

List of Publications

Peer-Reviewed Articles (stars indicate the 10 most relevant publications)

- Sarris, T., Palmroth, M., Aikio, A., Buchert, S. C., Clemmons, J., Clilverd, M., Dandouras, I., *et al.* (2023). Plasma-neutral interactions in the lower thermosphere-ionosphere: The need for in situ measurements to address focused questions. *Frontiers in Astronomy and Space Sciences*, 9, 1063190. <https://doi.org/10.3389/fspas.2022.1063190>.
- Dubart, M., Battarbee, M., Ganse, U., Osmane, A., Spanier, F., Suni, J., Johlander, A., *et al.* (2022). Sub-grid modeling of pitch-angle diffusion for ion-scale waves in hybrid-Vlasov simulations with Cartesian velocity space. *Physics of Plasmas*, 29, 103902. <https://doi.org/10.1063/5.0096361>.
- Ala-Lahti, M., Pulkkinen, T. I., Pfau-Kempf, Y., **Grandin, M.** & Palmroth, M. (2022). Energy flux through the magnetopause during flux transfer events in hybrid-Vlasov 2D simulations. *Geophysical research Letters*, 49, e2022GL100079. <https://doi.org/10.1029/2022GL100079>.
- Papadakis, K., Pfau-Kempf, Y., Ganse, U., Battarbee, M., Alho, M., **Grandin, M.**, Dubart, M., *et al.* (2022). Spatial filtering in a 6D hybrid-Vlasov scheme to alleviate adaptive mesh refinement artifacts: a case study with Vlasiator (versions 5.0, 5.1, and 5.2.1). *Geoscientific Model Development*, 15, 7903–7912. <https://doi.org/10.5194/gmd-15-7903-2022>.
- Turc, L., Zhou, H., Tarpus, V., Ala-Lahti, M., Battarbee, M., Pfau-Kempf, Y., Johlander, A., *et al.* (2022). A global view of Pc3 wave activity in near-Earth space: Results from hybrid-Vlasov simulations. *Frontiers in Astronomy and Space Sciences*, 9, 989369. <https://doi.org/10.3389/fspas.2022.989369>.
- Zhou, H., Turc, L., Pfau-Kempf, Y., Battarbee, M., Tarpus, V., Dubart, M., George, H., *et al.* (2022). Magnetospheric responses to solar wind Pc5 density fluctuations: Results from 2D hybrid-Vlasov simulation. *Frontiers in Astronomy and Space Sciences*, 9, 984918. <https://doi.org/10.3389/fspas.2022.984918>
- Alho, M., Battarbee, M., Pfau-Kempf, Y., Khotyaintsev, Yu. V., Nakamura, R., Ganse, U., Turc, L., *et al.* (2022). Electron signatures of reconnection in a global eVlasiator simulation. *Geophysical Research Letters*, 49, e2022GL098329. <https://doi.org/10.1029/2022GL098329>.
- George, H., Osmane, A., Kilpua, E. K. J., Lejosne, S., Turc, L., **Grandin, M.**, Kalliokoski, M. M. H., *et al.* (2022). Estimating Inner Magnetospheric Radial Diffusion Using a Hybrid-Vlasov Simulation. *Frontiers in Astronomy and Space Sciences*, 9, 866455. <https://doi.org/10.3389/fspas.2022.866455>.
- Johlander, A., Battarbee, M., Turc, L., Ganse, U., Pfau-Kempf, Y., **Grandin, M.**, Suni, J., *et al.* (2022). Quasi-Parallel Shock Reformation Seen by Magnetospheric Multiscale and Ion-Kinetic Simulations. *Geophysical Research Letters*, 49, e96335. <https://doi.org/10.1029/2021GL096335>.
- Suni, J., Palmroth, M., Turc, L., Battarbee, M., Johlander, A., Tarpus, V., Alho, M., *et al.* (2021). Connection Between Foreshock Structures and the Generation of Magnetosheath Jets: Vlasiator Results. *Geophysical Research Letters*, 48, e95655. <https://doi.org/10.1029/2021GL095655>.
- Tarpus, V., Turc, L., Battarbee, M., Suni, J., Blanco-Cano, X., Ganse, U., Pfau-Kempf, Y., *et al.* (2021). Foreshock cavitons and spontaneous hot flow anomalies: a statistical study with a global hybrid-Vlasov simulation. *Annales Geophysicae*, 39, 911–928. <https://doi.org/10.5194/angeo-39-911-2021>.

