

## Ivan A. Galkin

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### **A. SUMMARY**

Software IPT Lead with 25 years of experience in the research fields of intelligent imagery data processing, scientific data visualization, interactive analysis, instrument software design, and management of real-time observational data. Full member of US National Committee of International Union of Radio Science (URSI) since 2006. Vice-chair of URSI Ionosonde Network Advisory Group since 2008.

### **B. EDUCATION AND ACADEMIC EXPERIENCE**

#### **B1. Education**

**Sc.D. in Computer Science**, May 2004  
Department of Computer Science, College of Arts and Sciences  
University of Massachusetts Lowell, Lowell, MA

**M.S. in Computer Engineering**, February 1995  
Department of Electrical Engineering, College of Engineering  
University of Massachusetts Lowell, Lowell, MA

**B.S. in Radiophysics and Electronics**, *Summa Cum Laude*, August 1983  
Department of Physics  
Irkutsk State University, Irkutsk, USSR.

#### **B2. Academic Experience**

1993-present Center for Atmospheric Research, University of Massachusetts Lowell,  
Lowell, MA

**DIRECTOR OF SOFTWARE ENGINEERING** (2009-present)  
**SOFTWARE SECTION HEAD** (2004-2009)  
**SOFTWARE SYSTEMS ARCHITECT** (1995-2004)  
**RESEARCH ASSISTANT** (1993-1995)

1983-1993 Institute for Solar-Terrestrial Physics, USSR Academy of Sciences,  
Irkutsk, USSR

**JUNIOR RESEARCH ASSOCIATE (1985-1993)**  
**RESEARCH APPRENTICE (1983-1985)**

**B3. Awards**

- 2004 US Air Force Technology Transfer Award, Space Vehicles Directorate
- 2002 NASA Group Achievement Award, IMAGE mission
- 1995 Permanent US Residency in category of Outstanding Researcher
- 1994 U.S. National Committee of URSI, Student Competition Finalist, 2<sup>nd</sup> Prize
- 1983 *Summa Cum Laude* graduation, Irkutsk State University, Irkutsk, USSR
- 1978 Gold Medal graduation, High School #24, Irkutsk, USSR
- 1977 State Kremlin Palace Recognition Award and Ceremony, Moscow, USSR

**B4. Professional Membership**

- U.S. National Committee of URSI, Commission G, full member
- URSI Ionosonde Network Advisory Group, Vice-Chairman since 2008
- American Geophysical Union (AGU)

**C. RESEARCH**

**C1. Research Grants, Contracts and Proposals**

- P.I.,** *Calibration and Validation of F18 UV Measurements with Electron Density Profiles from GIRO*, NRL, 03/2010 to 09/2011, \$258,617
- Co-I.,** *Data Services Continuation for Resident Archives of IMAGE/RPI Expert-derived Data*, NASA, 06/2010 to 06/2012, \$111,198
- Co-I.,** *The Virtual Wave Observatory (VWO): a VxO for Heliophysics Data*, NASA, 11/2008 to 11/2011, \$74,442
- Co-I.,** *Enhancing Automated Analysis of Space Plasma Wave Data with Intelligent Systems Technique*, NASA, 08/2004 to 08/2007, \$148,000
- Software IPT Lead,** *Wave-Induced Precipitation of Electron Radiation for the DSX Mission*, AFRL/Stanford U., 6/5/2005-6/30/2010, \$4,769,037
- Software IPT Lead,** *IMAGE Mission Operation and Data Analysis*, SwRI/NASA, 12/1999-09/2007, \$2,617,544

**C2. Publication and Citation Information**

**C2a. First Author Publications**

- Galkin, I. A., B. W. Reinisch, and G.M. Khmyrov, Accuracy of virtual height measurements with digisondes, *INAG Bulletin*, No. 70, 1-15, 2009.
- Galkin, I. A., G. M. Khmyrov, A. V. Kozlov, B. W. Reinisch, X. Huang, and V. V. Paznukhov, The ARTIST 5, in *Radio Sounding and Plasma Physics*, *AIP Proc. 974*, 150-159, 2008.

