Jets downstream of collisionless shocks

Proposal to the International Space Science Institute
2015 Call for International Teams in Space Science
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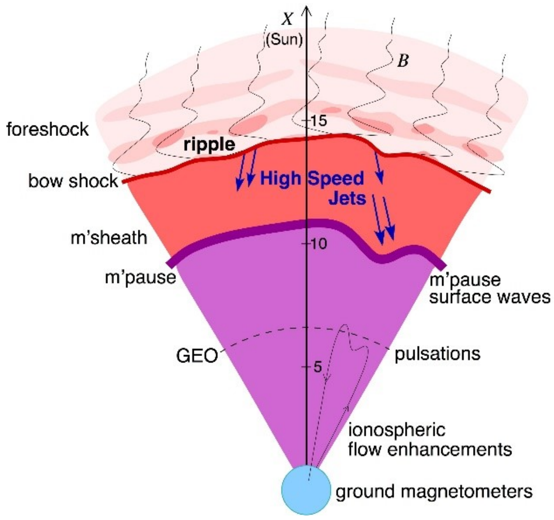

Figure 1: Sketch illustrating magnetosheath jets, upstream foreshock and bow shock, and downstream regions of jet impact.

Summary

Magnetospheric processes are highly dependent on the solar wind input to the magnetosphere. More precisely, it is the magnetosheath plasma that is in direct contact with the outer magnetospheric boundary, the magnetopause. One of the geo-effective magnetosheath phenomena are localized transient enhancements in density and/or dynamic pressure (called, e.g., jets or plasmoids) that cannot be explained by direct solar wind driving. These jets shall be the subject of the proposed team effort. Their occurrence should not be restricted to the Earth's magnetosheath. Instead, the phenomenon should be universal, downstream of collisionless shocks.

Recent statistical studies have shown that many of these transients occur downstream of the quasi-parallel bow shock, linking them to processes in the foreshock or at the shock itself. However, statistical findings also imply that different types of jets/plasmoids exist, which feature a range of characteristics and may be associated to a number of different source mechanisms proposed in many case studies. Yet these studies were based on differing definitions of transients, have used varying terminology, methodology, data sets/simulations, and yielded, not unexpectedly, differing results on origin and characteristics of jets. In any case, the jets/plasmoids appear to be plasma entities that flow through an ambient plasma of different characteristics. They share this fundamental property with magnetotail bursty bulk flows, to which they have not been compared to date.

So far, different groups studying jets/plasmoids (including source regions/mechanisms and jet impacts) have been largely disconnected from each other. Consequently, the findings in this field currently resemble pieces of a puzzle rather than a full picture. Our aim is to bring existing and new pieces together in order to construct that picture. We will do so: by compiling a comprehensive review article; by initiating teamwork between researchers familiar with data analysis and simulations, to reconcile findings from both approaches; and by launching inter-disciplinary collaborations to significantly advance our understanding of the nature of jets/plasmoids and bursty bulk flows. In order to achieve these objectives, we bring together a strong team, composed by top tier researchers from 7 different countries. Our team's combined expertise covers all areas relevant to the proposed research. The team is, hence, in a unique position to overcome present shortcomings of individual approaches to the jet/plasmoid phenomenon.

Scientific rationale, goals, and timeliness of the project

The Earth's magnetosphere constitutes a highly coupled and dynamic system. The evolution of that system is strongly dependent on the upstream solar wind conditions, which magnetospheric processes are often related to. However, it is not the pristine solar wind that is in direct contact with the outer boundary of the magnetosphere, the magnetopause. Instead, the solar wind plasma is decelerated at the bow shock upstream of the magnetopause from super-magnetosonic to sub-magnetosonic speeds, and it flows around the magnetosphere within the magnetosheath region (e.g., Spreiter et al., 1966). That shocked, inhomogeneous magnetosheath plasma and the magnetic field embedded in it constitute the true inputs to the magnetospheric system. These inputs are highly dependent on the wealth of phenomena inherent to the foreshock, bow shock, and magnetosheath regions.

One class of such phenomena are (localized) transient enhancements in the density and/or dynamic pressure downstream of the shock that cannot be explained by direct solar wind driving (see Figure 1). Originally, these were given the name "transient flux enhancements" by Nemecek et al. (1998), but they are also often called "magnetosheath high-speed jets" (e.g., Hietala et al., 2009; Plaschke et al., 2013), "fast plasmoids" (e.g., Karlsson et al., 2012; Gunell et al., 2014), "super-magnetosonic streams" (Savin et al., 2012), or "high dynamic pressure/kinetic energy pulses" (e.g., Amata et al., 2011; Archer et al., 2012).

These jets/plasmoids shall be the subject of our proposed team effort. In the following paragraphs we will outline: why these jets are relevant; what we know about them; what the shortcomings of previous investigations were; and how ISSI can be most valuable in helping us overcome those and construct a comprehensive picture of jets/plasmoids downstream of collisionless shocks.

Relevance of jets

When jets/plasmoids impact the magnetopause, they may cause localized, large amplitude boundary indentations (e.g., Shue et al., 2009; Amata et al., 2011; Dmitriev and Suvorova, 2012). These may result in magnetopause surface waves and/or low-frequency, compressional waves within the dayside magnetosphere (Plaschke et al., 2009; Plaschke and Glassmeier, 2011; Archer et al., 2013), which can excite field-line resonances (Samson et al., 1971; Chen and Hasegawa, 1974; Southwood, 1974), modify drift paths of radiation belt electrons (e.g., Elkington, 2003), and even lead to rapid loss of these electrons via magnetopause shadowing (Loto'aniu et al., 2010; Turner et al., 2012). The impact of jets on the magnetopause may also trigger local reconnection and flux transfer events (Karimabadi et al., 2014), in agreement with enhanced high latitude convection reported by Hietala et al. (2012). Furthermore, the jets/plasmoids may directly end up within the magnetosphere, due to impulsive penetration (e.g., Karlsson et al., 2012).

Jets/plasmoids are conceptually interesting as they provide long-range correlations from foreshock and shock processes to downstream phenomena, at the magnetopause and in the magnetosphere (Savin et al., 2012). At Earth, they facilitate (localized) energy, mass, and momentum coupling between regions up- and downstream of the dayside magnetosheath, over considerable distances with respect to the overall size of the magnetosphere. Moreover, these jets should be universal, occurring downstream of collisionless planetary, helio-, and astrophysical shocks. For instance, Saturn's bow shock can have ideal conditions for spontaneous jet formation (Masters et al., 2013), while the interaction of the heliospheric current sheet with the termination shock has been shown to create jets (Opher et al., 2003, 2004). The Earth's magnetosheath, though, remains the only environment in which jets/plasmoids can be studied by in-situ multi-spacecraft observations.

