

CURRICULUM VITAE

Angels Aran

Dep. of Quantum Physics and Astrophysics (FQA)

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UNESCO codes: 210201; 210203; 210602; 210603; 250115; 251299: Space Weather

Present position in FQA:

Physicist, Tenure-eligible Lector (2019 -)

Academic degrees:

- Ph.D. by the Universitat de Barcelona in Physics, Astronomy. Thesis: “Synthesis of proton flux profiles of SEP events associated with interplanetary shocks. The tool SOLPENCO”.
Qualification: Excellent Cum Laude. October 2007. Doctorate Extraordinary Award. Universitat de Barcelona. July 2009.
- Graduate in Physics. Universitat de Barcelona. September 1996.

Positions Held:

- 2012-2019: Senior postdoc at the Quantum Physics and Astrophysics Department of the University of Barcelona.
- 2009-2012: Internal Research Fellow at the Research and Scientific Support Department of the European Space Agency (ESA) at ESTEC, Noordwijk (The Netherlands).
- 2007-2008 Postdoctoral researcher, in “Solar Energetic Particles: data analysis and models. SOLPENCO2” project. Dep. Astronomy and Meteorology (DAM)-ICC-UB, Universitat de Barcelona.
- 2006-2007: Researcher, Work Package leader in the ESA/ESTEC “Solar Energetic Particle Environment Modelling Project”. Fundació Bosch i Gimpera. Universitat de Barcelona.
- 2004-2007: Research associate contract, at DAM, Universitat de Barcelona, Barcelona.
- 2000-2004: Research associate grant in the ESA/ESTEC SOLPENCO Project. Institut d'Estudis Espacials de Catalunya-DAM. Universitat de Barcelona, Barcelona.
- 1996-1998: High School teacher of Physics and Mathematics. Barcelona.

General Scientific indicators:

- Advisor of three PhD thesis:
 - “Latitudinal and longitudinal dependence of the injection rate of shock-accelerated protons and their flux profiles” by R. Rodríguez-Gasén (2011 May 6, University of Barcelona). Co-advising with Prof. Dr. B. Sanahuja.
 - “Analysis and modelling of the solar energetic particle radiation environment in the inner heliosphere in preparation for Solar Orbiter”, by Daniel Pacheco Mateo (2019 April 30, University of Barcelona). Co-advising with Dr. N. Àgueda.
 - “PARADISE: a model for energetic particle transport in the solar wind”, by Nicolas Wijzen (2020 April 30, Dual PhD KU Leuven – University of Barcelona). Advisor at KU Leuven Prof. Dr. S. Poedts.

- h-index: 17 (Web of Science, WoS, core collection) and 21 (Google Scholar)
- Publications: 45. From those 40, 19 correspond to 1st Quartile indexed publications and another 14 correspond to indexed journals of reference in the field of space weather, that correspond to 2nd Quartile in Astronomy and Astrophysics: Space Weather, since 2006 (3rd Quartile, 2nd since 2012) and Journal of Space Weather and Space Climate (2nd Quartile since 2013). Within the heliophysics and space weather community it was recommended to publish in this latter journal the results from EU FP7 and H2020 projects. Prior to that, the reference journal in the field was Advances in Space Research.
- Total Citations: 751 (WoS), 1085 (GS). Average last 5 years (2016-2020): 100.4 (WoS).

Brief summary of CV and key research experience:

- I am working in the Heliophysics and Space Weather field, particularly in the study of Solar Energetic Particle (SEP) events, since I got my master thesis (*suficiencia investigadora*) at the University of Barcelona (UB) in 2000.
- My research line includes: (i) Analysis of SEPs, solar wind and interplanetary (IP) magnetic field data from different spacecraft, as well as the solar activity that generates SEP events. (ii) Modelling of gradual proton events by the development of the Shock-and-Particle (SaP) model, that combines magnetohydrodynamic (MHD) simulations of the associated coronal/IP shock waves (the particle sources) with the simulation of transport of SEPs. (iii) Development of space weather tools for the prediction of the intensity and fluence of these SEP events in the inner heliosphere. Particularly, I built the first such a tool ever, SOLPENCO, in the scope of a project funded by the European Space Agency (ESA). My PhD thesis, “Synthesis of proton flux profiles of SEP events associated with interplanetary shocks. The tool SOLPENCO”, was awarded with the Extraordinary Doctorate Award of UB in 2009.
- After the PhD, I developed the ESA’s SEP/EM/SOLPENCO2 tool that enabled the creation of the first statistical SEP environment model for IP missions that considers IP shocks as SEP sources. I won a 2-year post-doctoral position at the Research and Scientific Support Department (RSSD) of ESA/ESTEC in the Netherlands, where I completed SOLPENCO2 and updated the SaP model. During this time, I strengthened my collaboration with the group of Prof. S. Poedts from KU Leuven (Belgium) on the development of further versions of the SaP model, in which they provide the IP shock model, and with the Space Environment and Effects section of ESA. In addition to the three research lines listed above, I collaborated with Dr. C. Cid of the University of Alcalá (UAH) in the study of the geoeffectiveness of solar activity by participating in two International Space Science Institute teams. My research at RSSD was recognised with one-year extension of my post-doctoral position and paved the path for the later successful attainment of the ESA’s IPRAM, SOL2UP and SAWS-ASPECS, and ecIRENE projects.
- In Summary, I have participated in 9 international research projects funded by ESA and the European Union: in 4 I have been the local principal investigator, in 6 a Work Package leader and I was the PI of the SOL2UP project. Three of these projects are under development in different phases (EU’s H2020 EUHFORIA 2.0, ESA’s SWAS-ASPECS y ecIRENE). Since 2012, I have participated in 5 proposals of the EU’s FP7/H2020 Research and Innovation Actions that were evaluated positively but were not funded (SRADTOOLS, SPACE WEAVES, EUHFORIA, RESPONSE and ROBUSTA).