- Galkin, I. A., B. W. Reinisch, and X. Huang, A tribute to the ARTIST, in *Radio Sounding and Plasma Physics*, AIP Conf. 974, 34-38, 2008.
- Galkin, I. A., G. M. Khmyrov, A. V. Kozlov, and B. W. Reinisch, Intelligent resident archive for RPI Level 2 data, in *Radio Sounding and Plasma Physics*, AIP Proc. 974, 111-117, 2008.
- Galkin, I. A., G. M. Khmyrov, B. W. Reinisch, and J. McElroy, The SAOXML 5: New format for ionogram-derived data, in *Radio Sounding and Plasma Physics*, AIP Proc. 974, 160-166, 2008.
- Galkin, I. A. and B. W. Reinisch, The new ARTIST 5 for all digisondes, *INAG Bulletin*, No. 69, 1-8, 2008.
- Galkin, I.A., Prof. Bodo Reinisch 70th Birthday Symposium in Radio Sounding and Plasma Physics, *IEEE Ant. Prop. Magazine*, 49(5), 146-150, 2007
- Galkin, I. A., G. M. Khmyrov, A. Kozlov, B. W. Reinisch, X. Huang, D. F. Kitrosser, Ionosonde networking, databasing, and web serving, *Radio Sci.*, 41(5), RS5S33, 10.1029/2005RS003384, 2006.
- Galkin, I. A., B. W. Reinisch, X. Huang, R. F. Benson, and S. F. Fung, Automated diagnostics for resonance signature recognition on IMAGE/RPI plasmagrams, *Radio Sci.*, 39(1), RS1015, doi:10.1029/2003RS002921, 2004.
- Galkin, I., B. W. Reinisch, G. Grinstein, G. Khmyrov, A. Kozlov, X. Huang, and S. F. Fung, Automated exploration of the radio plasma imager data, *J. Geophys. Res.*, 109(A12), A12210, doi:10.1029/2004JA010439, 2004.
- Galkin, I.A., D.F. Kitrosser, Z. Kecic, and B.W. Reinisch, Internet access to ionosondes, *J. Atmos. Solar-Terr. Phys.* 61, 181-186, Elsevier Science, 1999.
- Galkin, I.A., B.W. Reinisch, G.A. Ososkov, E.G. Zaznobina, and S.P. Neshyba, Feedback neural networks for ARTIST ionogram processing, *Radio Sci.*, 31, 1119-1129, 1996.

## C2b. Co-Authored Publications

- Zong, Q.-G, B. W. Reinisch, P. Song, Y. Wei, and I. A. Galkin, Dayside ionospheric response to the intense interplanetary shocks / Solar wind discontinuities: observations from the Digisonde Global Ionospheric Radio Observatory, accepted to *J. Geophys. Res.*, 2010.
- Reinisch, B. W., I. A. Galkin, G. M. Khmyrov, A. V. Kozlov, K. Bibl, I. A. Lisysyan, G. P. Cheney, X. Huang, D. F. Kitrosser, V.V. Paznukhov, Y. Luo, W. Jones, S. Stelmash, R. Hamel, and J. Grochmal, The New Digisonde for Research and Monitoring Applications, *Radio Sci.*, 2009. 44:p RS0A24, doi:10.1029/2008RS004115.
- Reinisch, B. W., I. A. Galkin, G. M. Khmyrov, A. V. Kozlov, I. A. Lisysyan, K. Bibl, G. Cheney, D. Kitrosser, S. Stelmash, K. Roche, Y. Luo, V. V. Paznukhov, and R. Hamel, Advancing digisonde technology: the DPS-4D, in *Radio Sounding and Plasma Physics*, AIP Conf. Proc. 974, 127-143, 2008.
- Reinisch, B. W., V. V. Paznukhov, I. A. Galkin, D. Altadill, and J. McElroy, Precise radar range measurements with digisondes, in *Radio Sounding and Plasma Physics*, AIP Conf. Proc. 974, 144-149, 2008.
- Zong, Q.-G, B. W. Reinisch, P. Song, I. Galkin, and X.J. Liu, Ionospheric Response to the Interplanetary Shock, in *Radio Sounding and Plasma Physics*, AIP Conf. Proc. 974, 52-57, 2008.
- Kouba, D., J. Boka, I. A. Galkin, O. Santolík, and P. Auli (2008), Ionospheric drift measurements: Skymap points selection, *Radio Sci.*, 43(1), RS1S90, doi:10.1029/2007RS003633, 2008.

