, S.**, Christian, D.J., Keenan, F.P. Tracking magnetic bright point motions through the solar atmosphere. *MNRAS*, 428, 3220, 2013. **(8 citations)**
13. Cegla, H.M., **Shelyag, S.**, Watson, C.A., Mathioudakis, M. Stellar Surface Magneto-convection as a Source of Astrophysical Noise. I. Multi-component Parameterization of Absorption Line Profiles. *ApJ*, 763, 95, 2013. **(5 citations)**
14. **Shelyag, S.**, Mathioudakis, M., Keenan, F.P. Mechanisms for MHD Poynting Flux Generation in Simulations of Solar Photospheric Magnetoconvection. *ApJL*, 753L, 22, 2012. **(11 citations)**
15. Cegla, H., Watson, C.A., Marsh, T.R., **Shelyag, S.**, Moulds, V., Littlefair, S., Mathioudakis, M., Polacco, D., Bonfils, X. Stellar jitter from variable gravitational redshift: implications for RV confirmation of habitable exoplanets. *MNRAS Letters*, 421L, 54, 2012. **(6 citations)**
16. Jess, D.B., **Shelyag, S.**, Mathioudakis, M., Keys, P.H., Christian, D.J., Keenan, F.P. Propagating Wave Phenomena Detected in Observations and Simulations of the Lower Solar Atmosphere. *ApJ*, 746, 183, 2012. **(26 citations)**
17. Keys, P., Mathioudakis, M., Jess, D., **Shelyag, S.**, Keenan, F.P., Crockett, P.J., Christian, D.J. The velocity distribution of magnetic bright points. *ApJL*, 740, 40, 2011. **(24 citations)**
18. Kuridze, D., Mathioudakis, M., Jess, D., **Shelyag, S.**, Christian, D., Keenan, F.P. Small-scale H-alpha jets in the solar chromosphere. *A&A*, 533, 76, 2011. **(3 citations)**