Sources and characteristics

The only two major statistical studies on these jets (Archer and Horbury, 2013; Plaschke et al., 2013) have benefited from multi-spacecraft (THEMIS) magnetosheath observations. Both studies agree that steady radial interplanetary magnetic field conditions are most favorable for jet occurrence. Hence, a larger fraction of jets appears to originate from the quasi-parallel shock or the upstream foreshock region. One possibility for jet formation in agreement therewith is related to bow shock rippling: The quasi-parallel shock is believed to be dynamically formed and reformed by foreshock structures that steepen in front of the nominal shock position (e.g., Schwartz and Burgess, 1991; Lucek et al., 2008; Omidi et al., 2005; Blanco-Cano et al., 2009). Consequently, the shock is not uniform and even, but patchy or rippled. Solar wind plasma entering the magnetosheath through locally inclined shock surfaces (at the ripples) will be less thermalized, i.e., faster than the ambient plasma, constituting the jets seen in the magnetosheath (Hietala et al., 2009, 2012; Hietala and Plaschke, 2013).

Statistical findings, however, also show a range of jet properties, suggesting different generation mechanisms, evolution downstream of the shock, and varying impacts on the magnetopause and magnetosphere. For instance, a sizeable number of jets are observed behind the quasi-perpendicular shock. Similarly, some jets are associated to changes in IMF direction rather than the predominantly steady solar wind conditions jets are typically observed under. Thus, it seems likely that only a combination of different sources can explain the entirety of the observed jets.

Different sources of magnetosheath jets have indeed been proposed and discussed in a number of case studies. For instance, rotational discontinuities in the IMF may interact with the bow shock and/or with solar wind ions that are reflected back upstream from the bow shock (e.g., Omidi and Sibeck, 2007; Turner et al., 2013). As shown by simulations of Lin et al. (1996a, 1996b), such an interaction may produce enhancements in dynamic pressure in the magnetosheath, along the discontinuity plane (see, Archer et al., 2012; Dmitriev and Suvorova, 2012). Discontinuities in the IMF may also trigger hot flow anomalies in the foreshock (e.g., Schwartz et al., 2000; Omidi and Sibeck, 2007). As these may constitute obstacles to the solar wind flow, jets may be created as a response to their occurrence (Savin et al., 2012; Archer et al., 2014). Magnetosheath jets may also result from reconnection at the magnetopause (e.g., Eastwood et al., 2014).

All these case studies show how diverse reasons for transient enhancements in dynamic pressure/density may be. Unfortunately, the studies are hard to compare, as they are based on vastly differing data sets or simulations, and use different methodology and definitions of transients. Hence, not unexpectedly, the resulting interpretations on the origins and nature of jets/plasmoids also vastly differ.

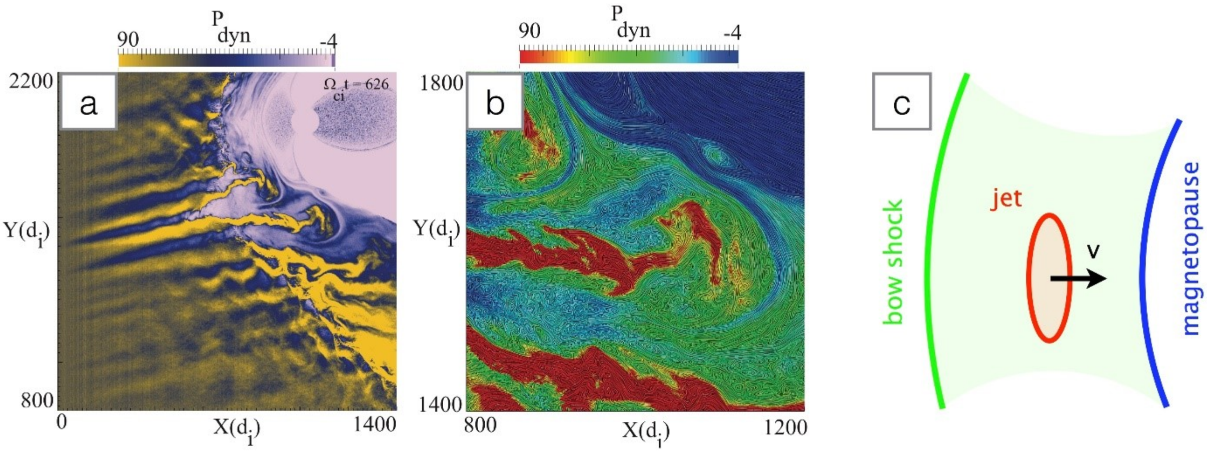

Figure 2, a and b: Jets appearing in global magnetospheric simulations, after Figure 15 in Karimabadi et al. (2014). Panel c: Sketch of a pancake shaped jet propagating toward the magnetopause.

Scale sizes and morphology

Similar challenges appear when studying scale sizes and morphology of jets/plasmoids. Typical estimates of the spatial sizes of the dynamic pressure or density enhancements are on the order of 1 Earth radius (e.g., Savin et al., 2008; Hietala et al., 2012; Archer et al., 2012; Karlsson et al., 2012; Plaschke et al., 2013), whereby the spread reported within studies and also from study to study is quite large (± an order of magnitude). Furthermore, multi-spacecraft analyses of Karlsson et al. (2012) and Gunell et al. (2014) seem to indicate that jets/plasmoids are pancake or cigar shaped plasma entities that traverse the magnetosheath flat side first (see Figure 2c).

This assertion is in stark contrast with simulation results by Karimabadi et al. (2014) that allow for a global view on the generation, and evolution of jets in the magnetosheath (see Figures 2a and b). In their simulations, jets do not penetrate straight through the sheath, but are bent and deflected. Consequently, they should look more like serpentine fast flows, elongated in propagation direction, embedded in the ambient plasma. Simulation results, in general, and this picture, in particular, need to be reconciled with the observations.

Comparison to bursty bulk flows (BBFs)

The jets/plasmoids consistently appear to be plasma entities that flow through an ambient plasma of different characteristics. They share this fundamental property with magnetotail bursty bulk flows (BBFs, Baumjohann, 1993; Angelopoulos et al., 1994), to which they have not been compared to date. Jets and BBFs, both appear to push ambient plasma away on their passage (e.g., Panov et al., 2010). However, while jets are mainly characterized by their dynamic pressure, that quantity is of minor importance for tail BBFs, which are shaped by an interplay of magnetic and thermal pressure forces. In fact, BBFs are defined by a magnetic flux bundle, which accelerates the plasma earthward. Correspondingly, currents flow on the interface between the BBF and the ambient tail plasma (e.g., Liu et al., 2013). It remains to be studied if jets also feature a distinct magnetic field configuration and currents on their boundaries, and how significant magnetic forces (field line draping and plasma beta effects) are in shaping jets. Consequently, comparative studies of jets and BBFs should be quite fruitful in order to unravel the fundamental physics governing plasma jet propagation, evolution, and impacts in different parameter ranges.

Goals and proposed team effort

So far, different groups studying magnetosheath jets/plasmoids, including jet sources and impacts, have been largely disconnected from each other, even more so from groups working on BBFs. Consequently, findings in this field currently resemble pieces of a puzzle rather than a full picture. Our aim is to bring the existing and new pieces together in order to construct that comprehensive picture. Together, we will seek answers to the following science questions:

1) What types of jets/plasmoids exist in terms of characteristics and generation mechanisms?
2) How do they evolve? How do they interact with the ambient (magnetosheath) plasma, and with the magnetopause?
3) What are their similarities with and differences from bursty bulk flows? What can we learn from a comparative approach in terms of jet/plasmoid physics?