- Khmyrov, G. M., I. A. Galkin, A. V. Kozlov, B. W. Reinisch, J. McElroy, and C. Dozois, Exploring digisonde ionogram data with SAO-X and DIDBase, in *Radio Sounding and Plasma Physics, AIP Conf. Proc. 974*, 175-185, 2008.
- Carpenter, D. L., T. F. Bell, D. Chen, D. N. C. Baran, B. W. Reinisch, and I. Galkin, Proton cyclotron (PC) echoes and a new resonance observed by the RPI instrument on the IMAGE satellite, *J. Geophys. Res.*, 112(A8), A08208, doi:10.1029/2007JA012139, 2007.
- Song, P., B. W. Reinisch, V. Paznukhov, G. Sales, D. Cooke, J.-N. Tu, X. Huang, K. Bibl, and I. Galkin, High-voltage antenna-plasma interaction in whistler wave transmission: Plasma sheath effects, *J. Geophys. Res.*, 112(A3), A03205, doi:10.1029/2006JA011683, 2007.
- Triskova, L., I. Galkin, V. Truhlik and B.W. Reinisch, Application of seamless vertical profiles for use in the topside electron density modeling, *Adv. Space Res.*, 39, 774-778, 2007.
- Denton, R. E., K. Takahashi, I. A. Galkin, P. A. Nsumei, X. Huang, B. W. Reinisch, R. R. Anderson, M. K. Sleeper, and W. J. Hughes, The distribution of density along magnetospheric field lines, *J. Geophys. Res.*, 11(A4), A04213, 10.1029/2005JA011414, 2006.
- Reinisch, B. W., X. Huang, I. A. Galkin, V. Paznukhov, and A. Kozlov, Recent advances in real-time analysis of ionograms and ionospheric drift measurements with digisondes, *J. Atmos. Solar-Terr. Physics*, 67, 1054-1062, 2005.
- Reinisch, B. W., I. A. Galkin, G. Khmyrov, A. Kozlov, and D. F. Kitrosser, Automated collection and dissemination of ionospheric data from the digisonde network, *Adv. Radio Sci.*, 2, 241-247, 2004.
- Fung, S. F., R. F. Benson, D. L. Carpenter, J. L. Green, V. Jayanti, I. A. Galkin, and B. W. Reinisch, Guided echoes in the magnetosphere: Observations by Radio Plasma Imager on IMAGE, *Geophys. Res. Lett.*, 30(11), 1589, 2003.
- Carpenter, D. L., M. Spasojevic, T. F. Bell, U. S. Inan, B. W. Reinisch, I. A. Galkin, R. F. Benson, J. L. Green, S. F. Fung, S. A. Boardsen, Small-scale field-aligned plasmaspheric density structures inferred from RPI on IMAGE, 107(A9), 1258, *J. Geophys. Res.*, 2002.
- Fung, S. F., Benson, R.F., Green, J.L., Reinisch, B.W., Haines, D.M., Galkin, I. A., Bougeret, J.-L., Manning, R., Reiff, P.H., Carpenter, D.L., Gallagher, D.L., and Taylor, W.W.L., Observations of Magnetospheric Plasmas by the Radio Plasma Imager (RPI) on the IMAGE Mission, *Adv. Space Res.*, 30 (10), 2259-2266, 2002
- Reinisch, B.W., Huang, X., Haines, D.M., Galkin, I.A., Green, J.L., Benson, R.F., Fung, S.F., Taylor, W.W.L., Reiff, P.H., Gallagher, D.L., Bougeret, J.-L., Manning, R., Carpenter, D.L., and Boardsen, S.A., First Results from the Radio Plasma Imager on IMAGE, *Geophys. Res. Letts.*, 28, 1167-1170, Geophys. Res. Ltrs. 2001.
- Reinisch, B.W., Haines, D.M., Galkin, I.A., Huang, X., Sales, G., Green, J.L., Benson, R.F., Fung, S.F., Taylor, W.L.L., Bougeret, J.L., Manning, R., Reiff, P., Carpenter, D.L., Gallagher, D.L., First Magnetospheric echo traces from the Radio Plasma Imager on IMAGE, *Kinnematics and Physics of Celestial Bodies*, No. 3, 8-12, 2000.
- Reinisch, B.W., Haines, D.M., Bibl, K., Cheney, G., Galkin, I.A., Huang, X., Myers, S.H., Sales, G.S., Benson, R.F., Fung, S.F., Green, J.L., Boardsen, S., Taylor, W.W.L., Bougeret, J.-L., Manning, R., Meyer-Vernet, N., Moncuquet, M., Carpenter, D.L., Gallagher, D.L., and Reiff, P., The Radio Plasma Imager investigation on the IMAGE spacecraft, *Space Science Reviews*, 91, 319-359, 2000.
- Green, J.L., Benson, R.F., Fung, S.F., Taylor, W.W.L., Boardsen, S.A., Reinisch, B.W., Haines, D.M., Bibl, K., Cheney, G., Galkin, I.A., Huang, X., Myers, S.H., Sales, G.S., Bougeret, J.-L., Manning, R., Meyer-Vernet, N., Moncuquet, M., Carpenter, D.L., Gallagher, D.L., and Reiff, P.H., Radio Plasma Imager Simulations and Measurements, *Space Science Reviews*, 91, 361-389, 2000.

