Dynamic screening in solar p-p reactions: Is the mean-field approach applicable in solar plasma?

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Although the Salpeter approximation for static screening is widely accepted and used in stellar modeling, the question of dynamic screening has been revisited. Here we reproduce Shaviv and Shaviv's numerical analysis of the screening energy for p-p reactions in the solar core using the techniques of molecular dynamics to directly calculate the motion of ions and electrons due to Coulomb interactions without the mean-field assumption inherent in the Salpeter approximation. We conclude that the effects of dynamic screening are relevant and should be included in the treatment of the plasma, especially in the computation of nuclear reaction rates.