

# Some Computational Tools in RPS

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## Abstract

Following the line started in [1], some interesting numerical and computational techniques used in part of our research in Relativistic Positioning Systems (RPS) are here explained (see [2, 3, 4]). As remarked in [1] (with other algorithms we have built), we also think the algorithms described in this conference talk can be applied to other areas in the fields we work and can also be extended in Science and Technology in general. One of our innovations is the application of HEALPix mollweide maps in the determination of the positioning errors. This technique is applied in the analysis of CMB anisotropies and we have extended it to RPS.

## References

- [1] Arnau i Córdoba, J.V., Fullana i Alfonso, M.J., Resolution of Initial Value Problems of Ordinary Differential Equations Systems *Mathematics*, 10(4), 593 (1-27), 2022. <https://doi.org/10.3390/math10040593>
- [2] Puchades Colemenero, N., Arnau Córdoba, J.V., Fullana i Alfonso, M.J., Relativistic positioning: including the influence of the gravitational action of the Sun and the Moon and the Earth's oblateness on Galileo satellites, *Astrophys. Space Sci.*, Volume(366):66 (19pp), 2021. DOI: [10.1007/s10509-021-03973-z](https://doi.org/10.1007/s10509-021-03973-z).
- [3] Fullana i Alfonso, M.J., Josep Vicent Arnau i Córdoba, J.V., Puchades Colmenero, N., *Some advances in Relativistic Positioning Systems. In Modelling for Engineering & Human Behaviour 2021*. València, July 14th-16th, 2021. Edited by: I.U. de Matemàtica Multidisciplinària, Universitat Politècnica de València. J.R. Torregrosa, J.C. Cortés, J. A. Hervàs, A. Vidal-Ferràndiz and E. López-Navarro, 2021. ISBN: 978-84-09-36287-5
- [4] Màrius Josep Fullana i Alfonso, Diego Pascual Sáez Milán, Josep Vicent Arnau i Córdoba and Neus Puchades Colmenero. Some Improvements on Relativistic Positioning Systems, *Applied Mathematics and Nonlinear Sciences*, Volume 3(1): 161-166, May 2018. DOI: [10.21042/AMNS.2018.1.00012](https://doi.org/10.21042/AMNS.2018.1.00012).

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