We will seek answers to these question in three steps: First, we propose to work on a review of the current knowledge, by compiling, discussing, and finally putting together the puzzle pieces that individual researchers and groups can contribute to the team. Secondly, we propose to start collaborations between groups working on simulations and observation analysis. Thereby, we seek to reconcile findings obtained with these two approaches to obtain a global picture/understanding of jet creation, evolution, and impact. Thirdly, we propose to start building a bridge between the communities that study (magnetosheath) jets/plasmoids and magnetotail BBFs, for the mutual benefit to both communities, to enhance our understanding of the fundamental physics underlying both (distinct, but related) phenomena.

Timeliness

The timeliness of our proposal stems from the recent advances in simulation and observational studies that make possible an efficient and productive multi-disciplinary approach on the phenomenon. The statistical studies by Archer and Horbury (2013) and Plaschke et al. (2013) yield the basis for differentiating various types and source mechanisms of jets. Recent simulations by Karimabadi et al. (2014) have shown for the first time, how jets may look like on a global scale. The simulations provide new testable features that can now be compared to observations.

Furthermore, the set of in-situ magnetosheath observations will soon be complemented by multi-spacecraft measurements from the Magnetospheric Multi-Scale (MMS) mission, launched on March 12, 2015. The four MMS spacecraft will fly in a tetrahedral configuration, studying kinetic scale physics of magnetic reconnection. The first two winters of the primary mission focus on dayside magnetopause reconnection and MMS may observe jets impinging on the magnetopause. Thus it will be crucial to understand magnetosheath transients as a boundary condition. This period may also give us the first opportunity to contrast kinetic scale (e.g., PIC and Vlasov-hybrid) simulations of jets with state-of-the-art MMS measurements. The first dayside season during which the spacecraft actually traverse the magnetosheath (after reaching high apogees in 2017) is going to start after the project is completed. Hence, our results can be used to conceive optimal data retrieval strategies for this later science season.

Expected output and impacts

Based on our discussions at ISSI, we expect to compile our views and current understanding of the generation mechanisms, evolution, and impact of magnetosheath jets/plasmoids into one comprehensive review paper. This paper will be written over the course of the project, and should be submitted to a major peer-reviewed journal during the last team meeting or shortly after. We envision all team members and young scientists of our team to be coauthors of this paper.

Secondly, we expect a number of papers to result from collaborations among individual team members. In particular, we expect major progress from simulations of magnetosheath jets, comparisons of different simulation methods to determine what key physics are involved, comparisons between simulations and observations and between jet and BBF physics. The team will also provide a venue to compare and benchmark, for the first time, state-of-the-art global kinetic simulations of the dayside magnetosphere.

Thirdly, we expect the understanding of the phenomenon of magnetosheath jets/plasmoids to be significantly advanced. In particular, we anticipate major progress in understanding how these structures, localized in time and/or space, contribute to mass, momentum, and energy transport from the foreshock, bow shock, and magnetosheath, to the magnetopause and into the inner magnetosphere. Correspondingly, our findings will directly contribute to the magnetospheric research community, studying magnetopause reconnection, ultra-low frequency waves (such as field-line resonances), drift paths of radiation belt electrons and/or radiation belt losses due to magnetopause shadowing.

Lastly, we expect to contribute to the data-analysis of the MMS mission and positively influence the planning of data retrieval strategies for its later dayside season. Therewith, we seek to lay the ground for the acquisition of kinetic scale multi-spacecraft measurements of jets for future studies.

Added value from ISSI

As stated above, individual researchers and groups have largely been working separately from each other, so far. The main purpose of our proposed project is to overcome this situation, in order to come up with a comprehensive picture of transients (jets/plasmoids) in the solar wind-magnetosphere interaction region. This purpose is optimally served by face-to-face meetings at ISSI of top tier researchers who work on observations, simulations, and theory, from both the jet and BBF communities. ISSI is able to provide us with a unique meeting place that allows us to focus entirely on: putting the comprehensive picture on sheath jets/plasmoids together; conducting comparative multi-disciplinary research; building new collaborations among team members and beyond.

Confirmed team members

In order to achieve our objectives, we bring together a strong, multi-disciplinary team comprised by the following 10 members and 1 confirmed young scientist from 7 countries:

Ferdinand Plaschke (team leader),	Space Research Institute,	**Austria**
Heli Hietala (co-leader),	Imperial College,	**UK**
Xochitl Blanco-Cano,	Universidad Nacional Autónoma de México,	**Mexico**
Primoz Kajdic,	Universidad Nacional Autónoma de México,	**Mexico**
Tomas Karlsson,	KTH Royal Institute of Technology,	**Sweden**
Nick Omidi,	Solana Scientific Inc.,	**USA**
Minna Palmroth,	Finnish Meteorological Institute,	**Finland**
Vadim Roytershteyn,	Space Science Institute,	**USA**
Viktor Sergeev,	St. Petersburg State University,	**Russia**
David Sibeck,	NASA Goddard Space Flight Center,	**USA**
Martin Archer (young scientist),	Imperial College,	**UK**

Our combined expertise covers all the relevant areas: theory and multi-spacecraft observations of solar wind, foreshock, bow shock, magnetosheath, magnetopause, and magnetosphere/magnetotail processes and interactions; multi-spacecraft analysis techniques; jet and BBF statistics; MHD, particle-in-cell (PIC), PIC-hybrid, and Vlasov-hybrid simulations, as well as their interpretation and comparison to observations. The pre-existing collaborations among some team members indicate that the working atmosphere will be productive and efficient in general, as well as during the face-to-face meetings at ISSI in particular. Our team is, hence, in a unique position to address the key scientific questions by following the three step approach detailed above.

Schedule of the project

We propose to meet three times at the ISSI facilities in Bern. The meetings would take place in fall 2015 (one week), spring 2016 (three days), and lastly, in fall 2016 (three days). The goals for the meetings are the following:

- 2015 fall meeting (one week):
  - Inspection of older and recent simulations and observations, definition of the structure of the review paper, determination of the leading authors and contributing collaborators for the various paper sections/topics.
  - Initiation of inter-disciplinary collaborations between team members to work on specific topics: e.g., identification of features in simulations to contrast with observations, development of new simulation set-ups and analysis tools to address specific questions originating from observational studies, contrasting of theory/observations of jets and BBFs.
- 2016 spring meeting (three days):
  - Discussion of progress on inter-disciplinary efforts, rough drafting of corresponding papers.
  - Assessment of the review paper status, update of its content in light of discussions and new results.
- 2016 fall meeting (three days):
  - Presentation and discussion of work on multi-disciplinary topics.
  - Final input to research papers. Final touch-up and submission of review paper.
  - Discussion of future collaborations and input to MMS dayside season data acquisition planning.

Between meetings, we will hold regular teleconferences to monitor and discuss the work progress.

Facilities required

We will require access to a wireless network and the internet. We expect most participants to bring a laptop. For students and unexpected needs we would like to have access to one computer/laptop. We will also need access to a printer and a meeting room for about 15 people. The room should be equipped with projection facilities and a white board. ISSI staff will be welcome to participate in our meetings. We may also use teleconferencing/skype, in case team members may not be able to attend one meeting.