- I am currently working on (among others): (i) The analysis and interpretation of SEP data from Solar Orbiter and other spacecraft in collaboration with the EPD-lead group in University of Alcalá (PI: J. Rodríguez-Pacheco) and with the Christian-Albrechts University in Kiel (Dr. D. Pacheco). (ii) The 3D modelling of SEP events and co-rotating interaction region events in close collaboration with the group at KU Leuven (Dr. Stefaan Poedts and Dr. N. Wijzen). (iii) The development of SEP prediction tools with the different collaborations lead by the Observatory of Athens (PI: A. Anastasiadis) and the SME SPARC (PI: I. Sandberg).
- I am co-author of 4 book chapters (3 in Springer's Astrophysics and Space Science Library) and I am co-author of 29 scientific-tech. reports leading 17 of them.
- > 125 contributions to international workshops and conferences.
- I am member of AGU since 2010, delegate of COSPAR since 2004 and of the Spanish Astronomical Society since 2006.
- Co-I of the Energetic Particle Detector (EPD) of solar Orbiter (2019-) and member of the Modelling and Data Analysis Working Group for Solar Orbiter/EPD (2015- 2020).
- Member Scientific Advisory Team of the Virtual Space Weather Modelling Centre Project of ESA (2016-).
- I have the accreditations of:
 - 'RECERCA' for associate professors (*professor agregat/contratado doctor*), by the 'Agència per a la Qualitat del Sistema Universitari de Catalunya', 20 November 2018.
 - 'Professorat Lector', by the 'Agència per a la Qualitat del Sistema Universitari de Catalunya', 5 December 2008.

Current Research Projects

- European Heliospheric FORecasting Information Asset 2.0 (EUHFORIA_2.0), EU's Horizon 2020 project, Grant Agreement No. 870405 (2019). PI: S. Poedts, KU Leuven (Belgium). Role of A. Aran: UB's local PI (2019-2022)
- European Contribution to International Radiation Environment near Earth Modelling System (ecIRENE) Project, ESA Contract n. 4000127282/19/NL/IB/gg. PI: I. Sandberg, Space Applications and Research Consultancy (SPARC, Greece). Role of A. Aran UB's local PI (2019-2022).
- SWAS-ASPECS, Solar Energetic Particle (SEP) Advanced Warning System (SAWS) - Advance Solar Particle Events Casting System Project, ESA Contract No. 4000120480/17/NL/LF/hh, July 2017 – December 2021. Role of A. Aran, UB's local PI and Work Package Leader.
- High energy sources with outflows at different scales (HESO), PID2019-105510GB-C31, PIs: J. M. Paredes & V. Bosch-Ramon (UB), Ministerio de Ciencia, Innovación y Universidades, June 2020 – May 2023. Role of A. Aran: member of the Research Team.
- Spanish contribution to LISA: instrument development and scientific exploitation (LISA-ES), PID2019-106515GB-100, PI: Miquel Nofraries & Carlos Fernandez Sopena (IEEC), Ministerio de Ciencia, Innovación y Universidades, Jan 2020 – Dec 2022. Role of A. Aran: member of the Working Team.
- Energetic Particle Detector on Solar Orbiter: Phase E, data calibration and exploitation, PID2019-104863RB-100, PI: R. Gómez-Herrero (UAH), Ministerio de Ciencia, Innovación y Universidades, June 2020 – May 2024. Role of A. Aran: member of the Working Team.