19. **Shelyag, S.**, Fedun, V., Keenan, F.P., Erdélyi, R., Mathioudakis, M. Photospheric magnetic vortex structures. *Annales Geophysicae*, 29, 883, 2011. **(25 citations)**
20. Fedun, V., **Shelyag, S.**, Verth, G., Mathioudakis, M., Erdélyi, R. MHD waves generated by high-frequency photospheric vortex motions. *Annales Geophysicae*, 29, 1029, 2011. **(27 citations)**
21. **Shelyag, S.**, Keys, P., Mathioudakis, M., Keenan, F.P. Vorticity in the solar atmosphere. *A&A*, 526, A5, 2011. **(53 citations)**
22. Fedun, V., **Shelyag, S.**, Erdélyi, R. Numerical modelling of footpoint-driven magneto-acoustic wave propagation in a localised solar flux tube. *ApJ*, 727, 17, 2011. **(51 citations)**
23. Crockett, P.J., Mathioudakis, M., Jess, D.B., **Shelyag, S.**, Keenan, F.P. The area distribution of solar magnetic bright points. *ApJL*, 722, L188, 2010. **(27 citations)**
24. Matloch, L., Cameron, R., **Shelyag, S.**, Schmitt, D., Schüssler, M. Mesogranular structure in a hydrodynamical simulation. *A&A*, 519, 52, 2010. **(12 citations)**
25. **Shelyag, S.**, Mathioudakis, M., Keenan, F.P., Jess, D. A photospheric bright point model. *A&A*, 515, 107, 2010. **(9 citations)**
26. Fedun, V., Erdélyi, R., **Shelyag, S.** Oscillatory response of the 3D solar atmosphere to the leakage of photospheric motion. *Solar Physics*, 258, 219, 2009. **(29 citations)**
27. **Shelyag, S.**, Zharkov, S., Fedun, V., Erdélyi, R., Thompson, M.J. Acoustic wave propagation in the solar sub-photosphere with localised magnetic field concentration: effect of magnetic tension. *A&A*, 501, 735, 2009. **(37 citations)**
28. **Shelyag, S.**, Fedun, V., Erdélyi, R. Magnetohydrodynamic code for gravitationally stratified plasma. *A&A*, 486, 655, 2008. **(33 citations)**
29. **Shelyag, S.**, Erdélyi, R., Thompson, M. J. Forward modelling of sub-photospheric flows for time-distance helioseismology. *A&A*, 469, 1101, 2007. **(14 citations)**
30. **Shelyag, S.**, Schüssler, M., Solanki, S. K., Vögler, A. Stokes diagnostics of simulated solar magneto-convection. *A&A*, 469, 731, 2007. **(37 citations)**
31. **Shelyag, S.**, Erdélyi, R., Thompson, M. J. Forward Modeling of Acoustic Wave Propagation in the Quiet Solar Subphotosphere. *ApJ*, 651, 576, 2006. **(22 citations)**
32. Khomenko, E. V., **Shelyag, S.**, Solanki, S. K., Vögler, A. Stokes diagnostics of simulations of magnetoconvection of mixed-polarity quiet-Sun regions. *A&A*, 442, 1059, 2005. **(66 citations)**
33. Vögler, A., **Shelyag, S.**, Schüssler, M., Cattaneo, F., Emonet, T. Simulations of magneto-convection in the solar photosphere. Equations, methods, and results of the MURaM code, *A&A*, 429, 335, 2005. **(388 citations)**
34. **Shelyag, S.**, Schüssler, M., Solanki, S.K., Berdyugina, S.V., Vögler, A. G-Band spectral synthesis and diagnostics of simulated solar magneto-convection. *A&A*, 427, 335, 2004. **(85 citations)**
35. Schüssler, M., **Shelyag, S.**, Berdyugina, S., Vögler, A., Solanki, S.K. Why Solar Magnetic Flux Concentrations Are Bright in Molecular Bands, *ApJ*, 597, L173, 2003. **(82 citations)**
36. Kontorovich, V.M., **Shelyag, S.I.** The influence of mergings on galaxy evolution. *Ap&SS*, 284, 475, 2003.
37. Kontorovich, V.M. and **Shelyag, S.I.** Bending of a Strong-Explosion-Induced Shock Wave around a Density Singularity (as Applied to the Remnants of Hypernovae). *JETP Letters*, 76, 115, 2002. **(3 citations)**
38. **Shelyag, S.** The overflow of density singularity by shock generated by strong explosion. *KosNT*, 7, 101, 2001.

#### REFEREED CONFERENCE PROCEEDINGS

1. **Shelyag, S.**, Fedun,V., Erdélyi, R., Keenan, F.P., Mathioudakis, M. Vortices in the Solar

- Photosphere. ASP Conference Series, 463, 107, 2012. **(2 citations)**
2. Zharkov, S., **Shelyag, S.**, Thompson, M.J. Analysis of Acoustic Wave Propagation in the Subphotosphere with Localized Magnetic Field Concentration. Proceedings of GONG 2008/SOHO 21 ASP Conference Series, 416, 167, 2009. **(1 citation)**
  3. **Shelyag, S.**, Zharkov, S., Fedun, V., Erdélyi, R., Thompson, M.J. Numerical simulation of acoustic wave propagation in the solar sub-photosphere. Proceedings of GONG 2008/SOHO 21 ASP Conference Series, 416, 75, 2009. **(4 citations)**
  4. **Shelyag, S.**, Erdélyi, R., Thompson, M. J. Helioseismology of sub-photospheric flows. Proceedings of SOHO 18/GONG 2006/HELAS, 123, 2006.
  5. Khomenko, E. V.; **Shelyag, S.**; Solanki, S. K.; Vögler, A.; Schüssler, M. Stokes diagnostics of magneto-convection. Profile shapes and asymmetries. Multi-Wavelength Investigations of Solar Activity, IAU Symposium, Vol. 223. Edited by Alexander V. Stepanov, Elena E. Benevolenskaya, and Alexander G. Kosovichev. Cambridge, UK: Cambridge University Press, 635, 2004. **(1 citation)**
  6. Cameron, R., Vögler, A., **Shelyag, S.**, Schüssler, M. The Decay of a Simulated Pore. ASP Conference Series, 57, 325, 2004. **(1 citation)**
  7. Vögler, A., **Shelyag, S.**, Schüssler, M., Cattaneo, F., Emonet, T., Linde, T. Simulation of Solar Magnetoconvection. Modelling of Stellar Atmospheres, Proceedings of the 210<sup>th</sup> Symposium of the International Astronomical Union held at Uppsala University, Uppsala, Sweden. Edited by N. Piskunov, W.W. Weiss, and D.F. Gray. ASP series, 2003, 157. **(19 citations)**
  8. Kontorovich, V.M. and **Shelyag, S.** Galaxy Cluster Mass Function Evolution Caused By Galaxy Mergings. ASP Conference Proceedings, 397, 268, 2002.