- Runov, A., **Grandin, M.**, Palmroth, M., Battarbee, M., Ganse, U., Hietala, H., Hoilijoki, S., *et al.* (2021). Ion distribution functions in magnetotail reconnection: Global hybrid-Vlasov simulation results. *Annales Geophysicae*, 39, 599–612. <https://doi.org/10.5194/angeo-39-599-2021>.
- Johlander, A., Battarbee, M., Vaivads, A., Turc, L., Pfau-Kempf, Y., Ganse, U., **Grandin, M.**, *et al.* (2021). Ion Acceleration Efficiency at the Earth's Bow Shock: Observations and Simulation Results. *The Astrophysical Journal*, 914, 82. <https://doi.org/10.3847/1538-4357/abfafc>.
- Grandin, M.**, Palmroth, M., Whipps, G., Kalliokoski, M., Ferrier, M., Paxton, L. J., Mlynczak, M. G., *et al.* * (2021). Large-scale dune aurora event investigation combining Citizen Scientists' photographs and spacecraft observations. *AGU Advances*, 2, e2020AV000338. <https://doi.org/10.1029/2020AV000338>.
- Palmroth, M., Raptis, S., Suni, J., Karlsson, T., Turc, L., Johlander, A., Ganse, U., *et al.* (2021). Magnetosheath jet evolution as a function of lifetime: Global hybrid-Vlasov simulations compared to MMS observations. *Annales Geophysicae*, 39, 289–308. <https://doi.org/10.5194/angeo-39-289-2021>.
- Palmroth, M., **Grandin, M.**, Sarris, T., Doornbos, E., Tourgaidis, S., Aikio, A., Buchert, S., *et al.* * (2021). Lower-thermosphere–ionosphere quantities: Current status of measuring techniques and models. *Annales Geophysicae*, 39, 189–237. <https://doi.org/10.5194/angeo-39-189-2021>.
- Battarbee, M., Brito, T., Alho, M., Pfau-Kempf, Y., **Grandin, M.**, Ganse, U., Papadakis, K., *et al.* (2021). Vlasov simulation of electrons in the context of hybrid global models: an eVlasiator approach. *Annales Geophysicae*, 39, 85–103. <https://doi.org/10.5194/angeo-39-85-2021>.
- Dubart, M., Ganse, U., Osmane, A., Johlander, A., Battarbee, M., **Grandin, M.**, Pfau-Kempf, Y., *et al.* (2020). Resolution dependence of magnetosheath waves in global hybrid-Vlasov simulations. *Annales Geophysicae*, 38, 1283–1298. <https://doi.org/10.5194/angeo-38-1283-2020>.
- Battarbee, M., Blanco-Cano, X., Turc, L., Kajdič, P., Johlander, A., Tarvus, V., Fuselier, S., *et al.* (2020). Helium in the Earth's foreshock: a global Vlasiator survey. *Annales Geophysicae*, 38, 1081–1099. <https://doi.org/10.5194/angeo-38-1081-2020>.
- Pfau-Kempf, Y., Palmroth, M., Johlander, A., Turc, L., Alho, M., Battarbee, M., Dubart, M., *et al.* (2020). Hybrid-Vlasov modeling of three-dimensional dayside magnetopause reconnection. *Physics of Plasmas*, 27, 092903. <https://doi.org/10.1063/5.0020685>.
- Grandin, M.**, Turc, L., Battarbee, M., Ganse, U., Johlander, A., Pfau-Kempf, Y., Dubart, M. & Palmroth, M. * (2020). Hybrid-Vlasov simulation of auroral proton precipitation in the cusps: Comparison of northward and southward interplanetary magnetic field driving. *Journal of Space Weather and Space Climate*, 10, 51. <https://doi.org/10.1051/swsc/2020053>.
- Turc, L., Tarvus, V., Dimmock, A., Battarbee, M., Ganse, U., Johlander, A., **Grandin, M.**, *et al.* (2020). Asymmetries in the Earth's dayside magnetosheath: results from global hybrid-Vlasov simulations. *Annales Geophysicae*, 38, 1045–1062. <https://doi.org/10.5194/angeo-38-1045-2020>.
- Battarbee, M., Ganse, U., Pfau-Kempf, Y., Turc, L., Brito, T., **Grandin, M.**, Koskela, T. & Palmroth, M. (2020). Non-locality of the Earth's quasi-parallel bow shock: injection of thermal protons in a hybrid-Vlasov simulation. *Annales Geophysicae*, 38, 625–643. <https://doi.org/10.5194/angeo-38-625-2020>.
- Akhavan-Tafti, M., Palmroth, M., Slavin, J. A., Battarbee, M., Ganse, U., **Grandin, M.**, Le, G., *et al.* (2020). Comparative analysis of the Vlasiator simulations and MMS observations of multiple X-line reconnection and flux transfer events. *Journal of Geophysical Research Space Physics*, 125, e2019JA027410. <https://doi.org/10.1029/2019JA027410>.

