Vlasiator: A story of two European Research Council grants

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Vlasiator is a unique global hybrid-Vlasov simulation, modelling the near Earth space in the six-dimensional phase space. It is the outcome of two European Research Council (ERC) grants, a Starting grant in 2007, and a Consolidator grant in 2015. At the time of the proposal in 2007 to the newly established ERC, Vlasiator was deemed impossible, as only two supercomputers existed in the world to which the extreme-scale computational model would have fitted into. However, Vlasiator's strategy is to target to the coming machines: with the speed of renewal of the supercomputer technology, a model targeted to the present technologies will already be old when the software is in production. With the help of the Moore law, latest supercomputer technologies, algorithmical innovations, and European research infrastructures, Vlasiator did make it into production in 2013, immediately showing a paradigm change in space physics. Vlasiator's most common conclusion is the strong role of scale coupling, in which the assumption that near-Earth physics could be investigated in isolation either temporally or regionally does not hold. Another important outcome is that even with lower resolution, ion kinetic dynamics offers a powerful explanation for near Earth physics.

This presentation shows the strategy, development and future prospects of Vlasiator, while an adjacent poster collects examples of physics that Vlasiator has addressed recently.