## CONFERENCES, WORKSHOPS AND SEMINARS

- **Shelyag, S.** The sun off the disk centre. Physics open day / Monash-Warwick meeting. Invited lecture. Warwick University, Coventry, UK.
- **Shelyag, S.** The sun off the disk centre. Seminar, IAC, Spain.
- **Shelyag, S.** Centre-to-limb spectropolarimetry of simulated solar photosphere: signatures of photospheric Alfvén waves. COSPAR, 2014, Moscow.
- **Shelyag, S.** Simulations of stellar jitter: a pathway to Earth-sized exoplanets? COSPAR, 2014, Moscow.
- **Shelyag, S.** Simulations of stellar jitter. CoolStars 18, 2014, USA.
- **Shelyag, S.** Centre-to-limb spectropolarimetry of simulated solar photosphere: signatures of photospheric Alfvén waves. National Astronomy Meeting, 2014, UK.
- **Shelyag, S.** Spectropolarimetric signatures of photospheric intergranular vortices. Hinode 7, Takayama, Japan, 2013.
- **Shelyag, S.** Spectropolarimetric signatures of photospheric intergranular vortices. Talk, Second UK-Ukraine meeting on solar physics and space science, Kiev, Ukraine, 2013.
- **Shelyag, S.** Radiative MHD modelling of the solar photosphere. Invited talk, Leverhulme flare seismology workshop, MSSL, UK, 2013.
- **Shelyag, S.** Spectropolarimetric signatures of photospheric intergranular vortices. Talk, 1<sup>st</sup> SOLARNET – 3<sup>rd</sup> EAST/ATST meeting, Oslo, Norway, 2013.