- Kilpua, E., Juusola, L., **Grandin, M.**, Kero, A., Dubyagin, S., Partamies, N., Osmane, A., *et al.* (2020). Cosmic noise absorption signature of particle precipitation during interplanetary coronal mass ejection sheaths and ejecta. *Annales Geophysicae*, 38, 557–574. <https://doi.org/10.5194/angeo-38-557-2020>.
- * Palmroth, M., **Grandin, M.**, Helin, M., Koski, P., Oksanen, A., Glad, M. A., Valonen, R., *et al.* (2020). Citizen scientists discover a new auroral form: Dunes provide insight into the upper atmosphere. *AGU Advances*, 1, e2019AV000133. <https://doi.org/10.1029/2019AV000133>.
- Turc, L., Roberts, O., Archer, M., Palmroth, M., Battarbee, M., Brito, T., Ganse, U., *et al.* (2019). First observations of the disruption of the Earth’s foreshock wave field during magnetic clouds. *Geophysical Research Letters*, 46, 12,644–12,653. <https://doi.org/10.1029/2019GL084437>.
- * **Grandin, M.**, Battarbee, M., Osmane, A., Ganse, U., Pfau-Kempf, Y., Turc, L., Brito, T., *et al.* (2019). Hybrid-Vlasov modelling of nightside auroral proton precipitation during southward interplanetary magnetic field conditions. *Annales Geophysicae*, 37, 791–806. <https://doi.org/10.5194/angeo-37-791-2019>.
- Palmroth, M., Praks, J., Vainio, R., Janhunen, P., Kilpua, E. K., Afanasiev, A., Ala-Lahti, M., *et al.* (2019). FORESAIL-1 cubesat mission to measure radiation belt losses and demonstrate de-orbiting. *Journal of Geophysical Research Space Physics*, 124, 5783–5799. <https://doi.org/10.1029/2018JA026354>.
- Grandin, M.**, Aikio, A. T. & Kozlovsky, A. (2019). Properties and geoeffectiveness of solar wind high-speed streams and stream interaction regions during solar cycles 23 and 24. *Journal of Geophysical Research Space Physics*, 124, 3871–3892. <https://doi.org/10.1029/2018JA026396>.
- Marchaudon, A., Blelly, P.-L., **Grandin, M.**, Aikio, A. T., Kozlovsky, A. & Virtanen, I. (2018). IPIM modeling of the ionospheric F_2 layer depletion at high latitudes during a high-speed stream event. *Journal of Geophysical Research Space Physics*, 123, 7051–7066. <https://doi.org/10.1029/2018JA025744>.
- Palmroth, M., Ganse, U., Pfau-Kempf, Y., Battarbee, M., Turc, L., Brito, T., **Grandin, M.**, *et al.* (2018). Vlasov methods in space physics and astrophysics. *Living Reviews in Computational Astrophysics*, 4, 1. <https://doi.org/10.1007/s41115-018-0003-2>.
- Turc, L., Ganse, U., Pfau-Kempf, Y., Hoilijoki, S., Battarbee, M., Juusola, L., Jarvinen, R., *et al.* (2018). Foreshock properties at typical and enhanced interplanetary magnetic field strengths: results from hybrid-Vlasov simulations. *Journal of Geophysical Research Space Physics*, 123, 5476–5493. <https://doi.org/10.1029/2018JA025466>.
- Juusola, L., Pfau-Kempf, Y., Ganse, U., Battarbee, M., Brito, T., **Grandin, M.**, Turc, L. & Palmroth, M. (2018). A possible source mechanism for magnetotail current sheet flapping. *Annales Geophysicae*, 36, 1027–1035. <https://doi.org/10.5194/angeo-36-1027-2018>.
- * **Grandin, M.**, Kero, A., Partamies, N., McKay, D., Whiter, D., Kozlovsky, A. & Miyoshi, Y. (2017). Observation of pulsating aurora signatures in cosmic noise absorption data. *Geophysical Research Letters*, 44, 5292–5300. <https://doi.org/10.1002/2017GL073901>.
- * **Grandin, M.**, Aikio, A. T. , Kozlovsky, A., Ulich, T. & Raita, T. (2017). Cosmic radio noise absorption in the high-latitude ionosphere during solar wind high-speed streams. *Journal of Geophysical Research Space Physics*, 122, 5203–5223. <https://doi.org/10.1002/2017JA023923>.
- Grandin, M.**, Blelly, P.-L., Witasse, O. & Marchaudon, A. (2016). Reply to Comment by Pätzold et al. on “Mars Express radio-occultation data: A novel analysis approach”. *Journal of Geophysical Research Space Physics*, 121, 10,592–10,598. <https://doi.org/10.1002/2015JA022229>.
- Grandin, M.**, Aikio, A. T. , Kozlovsky, A., Ulich, T. & Raita, T. (2015). Effects of solar wind high-speed streams on the high-latitude ionosphere: Superposed-epoch study. *Journal of Geophysical Research Space Physics*, 120, 10,669–10,687. <https://doi.org/10.1002/2015JA021785>.