Financial support requested

For our proposal, we just require the standard financial support package for international teams, which shall cover the travel costs of the team leader (approx. 250 €), plus hotel costs and per diem for all team members for the three meetings (lasting 1x one week and 2x three days). The hotel and per diem costs for the young scientists (Martin Archer and further young scientists to be identified once the proposal is selected) shall not exceed 20% of the financial means allotted to the team members.

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Opher, M., Liewer, P.C., Gombosi, T.I., Manchester, W., DeZeeuw, D.L., Sokolov, I., Toth, G., 2003. Probing the Edge of the Solar System: Formation of an Unstable Jet-Sheet. Astrophys. J. 591, L61–L65. doi:10.1086/376960

Opher, M., Liewer, P.C., Velli, M., Bettarini, L., Gombosi, T.I., Manchester, W., DeZeeuw, D.L., Toth, G., Sokolov, I., 2004. Magnetic Effects at the Edge of the Solar System: MHD Instabilities, the de Laval Nozzle Effect, and an Extended Jet. Astrophys. J. 611, 575–586. doi:10.1086/422165

Panov, E.V., Nakamura, R., Baumjohann, W., Angelopoulos, V., Petrukovich, A.A., Retinò, A., Volwerk, M., Takada, T., Glassmeier, K.-H., McFadden, J.P., Larson, D., 2010. Multiple overshoot and rebound of a bursty bulk flow. Geophys. Res. Lett. 37, n/a–n/a. doi:10.1029/2009GL041971

Plaschke, F., Glassmeier, K.-H., 2011. Properties of standing Kruskal-Schwarzschild-modes at the magnetopause. Ann. Geophys. 29, 1793–1807. doi:10.5194/angeo-29-1793-2011

Plaschke, F., Glassmeier, K.-H., Auster, H.U., Constantinescu, O.D., Magnes, W., Angelopoulos, V., Sibeck, D.G., McFadden, J.P., 2009. Standing Alfvén waves at the magnetopause. Geophys. Res. Lett. 36, n/a–n/a. doi:10.1029/2008GL036411

Plaschke, F., Hietala, H., Angelopoulos, V., 2013. Anti-sunward high-speed jets in the subsolar magnetosheath. Ann. Geophys. 31, 1877–1889. doi:10.5194/angeo-31-1877-2013

Samson, J.C., Jacobs, J.A., Rostoker, G., 1971. Latitude-dependent characteristics of long-period geomagnetic micropulsations. J. Geophys. Res. 76, 3675–3683. doi:10.1029/JA076i016p03675

Savin, S., Amata, E., Zelenyi, L., Budaev, V., Consolini, G., Treumann, R., Lucek, E., Safrankova, J., Nemecek, Z., Khotyaintsev, Y., Andre, M., Buechner, J., Alleyne, H., Song, P., Blecki, J., Rauch, J.L., Romanov, S., Klimov, S., Skalsky, A., 2008. High energy jets in the Earth's magnetosheath: Implications for plasma dynamics and anomalous transport. JETP Lett. 87, 593–599. doi:10.1134/S0021364008110015

Savin, S., Amata, E., Zelenyi, L., Lutsenko, V., Safrankova, J., Nemecek, Z., Borodkova, N., Buechner, J., Daly, P.W., Kronberg, E.A., Blecki, J., Budaev, V., Kozak, L., Skalsky, A., Lezhen, L., 2012. Super fast plasma streams as drivers of transient and anomalous magnetospheric dynamics. Ann. Geophys. 30, 1–7. doi:10.5194/angeo-30-1-2012

Schwartz, S.J., Burgess, D., 1991. Quasi-parallel shocks: A patchwork of three-dimensional structures. Geophys. Res. Lett. 18, 373–376. doi:10.1029/91GL00138

Schwartz, S.J., Paschmann, G., Sckopke, N., Bauer, T.M., Dunlop, M., Fazakerley, A.N., Thomsen, M.F., 2000. Conditions for the formation of hot flow anomalies at Earth's bow shock. J. Geophys. Res. 105, 12639. doi:10.1029/1999JA000320

Shue, J.-H., Chao, J.-K., Song, P., McFadden, J.P., Suvorova, A., Angelopoulos, V., Glassmeier, K.H., Plaschke, F., 2009. Anomalous magnetosheath flows and distorted subsolar magnetopause for radial interplanetary magnetic fields. Geophys. Res. Lett. 36. doi:10.1029/2009GL039842

Southwood, D.J., 1974. Some features of field line resonances in the magnetosphere. Planet. Space Sci. 22, 483–491. doi:10.1016/0032-0633(74)90078-6

Spreiter, J.R., Summers, A.L., Alksne, A.Y., 1966. Hydromagnetic flow around the magnetosphere. Planet. Space Sci. 14, 223. doi:10.1016/0032-0633(66)90124-3

Turner, D.L., Omidi, N., Sibeck, D.G., Angelopoulos, V., 2013. First observations of foreshock bubbles upstream of Earth's bow shock: Characteristics and comparisons to HFAs. J. Geophys. Res. Space Phys. 118, 1552–1570. doi:10.1002/jgra.50198

Turner, D.L., Shprits, Y., Hartinger, M., Angelopoulos, V., 2012. Explaining sudden losses of outer radiation belt electrons during geomagnetic storms. Nat. Phys. 8, 208–212. doi:10.1038/nphys2185

Ferdinand Plaschke

Professional preparation

2007 Diploma, Physics, Technische Universität (TU) Braunschweig, Germany
2011 Doctorate, Natural Sciences, TU Braunschweig, Germany

Appointments

2007 – 2011 Researcher and doctoral student, TU Braunschweig, Germany
2007 – 2011 Member IMPRS, Max-Planck-Institute for Solar System Research, Germany
2011 – 2012 Assistant Researcher, University of California Los Angeles, USA
2013 – Junior Scientist, Space Research Inst., Austrian Academy of Sci., Austria
2013 – External Lecturer, Univ. of Applied Sciences Wiener Neustadt, Austria
2013 – External Lecturer, TU Graz, Austria

Mission involvements, honors and awards

JUICE MAG team science Co-investigator
THEMIS flux-gate magnetometer (FGM) in-flight calibration and data processing activities, FGM team, 2008-
MMS magnetometer and electron drift instrument cross-calibration activities, digital flux-gate (DFG) magnetometer team, 2013-
Walter-Kertz-Studienpreis, TU Braunschweig, 2011
Heinrich-Büssing-Award, TU Braunschweig, 2012

Participation in ISSI activities

2008: team on multi-scale electrodynamics of magnetosphere-ionosphere interactions at high latitudes, lead by A. V. Streltsov

Relevant publications (from a total of 27 publications)

Plaschke, F., Taylor, M. G. G. T., and Nakamura, R., Alternative interpretation of results from Kelvin-Helmholtz vortex identification criteria, Geophys. Res. Lett., 41, 244-250, doi:10.1002/2013GL058948, 2014.
Hietala, H., and Plaschke, F., On the generation of magnetosheath high-speed jets by bow shock ripples, J. Geophys. Res., 118, 7237-7245, doi:10.1002/2013JA019172, 2013.
Plaschke, F., Hietala, H., and Angelopoulos, V., Anti-sunward high-speed jets in the subsolar magnetosheath, Ann. Geophys., 31, 1877-1889, doi:10.5194/angeo-31-1877-2013, 2013.
Plaschke, F., Angelopoulos, V., and Glassmeier, K.-H., Magnetopause surface waves: THEMIS observations compared to MHD theory, J. Geophys. Res., 118, 1483–1499, doi:10.1002/jgra.50147, 2013.
Plaschke, F., and Glassmeier, K.-H., Properties of standing Kruskal-Schwarzschild-modes at the magnetopause, Ann. Geophys., 29, 1793-1807, doi:10.5194/angeo-29-1793-2011, 2011.
Plaschke, F., Glassmeier, K.-H., Auster, H. U., Constantinescu, O. D., Magnes, W., Angelopoulos, V., Sibeck, D. G., and McFadden, J. P., Standing Alfvén waves at the magnetopause, Geophys. Res. Lett., 36, L02104, doi:10.1029/2008GL036411, 2009.

