



Contribution ID: 491

Type: Poster

AIDA: Modelling and Machine Learning representation of kinetic processes in the solar wind

Monday, 6 September 2021 15:30 (13 minutes)

Many processes in the solar atmosphere and in the solar wind require a kinetic description. Additionally the latest missions, SolO and PSP, provide new unique view of kinetic processes. We report here the approach of the Horizon 2020 project AIDA (www.aida-space.eu): using a combination of massively parallel kinetic particle in cell simulations and machine learning data mining. The study of kinetic processes provide large data sets: for example a massively parallel PIC simulation of the solar wind produces several TB of data each time step. Space and solar missions provide increasingly massive dat sets as well. Human investigation or even traditional automatic methods struggle to deal with this size and complexity. Recently machine learning (ML) has become the focus of concentrated attention in our community. AIDA is an example of a community-building project to address practical problems in this area.

With the tools of AIDA we provide methods to study with compatible integrated methods, based on python, both results from observations and from simulation.

We will present the methods developed by AIDA, focusing on machine learning (ML) methods to analyse particle distributions, to analyse time series, and too analyse images (including higher dimensional data sets). We will show both supervised and unsupervised methods to identify extreme events such as reconnection. We will show the application to both simulation results and observational data.

Student poster?

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Session Classification: Poster Session 2.4

Track Classification: Session 3 - Fundamental Plasma Processes in the Solar Atmosphere: Magnetic Reconnection, Waves, Emission, Particle Acceleration