Grandin, M., Blelly, P.-L., Witasse, O. & Marchaudon, A. (2014). Mars Express radio-occultation data: A novel analysis approach. *Journal of Geophysical Research Space Physics*, *119*, 10,621–10,632. <https://doi.org/10.1002/2014JA020698>.

Invited Viewpoint Commentary

Grandin, M. (2020), Small-scale optical atmospheric emissions discovered using citizen science photographs. *AGU Advances*, *1*, e2020AV000268. <https://doi.org/10.1029/2020AV000268>. Note: Viewpoint commentary on paper “The Mysterious Green Streaks Below STEVE” by Semeter et al. (2020).

PhD Thesis

Grandin, M. (2017), *Multi-instrument and modelling studies of the ionospheres at Earth and Mars*, PhD thesis, University of Oulu, Sodankylä Geophysical Observatory Publications, No. 113, ISBN 978-952-62-1615-7, URL: <http://urn.fi/urn:isbn:9789526216157>.

Publications Intended for the General Public

Grandin, M. & Palmroth, M. (2020), New auroral dunes discovered through citizen science. Article for the EGU Solar–Terrestrial Sciences (ST) Division blog, 14 April 2020. URL: <https://blogs.egu.eu/divisions/st/2020/04/14/new-auroral-dunes-discovered-through-citizen-science/>.

Invited Scientific Presentations (as first author and/or presenter)

Grandin, M., Turc, L., Battarbee, M., Ganse, U., Johlander, A., Pfau-Kempf, Y., Dubart, M. & Palmroth, M. (2020). Auroral proton precipitation fluxes inferred from global hybrid-Vlasov simulations. 2020 Virtual GEM Workshop, 20–24 July 2020 (virtual conference). Invited online oral presentation.

Grandin, M., Battarbee, M., Brito, T., Dubart, M., Ganse, U., Pfau-Kempf, Y., Turc, L. & Palmroth, M. (2019). Hybrid-Vlasov modelling of nightside auroral proton precipitation during southward interplanetary magnetic field conditions. 14th International Conference on Substorms, 30 September – 4 October 2019, Tromsø, Norway. Invited oral presentation.

Grandin, M., Partamies, N., Kero, A., McKay, D., Kozlovsky, A. & Whiter, D. (2016). Investigating the contribution of high-energy precipitation during pulsating aurora: KAIRA and optical data comparison. 43rd Annual European Meeting on Atmospheric Studies by Optical Methods, 15–19 August 2016, Winchester, United Kingdom. Invited oral presentation.

Presentations Intended for the General Public

Grandin, M., (2022), Dune aurora and citizen science. Uuden Tiedon Klubi, 2 March 2022, Helsinki, Finland.

Grandin, M., (2022), Dune aurora: A citizen science study. Night of Science, 20 January 2022, Helsinki, Finland.

Grandin, M., (2020), The polar aurora: What we know, what we know we don't know, and what *you* can help us know. School visit at Helsingin Suomalainen Yhteiskoulu, 20 November 2020, Helsinki, Finland.

Grandin, M., (2020), The dunes: Story of a new form of aurora. Austrian school visit at Sodankylä Geophysical Observatory, 19 February 2020, online.

Grandin, M. & Turc, L. (2018). From the Sun to the Earth: Journey of a solar storm. An Afternoon in the Science Basement talk series, 24 November 2018, Tiedekulma, Helsinki, Finland.

Grandin, M., (2018), The science and popular culture behind the aurora. European Researchers' Night, 28 September 2018, Institut Français de Finlande, Helsinki, Finland.