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Non-Standard Models, Solar Neutrinos, and Large theta 13

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Solar neutrino experiments have yet to see directly the transition region between matter-enhanced and vacuum oscillations. The transition region is particularly sensitive to models of non-standard neutrino interactions and propagation. We examine several such non-standard models, which predict a lower-energy transition region and a flatter survival probability for the 8B solar neutrinos than the standard large-mixing angle (LMA) model. We find that while some of the non-standard models provide a better fit to the solar neutrino data set, the large measured value of theta_13 and the size of the experimental uncertainties lead to a low statistical significance for these fits. We have also examined whether simple changes to the solar density profile can lead to a flatter 8B survival probability than the LMA prediction, but find that this is not the case for reasonable changes. We conclude that the data in this critical region is still too poor to determine whether any of these models, or LMA, is the best description of the data.

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