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Constraining interstellar dust properties from dynamical studies and observations

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Abstract

Properties of Interstellar dust (ISD) are reconstrained by simulating their paths through the Heliosphere, and then comparing the simulations to Ulysses observations.

The new simulation code follows the same assumptions for the dust dynamics as the Landgraf model [1]. We discuss these dynamics and the modeling 'behind' the simulations. The assumptions for the modeling of the interplanetary magnetic field and for the dust particle properties are refined.

ISD densities and fluxes are derived from their trajectories for the whole solar system (spatial variability), as well as for the whole solar cycle (temporal variability). A database of such density maps is built for various combinations of the two main parameters that determine the dust trajectories: the ratio of solar radiation pressure force and gravitational force of the Sun (β), and the charge to mass ratio (Q/m).

Realistic combinations of β and Q/m are assumed for comparing the simulated ISD fluxes with measured ISD fluxes from the Ulysses dataset. Such comparisons can be used to constrain the ISD particle properties and to reassess the mass influx of ISD into the Heliosphere. This contributes to a more accurate estimate of the total influx of dust on Saturns rings, the asteroid belt and the Kuiper belt.

References

[1] Landgraf, M.: Modeling the motion and distribution of interstellar dust inside the heliosphere, JGR, Vol. 105, pp. 10303-10316, 2000.