Heli Hietala

Professional preparation

2007 MSc, Theoretical Physics, University of Helsinki, Finland
2012 PhD, Theoretical Physics, University of Helsinki, Finland

Appointments

2007 – 2012 Researcher (doctoral student), University of Helsinki, Finland
2012 – Research Associate, Imperial College London, UK

Mission and Committee Involvements, Honors and Awards

Vlasiator, kinetic global simulation, Co-investigator
Outstanding Student Paper Award, Space Physics and Aeronomy Section, AGU 2011
Outstanding Student Poster Award, Solar-Terrestrial Sciences Division, EGU 2011

Participation in ISSI activities

2013: ISSI Workshop on *Multi-Scale Structure Formation and Dynamics in Cosmic Plasmas*
2013-2015: team on *Ion and Electron Bulk Heating by Magnetic Reconnection*, funded by ISSI, lead by Tai Phan

Relevant publications (from a total of 16 publications)

1. **H. Hietala**, J. F. Drake, T. D. Phan, J. P. Eastwood, and J. P. McFadden, *Ion temperature anisotropy across a magnetotail reconnection jet*, Geophys. Res. Lett., (2015) submitted.
2. Eastwood JP, Goldman MV, **Hietala H**, Newman DL, Mistry R, Lapenta G, *Ion reflection and acceleration near magnetotail dipolarization fronts associated with magnetic reconnection*, J. Geophys. Res., (2015) in press.
3. J. P. Eastwood, **H. Hietala**, G. Toth, T. D. Phan and M. Fujimoto, *What controls the structure and dynamics of Earth's magnetosphere?*, Space Sci. Rev., (2014) in press.
4. **H. Hietala**, J. P. Eastwood and A. Isavnin, *Sequentially released tilted flux ropes in the Earth's magnetotail*, Plasma Phys. Control. Fusion, 56 (2014) 064011.
5. **H. Hietala** and F. Plaschke, *On the generation of magnetosheath high speed jets by bow shock ripples*, J. Geophys. Res., 118 (2013) 7237-7245.
6. F. Plaschke, **H. Hietala** and V. Angelopoulos, *Anti-sunward high-speed jets in the subsolar magnetosheath*, Ann. Geophys., 31 (2013) 1877-1889.
7. **H. Hietala**, A. Sandroos, and R. Vainio, *Particle Acceleration in Shock-Shock Interaction: Model to Data Comparison*, Ap. J. Lett., 751 (2012) L14.
8. **H. Hietala**, N. Partamies, T. V. Laitinen, L. B. N. Clausen, G. Facskó, A. Vaivads, H. E. J. Koskinen, I. Dandouras, H. Rème, and E. A. Lucek, *Supermagnetosonic subsolar magnetosheath jets and their effects: from the solar wind to the ionospheric convection*, Ann. Geophys., 30 (2012) 33-48.
9. **H. Hietala**, N. Agueda, K. Andréeová, R. Vainio, S. Nylund, E. K. J. Kilpua and H. E. J. Koskinen, *In situ observations of particle acceleration in shock-shock interaction*, J. Geophys. Res., 116 (2011) A10105.
10. **H. Hietala**, T. V. Laitinen, K. Andréeová, R. Vainio, A. Vaivads, M. Palmroth, T. I. Pulkkinen, H. E. J. Koskinen, E. A. Lucek and H. Rème, *Supermagnetosonic Jets behind a Collisionless Quasiparallel Shock*, Phys. Rev. Lett., 103 (2009) 245001.

Xochitl Guillermina Blanco-Cano

PERSONAL DATA

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CHRONOLOGY OF EDUCATION:

-Bachelor of Science (Physics), Science School, UNAM, México, 1985 - 1990.
-PhD in Astrophysics, Queen Mary and Westfield College, University of London, UK, 1991-1995, Thesis: "Waves and particles upstream of the Earth's Bow Shock"

CHRONOLOGY OF EMPLOYMENT:

- April 1996-August 2001, Space Physics Associate Researcher, Instituto de Geofísica, UNAM, México City, México.
-August 2001-January 2005, Space Physics Researcher, Level A, Departamento de Física Espacial, Instituto de Geofísica, UNAM, México City, México.
-February 2005- February 2010., Space Physics Researcher, Level B, Departamento de Física Espacial, Instituto de Geofísica, UNAM, México City, México.
-March 2010-to present time, Full Professor (Investigador Titular C de tiempo completo), Departamento de Ciencias Espaciales, Instituto de Geofísica, UNAM, México City, México.

APPOINTMENTS

CLUSTER (ESA) Mission Guest Investigator, "Upstream transients and their influence on the bow shock and magnetosheath", 2015-2016.

HONORS AND AWARDS:

- Juana de Asbaje Award, UNAM, México, 2005.

PARTICIPATIONS IN ISSI ACTIVITIES

2012, Europlanet Workshop, GIANT PLANET MAGNETODISCS AND AURORAE. Several review papers were written. I participated in Achilleos, N., André N., **Blanco-Cano, X**., et al., 1. Transport of Mass, Momentum and Energy in Planetary Magnetodisc Regions, Space Science Rev., Online First, DOI: 10.1007/s11214-014-0086-y, 10/2014.

Relevant publications

-Blanco-Cano, X., N. Omidi and C. T. Russell, How to make a Magnetosphere,*Astronomy and Geophysics*, Royal Astronomical Society, Junio 2004, Vol. 45 (3), 15-17, 2004.
-Blanco-Cano, X., N. Omidi and C.T., Russell, ULF waves and their influence on bow shock and magnetosheath structures, *Adv. Space Res*., 37 (8), p. 1522-1531, 2006.
-Blanco-Cano, X., N. Omidi and C. T. Russell, Macrostructure of collisionless bow shocks: 2. ULF waves in the foreshock and magnetosheath, *J. Geophys. Res*., 111, Issue A10, DOI 10.1029/2005JA01142, 2006.
-Blanco-Cano, X.; Omidi, N.; Russell, C. T., Global hybrid simulations: Foreshock waves and cavitons under radial interplanetary magnetic field geometry, *J. Geophys. Res*., 114, 10.1029/2008JA013406, 2009.
-Blanco-Cano X., Kajdič P., Omidi N., Russell C. T., Foreshock cavitons for different interplanetary magnetic field geometries: simulations and observations, Journal of Geophysical Research, 116 (A9), DOI 10.1029/2010JA016413, 2011.
-Rojas-Castillo D., X. Blanco-Cano,P. Kajdic, N. Omidi, Foreshock compressional boundaries observed by Cluster, J. Geophys. Res., Vol. 118, Issue 2, pp. 698-715, 2013.

