

Dynamics of Interstellar Dust in the Solar System: From In-Situ Measurements to Models

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Abstract

Interstellar Dust particles (ISD) of submicron to micron sizes have been observed by in-situ dust instruments inside the solar system since the early 1990s [1]. The dust detector on board the Ulysses spacecraft has collected the most comprehensive dataset of ISD particles penetrating the heliosphere between 1992 and 2007.

While mostly compatible to be within 20° of the direction of the neutral gas flow through the solar system, the measured dust exhibits peculiarities in several time periods. In 2005 we measured a shift in dust direction by 50° , as previously hinted at by [2]. Furthermore, in this time period the dust flux shows a steep rise, which is observed in the small particles 4 months ahead of an increase in the larger particle flux. These variations of the dust flux and angular distribution can only be understood in terms of the grain interaction with the heliospheric plasma environment. We are modeling these processes by numerically integrating the ISD flow through the solar system [3][4].

Here we present new results from our analysis of the Ulysses measurements, and provide an improved interpretation in terms of our modeling of the dust's interaction with the interplanetary plasma environment. We examine the discrepancies between the observed and the modeled masses, the impact on dust dynamics, and discuss a moderate porosity of the ISD grains as a possible explanation.

References

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