- **Shelyag, S.** Numerical modelling of the solar photosphere: bridging theory and observations. Invited seminar, NSO, Sunspot, NM, USA, 2012.
- Cegla, H., Watson, C., Marsh, T., **Shelyag, S.**, Moulds, V., Littlefair, S., Mathioudakis, M., Pollacco, D., Bonfils, X. Towards Earth-like Worlds: Identifying and Removing Stellar Jitter. American Astronomical Society, AAS Meeting 219, 432.03.
- **Shelyag, S.** Vortices in the solar photosphere. Talk, ATST/EAST workshop, Washington DC, 2011.
- **Shelyag, S.** Numerical modelling of the solar photosphere: bridging theory and observations. Invited talk, International Top Young Seminar, JAXA, 2011.
- **Shelyag, S.**, Mathioudakis, M., Keenan, F.P. Photospheric vortex motions. Talk, BUKS 2011.
- **Shelyag, S.**, Mathioudakis, M., Keenan, F.P. Multiwavelength spectropolarimetric diagnostics of simulated solar photosphere. Invited talk, RAS specialist discussion meeting "Waves in the magnetic Sun", 2011.
- **Shelyag, S.** Simulations and radiative diagnostics of waves and turbulence in the solar atmosphere. Mullard Space Science Laboratory. Seminar, 2010.
- **Shelyag, S.** Simulations and radiative diagnostics of waves and turbulence in the solar atmosphere. Armagh Observatory. Seminar, 2010.
- **Shelyag, S.**, Mathioudakis, M., Keenan, F.P., Jess, D. Simulations and radiative diagnostics of waves and turbulence in the solar atmosphere. Invited talk, ISRADYNAMICS 2010.
- **Shelyag, S.**, Mathioudakis, M., Keenan, F.P., Jess, D. A photospheric bright point model. RAS specialist discussion meeting "Waves and turbulence in solar-terrestrial plasmas", 12/03/2010.
- **Shelyag, S.**, Zharkov, S., Fedun, V., Erdélyi, R., Thompson, M.J. Numerical simulation of acoustic wave propagation in the solar sub-photosphere with localised magnetic field concentration. Boulder, August 2008, SOHO21.
- **Shelyag, S.**, Erdélyi, R., Thompson, M. J. "Forward Simulations of Subphotospheric Flows for Time-Distance Helioseismology." Sunspot, NM, USA, April 2007, NSO Workshop 24.
- **Shelyag, S.**, Erdélyi, R., Thompson, M. J. "Helioseismology of sub-photospheric flows." Sheffield, UK, August 2006, SOHO18
- **Shelyag, S.**, Erdélyi, R., Thompson, M. J. "Forward modelling of acoustic wave propagation in the solar sub-photosphere", Tucson, AZ, USA, December 2005,
- **Shelyag, S.**, Erdélyi, R., Thompson, M. J. "Forward modelling of acoustic wave propagation in the solar sub-photosphere", San Francisco, CA, USA, December 2005, 2005 AGU Fall Meeting.
- **Shelyag, S.**, Erdélyi, R., Thompson, M. J. "Forward modelling of acoustic wave propagation in the solar sub-photosphere", Birmingham, UK, NAM 2005, April 2005.
- Cameron, R., Vögler, A., **Shelyag, S.**, Schüssler, M. "The Decay of a Simulated Pore." Roppongi, November 2003, Fifth Solar-B Science Meeting "The Solar-B Mission and the Forefront of Solar Physics".
- Khomenko, E.V., **Shelyag, S.**, Solanki, S.K., Vögler, A., Schüssler, M. „Stokes diagnostics of magneto-convection. Profile shapes and asymmetries". St. Petersburg, June 2004, 223th IAU Symposium "Multi-Wavelength Investigations of Solar Activity".
- Solanki, S.K., **Shelyag, S.**, Vögler, A., Schüssler, M. „Solar magneto-convection simulations and comparison with observations". Nice, France, April 2003, EGS-AGU-EUG Joint Assembly.
- Vögler, A., **Shelyag, S.**, Schüssler, M., Cattaneo, F., Emonet, T., Linde, T. "Simulation of Solar Magnetoconvection". Uppsala, Sweden, June 2002: 210th IAU Symposium "Modelling of Stellar Atmospheres".
- Kontorovich, V.M., **Shelyag, S.** "Exact solutions of Kompaneets equation for non-central

explosion in a medium with bi-exponential density distribution, and hypernova remnants". Puschino, Russia, April 2001: "The modern problems of extragalactic astronomy".

- **Shelyag, S.** "The overflow of a density singularity by a shock generated by a strong explosion". Alushta, Ukraine, Sep 2000: VIII Ukrainian Conference "Plasma Physics and Controlled Fusion".
- **Shelyag, S.** "The galaxy cluster evolution depending on gravitational interactions and merging of galaxies in cluster". Kharkiv, Ukraine, Nov 2000: Ukrainian-Russian Conference "Gravitation and Cosmology".
- **Shelyag, S.** Kontorovich, V.M., "The overflow of a star by supernova explosion (exact solution of Kompaneets equation)". Moscow, Russia, Dec 2000: 11-th session of Russian Academy of Science on Nonlinear Dynamics.
- Kontorovich, V.M., **Shelyag, S.** "The enveloping of a density singularity by shock generated by strong explosion". Munich, Germany, September 2001: JENAM-2001.
- Kontorovich, V.M., **Shelyag, S.** "The galaxy cluster evolution in the merging model". Moscow, Russia, May 2000: JENAM-2000.
- Kontorovich, V.M., **Shelyag, S.** "The galaxy cluster evolution in the merging model". Puschino, Russia, April 2000: "The modern problems of extragalactic astronomy".
- Djukarev, Ju.M., **Shelyag, S.** "Computer demonstrations in probabilities theory". Kharkiv, Ukraine, June 1998: "Using of personal computers in scientific research and education".