Primož Kajdič

Education

2002 - Diploma, Faculty of mathematics and physics, University in Ljubljana, Slovenia
2005 - Master, Faculty of Sciences, Institute for Astronomy, Universidad Nacional Autónoma de México, México
2008 - PhD, Faculty of Sciences, Institute for Astronomy, Universidad Nacional Autónoma de México, México

Postdocs and fellowships

- Fellowship position at European Space Research and Technology Centre (ESTEC), European Space Agency, Noordwijk, Holland, December 2013 – December 2015.
- Postdoctoral position at Institut de Recherche en Astrophysique et Planétologie (IRAP) from May 2012 to August 2013 with the STEREO SWEA team.
- Postdoctoral scholarship funded by the research proyect of Conacyt at the Instituto de Geofísica, UNAM, from March 2011 to April 2012.
- Postdoctoral scholarship awarded by the DGAPA in the Insituto de Geofísica, UNAM, during the period March 2009 – February 2011.
- Postdoctoral scholarship awarded by the Conacyt during the period from March 2008 to February 2009 at the Posgrado de Ciencias de la Tierra at the Instituto de Geofísica, UNAM.

Current affiliation

Tenure track, Instituto de Geofísica, Universidad Nacional Autónoma de México, México

Relevant publications (from a total of 21)

1. Kajdič, P., Blanco-Cano, X., Omidi, N., Meziane, K., Russell, C. T., Sauvaud, J.-A., Dandouras, I. y Lavraud B, 2013, 'Statistical analysis of foreshock cavitons', Ann. Geophys., 31, 2163-2178, doi:10.5194/angeo-31-2163-2013, 2013
2. Rojas-Castillo, D., Blanco-Cano, X., Kajdič, P., Omidi, N., 2013, 'Foreshock compressional boundaries observed by Cluster', Jour. Gephys. Res., 118, 698-715, doi: 10.1029/2011JA017385
3. Omidi, N., Blanco-Cano, X., Rojas-Castillo, D., Turner, D., Zhang, H., Kajdič, P., 2013, 'Dynamics of the Foreshock Compressional Boundary and its Connection to Foreshock Cavities', Jour. Gephys. Res., 118, 823-831, doi:10.1002/jgra.50146
4. Blanco-Cano, X., Kajdič, P., Omidi, N., Russell, C. T., 2011, 'Foreshock cavitons for different interplanetary magnetic field geometries: Simulations and observations', J. Geophys. Res., doi:10.1029/2010JA016413
5. Kajdič, P., Blanco-Cano, X., Omidi N., Russell, C. T.,2011, Multi-spacecraft study of foreshock cavitons upstream of the quasi-parallel bow shock", Planet. Space. Sci., 59, 705

Invited talks

'Interplanetary shocks during the solar cycle 24', presentado en IAGA 2013, The XIIth Scientific Assembly, Mérida, México, August 29, 2013

Sessions organized

'Multipoint Measurements in the Solar Wind', AGU, Meeting of Americas, Cancún, México, May 14-17, 2013

Prizes and acknowledgements

First place in the regional contest for the best diploma, 2003.
Graduated with honors, PhD, 2008.

Curriculum Vitae

Tomas Karlsson
Space and Plasma Physics
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Date of birth: May 15, 1964

Present employment

Royal Institute of Technology, Stockholm, Oct '99 – present:. Present title: Associate Professor.

Educational History

- PhD, Royal Institute of Technology, June, ´02
- Studies at the Institute for Theoretical Physics, Lund University, January '91 – December '91
- BSc, Lund University, May '91

Mission involvements, honors and awards

- Teaching Award, 'En fjäder i hatten', awarded by the students at the Engineering Science Programme, KTH, 2008.
- Co-I on the Solar Orbiter mission.
- Lead Co-I for the MEFISTO instrument on BepiColombo/MMO.

Selection of scientific papers

Karlsson, T., G. T. Marklund, L. G. Blomberg, and A. Mälkki, Subauroral Electric Fields Observed by the Freja Satellite, a Statistical Study, J. Geophys. Res., 103, 4327-4341, 1998.

Karlsson, T. and G. T. Marklund, Results from the DC Electric Field Experiment on the Freja Satellite, Adv. Space Res., 23, No. 10, 1657-1665, 1999.

Marklund, G. T., N. Ivchenko, T. Karlsson, et al., Temporal evolution of the electric field accelerating electrons away from the auroral ionosphere, Nature, 414, 724, 2001.

Karlsson, T.,et al., Separating Spatial and Temporal Variations in Auroral Electric and Magnetic Fields by Cluster Multipoint Measurements, Ann. Geophys., 22, 2463-2472, 2004.

Karlsson, T., G. Marklund, N. Brenning, I. Axnäs, On Enhanced Aurora and Low-Altitude Parallel Electric Fields, Phys. Scr., 72, 5, 419-422, 2005.

Karlsson, Tomas, et al., High-altitude signatures of ionospheric density depletions caused by field-aligned currents, arXiv:0704.1610v1 [physics.space-ph], 2007.

Streltsov A., T. Karlsson, Small-scale, localized electromagnetic waves observed by Cluster: Result of magnetosphere-ionosphere interactions, Gepohys. Res. Lett., 35, 22, L22107, doi: 10.1029/2008GL035956, 2008.

Gunell, H., et al., Plasma penetration of the dayside magnetopause. Physics of Plasmas, 19(7), 072906, 2013.

Karlsson, T., N. Brenning, H. Nilsson, J.-G. Trotignon, X. Vallières, and G. Facsko, Localized density enhancements in the magnetosheath; 3D morphology and possible importance for impulsive penetration, J. Geophys. Res., doi:10.1029/2011JA017059, 117, A03227, 2012.

Karlsson, T., The acceleration region of stable auroral arcs, in AGU Geophysical Monograph: Auroral Phenomenology and Magnetospheric Processes: Earth and other Planets, 2012.

Hamrin, M., Norqvist, P., Karlsson, T., et al., The evolution of flux pileup regions in the plasma sheet: Cluster observations. Journal of Geophysical Research, 118(10), 6279-6290, 2013.

Pitkänen, T., Hamrin, M., Norqvist, P., Karlsson, T. & Nilsson, H., IMF dependence of the azimuthal direction of earthward magnetotail fast flows. Geophysical Research Letters, 40(21), 5598-5604, 2013.

Gunell, H., et al., Waves in high-speed plasmoids in the magnetosheath and at the magnetopause. Annales Geophysicae, 32(8), 991-1009, 2014.

Hamrin, M., Pitkänen, T., Norqvist, P., Karlsson, T., et al., Evidence for the braking of flow bursts as they propagate toward the Earth, Journal of Geophysical Research - Space Physics, 119(11), 9004-9018, 2014.