Reinisch, B.W., Haines, D.M., Bibl, K., Galkin, I., Huang, X., Kitrosser, D.F., Sales, G.S., and Scali, J.L., Ionospheric sounding support of OTH radar, *Radio Sci.*, 32, 4, pp. 1681-1694, 1997.

### **C3. Conference Presentations and Seminars**

#### **C3a. Conference Presentations with Extended Proceedings**

- Galkin, I. A., B. W. Reinisch, X. Huang, G. M. Khmyrov, and V.P. Paznukhov, Uncertainty and confidence of ionospheric specification with the Digisonde ARTIST ionogram autoscaler, *Proc. 2008 International Ionospheric Effects Symposium*, 450-457, 2008.
- Galkin, I.A., A Tribute to the ARTIST, Prof. Bodo Reinisch 70<sup>th</sup> Birthday Honorary Symposium, 2007.
- Galkin, I. A., G. M. Khmyrov, A. Kozlov, B. W. Reinisch, J. C. Tilton, S. F. Fung, and A. Plaza, A pre-attentive vision model for data prospecting, *CITSA Proc., vol. I*, pp. 24-29, 2005.
- Galkin, I. A., G. M. Khmyrov, A. Kozlov, B. W. Reinisch, X. Huang, and D. F. Kitrosser, Digisonde networking, databasing, and webserving, in *Proc. 2005 International Ionospheric Effects Symposium*, pp. 757-763, 2005.
- Galkin, I. A., G. M. Khmyrov, B. W. Reinisch, J. C. Tilton, and S. F. Fung, Processing radio plasma imager plasmagrams utilizing hierarchical segmentation, *Proc. NASA Earth Science Technology Conference (ESTC)*, pp. B8P3: 1-7, 2004.
- Galkin, I. A., G. M. Khmyrov, A. Kozlov, B.W. Reinisch, X. Huang, and G. Sales, New tools for analysis of space-borne sounding data, *Proc. 2001 USNC/URSI Nat. Radio Sci. Meeting*, Boston, MA, pp. 304, 2001.
- Galkin, I.A., On the problem of automatic scaling of vertical incidence and backscatter ionograms, *Proc. ISAP-92*, Sapporo, 1197-1200, 1992.