Publications (in refereed journals, last 5 years)

1. Wijzen, N., Aran, A., Scolini, C., Lario, D., Afanasiev, A., Vainio, R., Sanahuja, B., Pomoell, J., Poedts, S., *Observation-based modelling of the energetic storm particle event of 14 July 2012*, *Astronomy & Astrophysics*, 659, A187, 14pp (2022).
2. Aran, A., et al., *Evidence for local particle acceleration in the first recurrent galactic cosmic ray depression observed by Solar Orbiter. The ion event on 19 June 2020*. *Astronomy & Astrophysics*, 656, L10, 8pp (2021).
3. Wijzen, N., E. Samara, A. Aran, D. Lario, J. Pomoell and S. Poedts, *A Self-consistent simulation of proton acceleration and transport near a high-speed solar wind stream*, *The Astrophys. J. Letters*, 908, L26, 9pp (2021).
4. Lavasa, E., G. Giannopoulos, A. Papaioannou, A. Anastasiadis, I. A. Daglis, A. Aran, D. Pacheco and B. Sanahuja, *Assessing the predictability of solar energetic particles with the use of machine learning techniques*, *Solar Physics*, 297, 107, 47pp (2021).
5. R. Gómez-Herrero, et al., *First near-relativistic solar electron events observed by EPD onboard Solar Orbiter*, *Astronomy & Astrophysics*, 656, L3, 8pp (2021).
6. Kollhof, A., et al., *The first widespread solar energetic particle event observed by Solar Orbiter on 2020 Novembre 19*, *Astronomy & Astrophysics*, 656, A20, 16pp (2021).
7. Wimmer, Schweingruber, R. F., et al., *First year of energetic particle measurements in the inner heliosphere with Solar Orbiter's Energetic Particle Dectector*, *Astronomy & Astrophysics*, 656, A22, 17pp (2021).
8. Aminalragia-Giamini, S., S. Raptis, A. Anastasiadis, A. Tsigkanos, I. Sandberg, A. Papaioannou, C. Papadimitriou, P. Jiggins, A. Aran and I. A. Daglis, *Solar energetic particle even occurrence prediction using solar flare soft X-rays measurements and machine learning*, *J. Space Weather and Space Climate*, 11, 59 15pp, doi:10.1051/swsc/2021043 (2021).
9. Wijzen, N., A. Aran, B. Sanahuja, J. Pomoell and S. Poedts, *The effect of drifts on the decay phase of SEP events*, *Astronon. & Astrophys*, 634, A82, 13pp. (2020).
10. S. Aminalragia-Giamini, P. Jiggins, A. Anastasiadis, I. Sandberg, A. Aran, R. Vainio et al., *Prediction of Solar Proton Event Fluence spectra from their Peak flux spectra*, *J. Space Weather Space Clim. Volume 10*, 16pp, doi:10.1051/swsc/2019043 (2020).
11. Rodríguez-Pacheco, J., et al., *The energetic particle detector. Energetic particle instrument suite for the Solar Orbiter mission*, *Astronomy & Astrophysics*, 642, A7 (35pp), (2020)
12. Rouillard, A. P., et al., *Models and data analysis tools for the Solar Orbiter mission*, *Astronomy & Astrophysics*, 642, A2 (32pp), (2020).
13. Zouganelis, Y., et al., *The Solar Orbiter Science Activity Plan. Translating solar and heliospheric physics questions into action*, *Astronomy & Astrophysics*, 642, A3 (19pp), (2020).
14. Wijzen, N., A. Aran, J. Pomoell and S. Poedts, *Spreading protons in the heliosphere: a note on cross-field diffusion effects*. *Journal of Physics Conf. Series*, 1332, 012018 14pp (2019).
15. Wijzen, N., A. Aran, J. Pomoell and S. Poedts, *The interplanetary spread of Solar Energetic Protons Near a High-Speed Solar Wind Stream*, *Astronon. & Astrophys*, 624, A47, 12pp. (2019).
16. Pacheco, D., N. Agueda, A. Aran, B. Heber and D. Lario, *Full inversion of solar relativistic electron events measured by the Helios spacecraft*, *Astronon. & Astrophys*, 624, A3, 20pp. (2019).

17. Wijsen, N., A. Aran, J. Pomoell and S. Poedts, *Modelling three- dimensional transport of solar energetic protons in a corotating interaction region generated with EUHFORIA*, *Astronon. & Astrophys.*, 622, A28, 17pp (2019).
18. Georgoulis, M. K., A. Pappaioannou, I. Sandberg et al., *Analysis and interpretation of the inner-heliospheric SEP events with the ESA Standard Radiation Environment Monitor (SREM) onboard the INTEGRAL and Rosetta Missions*, *Journal of Space Weather and Space Climate* 8, A40, 32pp (2018).
19. Afanasiev, A., R. Vainio, A.P. Rouillard, M. Battarbee, A. Aran and P. Zucca, *Modelling proton acceleration in application to a ground level event*, *Astronon. & Astrophys.*, 614, A4, 11pp (2018).
20. Pacheco, D., N. Agueda, R. Gómez-Herrero and A. Aran, *Interplanetary transport of solar near-relativistic electrons on 2014 August 1 over a narrow range of heliolongitudes*, *Journal of Space Weather and Space Climate* 7, A30, 8pp (2017).
21. Guerrero, A., J. Palacios, M. Rodríguez-Bouza, I. Rodríguez Bilbao, A. Aran, C. Cid at al., *Storm and Substorm Causes and Effects at Midlatitude Location for the St. Patrick's 2013 and 2015 Events*, *J. Geophys. Res. - Space Physics*, 122, I10, 9994- 10,011 (2017).