Nakamura, R., Karlsson, T., et al., Low- altitude electron acceleration due to multiple flow bursts in the magnetotail. Geophysical Research Letters, 41(3), 777-784, 2014.

Karlsson, T., et al., Magnetic forces associated with bursty bulk flows in Earth's magnetosphere, to be submitted to Geophys. Res. Lett., 2015.

Curriculum Vitae N.Omidi

Contact:

N. Omidi
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Education:

University of Iowa, IA	Industrial & Management Engineering	B. S. (1979)
University of Iowa, IA	Physics	Ph.D. (1984)
University of Maryland	Postdoctoral Research	1984-1985

Appointments:

Senior Scientist , Solana Scientific Inc. , 2005-present
Senior Scientist , SciberNet Inc. , 1996-2005
Research Scientist and Lecturer , UCSD, 1993-2005
Associate Research Scientist and Lecturer, UCSD, 1989-1993
Associate Research Scientist , UCLA, 1988-1989
Assistant Research Scientist , UCLA, 1985-1988

Research Activities:

Dr. Omidi is an expert in kinetic plasma simulations and their applications to space physics. He has developed and refined a number of electrostatic and electromagnetic codes. He has extensive experience in numerical modeling of solar wind interaction with magnetized planets and asteroids, as well as, out-gassing comets and active experiments in space. He is internationally known for his use of hybrid simulations to study space plasma phenomena and was an instructor at the Fourth International School for Space Simulation. He has published over 100 articles in refereed journals and scientific books on linear and nonlinear properties of ULF and VLF waves, physics of collisionless shocks and plasma discontinuities, magnetic reconnection, FTEs at the magnetopause, cometary plasma processes and plasma-neutral gas-dust interactions at Enceladus.

Selected Publications:

Omidi, N., J. P. Eastwood, and D. G. Sibeck (2010), Foreshock bubbles and their global magnetospheric impacts, J. Geophys. Res., 115, A06204, doi:10.1029/2009JA014828.

Omidi, N., D. Sibeck, X. Blanco-Cano, D. Rojas-Castillo, D. Turner, H. Zhang, and P. Kajdi_c (2013), Dynamics of the foreshock compressional boundary and its connection to foreshock cavities, J. Geophys. *Res. Space.Physics*, 118, 823–831, doi:10.1002/jgra.50146.

Omidi, N., H. Zhang, D. Sibeck, and D. Turner (2013), Spontaneous hot flow anomalies at quasi-parallel shocks: 2. Hybrid simulations, J. Geophys. Res. Space Physics, 118, 173–180, doi:10.1029/2012JA018099.

Omidi, N., D. Sibeck, O. Gutynska, and K. J. Trattner (2014), Magnetosheath filamentary structures formed by ion acceleration at the quasi-parallel bow shock, J. Geophys. Res. Space Physics, 119, doi:10.1002/2013JA019587.

Omidi, N., H. Zhang, C. Chu, D. Sibeck, and D. Turner (2014), Parametric dependencies of spontaneous hot flow anomalies, J. Geophys. Res. Space Physics, 119, doi:10.1002/2014JA020382.

Minna M. E. Palmroth

Professional preparation

1999 MSc, Physics, University of Helsinki, Finland
2003 PhD, Physics, University of Helsinki, Finland

Appointments

1999 – 2011 Researcher, Finnish Meteorological Institute (FMI), Finland
2004 – 2004 Visiting Scientist, High Altitude Observatory, NCAR Boulder, USA
2005 – 2008 Academy of Finland postdoctoral scientist, FMI, Finland
2008 – 2013 Academy Research Fellow, FMI, Finland
2011 – Unit head, Earth Observation, FMI, Finland
2013 – Research professor, FMI, Finland

Mission and Committee Involvements, Honors and awards

Vlasiator, kinetic global simulation, Principal investigator
GUMICS, global MHD simulation, Co-investigator
European Research Council Starting grant 2007, 200141-QuESpace
Partnership for advanced computing (PRACE Europe) Tier-0 awardee 2015
Partnership for advanced computing (PRACE Europe) Tier-0 awardee 2012
European Commission Space programme, Scientific Advisory Group member, 2013-
Cooperation forum member to advise in scientific computing in Finland, representing Finnish government research institutes, 2013-2015

Participation in ISSI activities

2007-2009: team on GeoSpace at the system level, funded by ISSI, lead by Mark Lester

Relevant publications (from a total of 59 publications)

Von Alfthan, S., Pokhotelov, D., Kempf, Y., Hoilijoki, S., Honkonen, I., Sandroos, A., and Palmroth, M., Vlasiator: First kinetic global hybrid-Vlasov simulation code for modeling space plasma, *J. Atmos. Solar Terr. Phys*., 10.1016/jjastp.2014.08.012, 2014

Kempf, Y., Pokhotelov, D., von Alfthan, S., Vaivads, A., Palmroth, M., and Koskinen, H. E. J., Wave dispersion in the hybrid-Vlasov model: verification of Vlasiator, *Phys. Plasmas*, 20, 112114 (2013); doi: 10.1063/1.4835315, 2013

Palmroth, M., Honkonen, I., Sandroos, A., Kempf, Y., von Alfthan, S., and Pokhotelov, D., Preliminary testing of global hybrid-Vlasov simulation: Magnetosheath and cusps under northward interplanetary magnetic field, *J. Atm. Solar Terr. Phys.*, 99, 41-46, 10.1016/j.jastp.2012.09.013, 2013

Palmroth, M., Laitinen, T. V., Anekallu, C. R., Pulkkinen, T. I., Dunlop, M., Lucek, E. A., and Dandouras, I., Spatial dependence of magnetopause energy transfer: Cluster measurements verifying global simulations, *Ann. Geophys.*, 29, 823-838, 2011.

Palmroth, M., Koskinen, H. E. J., Pulkkinen, T. I., Toivanen, P. K., Janhunen, P., Milan, S. E., and Lester, M., Magnetospheric feedback in solar wind energy transfer, *J. Geophys. Res*, 115, A00I10, doi:10.1029/2010JA015746, 2010.

Palmroth, M., Partamies, N., Polvi, J., Pulkkinen, T. I., McComas, D. J., Barnes, R. J., Stauning, P., Smith, C. W., Singer, H. J., and Vainio, R., Solar wind - magnetosphere coupling efficiency for solar wind pressure impulses, Geophys. Res. Lett., 34, doi:10.1029/2006GL029059, 2007.

Palmroth, M., Pulkkinen, T.I., Janhunen, P., and Wu, C.-C., Stormtime energy transfer in global MHD simulation, *J. Geophys. Res., 108*, 1048, doi:101029/2002JA009446, 2003.