#### **C3b. Oral Presentations with Published Abstract**

- Galkin, I. A., B.W. Reinisch, G.M. Khmyrov, A.P. Kozlov, and S. Fung. Intelligent Image Prospecting for IMAGE RPI Mission, World Automation Congress, 2006.
- Galkin, I. A., X. Huang, B.W. Reinisch, and R.F. Benson, Adaptive Techniques for and Intelligent Onboard Magnetospheric/Ionospheric Radar, AGU Fall Meeting, 2006.
- Galkin, I. A., B.W. Reinisch, G.M. Khmyrov, A.P. Kozlov, J. Grinstein, and S.F. Fung. Data Prospecting with CORPRAL: Pre-attentive Vision Model at Work, AGU Fall Meeting, 2005.
- Galkin, I. A., D. Kitrosser, B.W. Reinisch, and D.Haines, The Global Digisonde Network, PIERS-99, 1999.
- Galkin, I. A., D. Kitrosser, B.W. Reinisch, and T.Bullett, Internet Access to Real Time Ionosonde Data and N(h) Profiles, XXVI General Assembly of URSI, 1999.
- Galkin, I. A., Z. Kecic, and B.W. Reinisch, Internet Access to Ionosondes, VIII IAGA Scientific Assembly, 1997.
- Galkin, I. A. and B.W. Reinisch, Neural Networks for Recognition of Ionogram Traces, XXI UIGG General Assembly, 1995
- Galkin, I. A. Neural Networks for Recognition of Ionogram Traces, National Radio Science Meeting, Student Paper Competition, 2<sup>nd</sup> place, 1994.

#### **C3c. Selected Other Oral Presentations**

- Galkin, I.A., B.W. Reinisch, and X. Huang, Confidence and Uncertainty of GIRO Data for Assimilation in the Real-Time IRI, IRI Workshop, 2009

- Galkin, I.A., TNT Capabilities and Data Products, DSX Science Team Meeting, 2009.
- Galkin, I.A., TNT Flight and Test Software, WIPER Critical Design Review, 2007.
- Galkin, I. A., B.W. Reinisch, G.M. Khmyrov, and A.P. Kozlov, CORPRAL to hit 1 million plasmagram mark, NASA IMAGE Science Meeting, 2004
- Galkin, I. A., B.W. Reinisch, G.M. Khmyrov, and A.P. Kozlov, An Automated Image Processing System for RPI Data, NASA IMAGE Science Meeting, 2003.
- Galkin, I. A., B.W. Reinisch, and G.M. Khmyrov, RPI Data Analysis Using the BinBrowser Tool, School on Analysis Techniques for Space Plasma Data, 2001

#### ***C4. Current Research Interests***

My primary research interest is to build intelligent systems that replicate human abilities to interpret visual data. Associated with this research is development of techniques for scientific data visualization that benefit knowledge discovery. Design of interactive systems for data analysis and mission planning is one of important applications of my data visualization research. I have been active in the associated field of the data models for NASA virtual observatories, concentrating on the standards for capturing and querying expert annotations of the wave datasets. I also seek new applications of the intelligent system components such as artificial neural networks to other projects of the Center of Atmospheric Research, in particular, design of assimilative techniques for the models of ionospheric plasma distribution.

#### ***D. INSTRUCTIONAL ACTIVITIES***

##### ***D1. Teaching/Seminars***

I have been teaching digisonde operations and maintenance at the annual/bi-annual International Digisonde Training Seminars since 1995. The series is organized by the UML Center of Atmospheric Research for international scientists and engineers conducting experiments with the Digisonde ionospheric sounder. I have similar teaching responsibilities during 2-week instructional courses that are organized for the science and engineering teams from organizations acquiring new digisonde systems.

##### ***D2. Student Instruction***

At the Center for Atmospheric Research, I was responsible for project supervision of graduate UML students Sudha Shunmugam (2007), Patricia Briea (2006), and undergraduate UML students Jordan Grinstein (2005), Jonathan McElroy (2007), Ebrahim Nasser (2010), and Dan Khmyrov (2010). Supervision resulted in multiple student presentations at seminars/conferences, one paper publication, and deployment of an Engineering Notice RSS document management system at the Center.

### ***E. REVIEWING SERVICES***

I have served as a reviewer for following Scientific Journals:

Acta Geophysica  
Advances in Space Physics  
Annales Geophysica  
Computers and Geosciences  
Earth Science Informatics  
International Journal of Geomagnetism and Aeronomy  
Journal of Atmospheric and Solar-Terrestrial Physics  
Radio Science