Vadim Roytershteyn

Professional preparation

1998 M.S., Applied Physics, State Technical University, St. Petersburg, Russia
2007 Ph.D., Physics, Massachusetts Institute of Technology, USA

Appointments

2006 – 2008 Postdoctoral Research Scholar, University of Iowa, USA
2008 – 2011 Postdoctoral Research Associate, Los Alamos National Laboratory, USA
2011 – 2012 Assistant Project Scientist, University of California, San Diego, USA
2012 – 2014 Research Scientist, SciberQuest, Inc, USA
2014 – Research Scientist, Space Science Institute, USA

Participation in ISSI activities

2014: team on kinetic turbulence and heating in the solar wind, lead by F. Sahraoui & D. Sundkvist

Relevant publications (from a total of 30+ publications)

Karimabadi, H., V. Roytersheyn, H.X. Vu, Y.A. Omelchenko et al. (2014), The link between shocks, turbulence, and magnetic reconnection in collisionless plasmas, Phys. Plasmas 21(6), 062308,

Y.H. Liu, W. Daughton, H. Karimabadi, H. Li, and V. Roytershteyn, "Bifurcated Structure of the Electron Diffusion Region in Three-Dimensional Magnetic Reconnection, *Phys. Rev. Letters,* 110, 265004 (2013)

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Education and degrees

1966(9)-1972(1):	Leningrad State University (geophysics)
1971(12):	M.S. in geophysics, Dept. of Physics in the Leningrad State University
1975(01):	Ph.D. (Cand. of Science) in geophysics from Leningrad State University
1990(02):	Doctor of Science degree in geophysics from Leningrad State University

Scientific career and full-time employment:

1974-till present: research in the Laboratory of Magnetospheric Physics,
at the Institute of Physics and Physical Faculty, Leningrad State University:

1974 - 1979	Junior Scientist
1979 - 1990	Senior Scientist
1990 - 1997	Leading Scientist
1997 - present	Professor, St.Petersburg State University

Speciality: Space Physics, Magnetospheric Physics with emphasize on physics of Substorms, and Magnetotail Physics

International awards:

2004 and 2008 - citations for excellence in refereeing from American Geophysical Union
2008 - Julius Bartels medal of European Geoscience Union for research in solar-terrestrial sciences

Participation in International Projects and activities:

- Coordinator of Ground-Based Observation working group and member of Scientific Committee of INTERBALL project (1985-2001)
- Member of CLUSTER Ground-Based Observation Working Group
- Co-Investigator in THEMIS project
- Associate editor, Journal Geophysical Research Space Physics (2006-2012)

Participation in ISSI activities:

2001: team on Auroral Physics (lead by G.Paschmann);
2006: team on Magnetotail transients (lead by S. Sharma);
2010: team on Substorm Current Wedge revisited (lead by L. Kepko);
2012: team on Magnetotail transients (lead by A.Retino).

Relevant recent publications (from a total of 250 papers) .

Sergeev, V. A., V. Angelopoulos, and R. Nakamura, Recent advances in understanding substorm dynamics, Geophys. Res. Lett., 39, L05101, doi:10.1029/2012GL050859, 2012

Dubyagin, S., V. Sergeev, S. Apatenkov, V. Angelopoulos, A. Runov, R. Nakamura, W. Baumjohann, J. McFadden, and D. Larson, Can flow bursts penetrate into the inner magnetosphere? Geophys. Res. Lett., 38, L08102, doi:10.1029/2011GL047016, 2011.

Sergeev, V. A., I. Chernyaev, S. Dubyagin, Y. Miyashita, V. Angelopoulos, R. Nakamura, P. D. Boakes, and M. G. Henderson, Energetic particle injections to geostationary orbit: relationship to flow bursts and magnetospheric state, J. Geophys. Res.,117, A10207, doi.org/10.1029/2012JA017773, 2012.

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NASA/GSFC Positions Held:

2004-2006	LWS TR&T Project Scientist
2007-present	LWS Geospace Mission Scientist
2004-2007	LWS Geospace Project Scientist
2003-present	THEMIS Project Scientist

Professional Activities:

2014-present	President AGU SPA Section
2011-2013	Chair, NSF GEM steering committee
2004-2007	Associate Editor, GRL
2004-2010	Editorial Advisory Board, EOS
2005-2010	Guest Editor, Advances in Space Research

Meetings Organized:

1993	Organizer, IAGA Session on Magnetosheath
1999	Organizer, IAGA Session on Shock, Sheath, and Magnetopause
2000	Co-Organizer, NATO Magnetosheath Meeting, Antalya, Turkey
2003	Co-Organizer, IAGA Magnetopause Session, Sapporo, Japan

Awards

1992 AGU Macelwane Award

Publications: 292 refereed publications (74 first-authored).

1. Sibeck, D. G., A model for the transient magnetospheric response to sudden solar wind dynamic pressure variations, J. Geophys. Res., 95, 3755, 1990.
2. Sibeck, D. G. and V. Angelopoulos, THEMIS science objectives and mission phases, Space Sci. Rev., 141, 35-89, 2008.
3. Sibeck, D. G., et al., ARTEMIS Science Objectives, Space Sci. Rev., 10.1007/s11214-011-9777-9, 2011.
4. Omidi, N., D. G. Sibeck, et al., Dynamics of the foreshock compressional boundary and its connection to foreshock cavities, J. Geophys. Res., 118, 823-831, 2013.
5. Zhang, H., D. G. Sibeck, et al., Spontaneous hot flow anomalies at quasi-parallel shocks: 1. Observations, J. Geophys. Res., 118, 3357-3363, 2012.

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Education & Qualifications

2010-2014 PhD Space Plasma Physics, Imperial College London, UK
2002-2006 MSci Physics with Theoretical Physics, Imperial College London, UK

Experience

2014 - Visiting Researcher, Imperial College London, UK
2014 - Outreach Officer, Queen Mary University of London, UK
2010 - Freelance Science Writer/Presenter
2014 Research Associate, Imperial College London, UK

Mission involvements, honors and awards

Solar Orbiter MAG calibration activities, Imperial College London, 2014
CINEMA MAGIC instrument in-flight calibration, attitude determination and science capability determination, Imperial College London, 2012-2014
Best Use of Online Video: BBC How to Put a Human on Mars, World Digital Media Awards 2014
Best Use of Online Video: BBC How to Put a Human on Mars, European Digital Media Awards 2014
THEMIS Mission Research Highlight 2013: Archer et al. (2013) Geophys. Res. Lett. 40 5003
THEMIS Mission Research Highlight 2013: Archer & Horbury (2013) Ann. Geophys. 31 319
Outstanding Student Paper Award, Space Physics & Aeronomy, AGU Fall Meeting 2012
STFC Science in Society Small Award: "DJ Physics", 2011
Callendar Prize 2006, Imperial College London
Royal College of Science Association Prize 2005

Relevant publications (from a total of 11 publications)

M. O. Archer and F. Plaschke (2015) What frequencies of standing surface waves can the subsolar magnetopause support?, J. Geophys. Res., submitted

M. D. Hartinger, F. Plaschke, M. O. Archer, D. T. Welling, M. B. Moldwin, A. Ridley (2015) The global structure and time evolution of dayside magnetopause surface eigenmodes, Geophys. Res. Lett., in press

M. O. Archer, D. L. Turner, J. P. Eastwood, S. J. Schwartz, T. S. Horbury (2015) Global impacts of a Foreshock Bubble: Magnetosheath, magnetopause and ground-based observations, Planet. Space Sci., 106, 56-66, doi: 10.1016/j.pss.2014.11.026

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