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STATEMENT OF PURPOSE:

My research has the scientific potential for promoting greater understanding of two important phenomena: first is the Io plasma torus and second is Jupiter's magnetosphere. My dataset uses diffusive equilibrium assumptions to extrapolate plasma densities in 4 dimensional space around Jupiter. These extrapolations are based on measured densities that Voyager 1 took as it flew by Jupiter. I have already visualized the most significant portions of the plasma, which is being used by JUNO's gravity team to help subtract noise from signals sent to and from JUNO. The visualization of the plasma distribution shows a definitive toroidal structure that will help scientists better understand and further research the Io plasma torus. Given that my visualization is dependent on the magnetic field, an accurate magnetic field model is required to properly match proposed plasma densities with observed densities. Therefore, my visualizations, computed using various different magnetic field models, have the scientific benefit of creating a better understanding of Jupiter's magnetic field. Io spews 1000kg of volcanic material into its atmosphere every second and this material eventually ends up orbiting Jupiter as plasma. These visualizations tell the story of how Jupiter's magnetosphere captures this material and creates the fantastic Io plasma torus.

DESCRIPTION OF DATA SETS:

I use data from the Voyager 1 Plasma Spectrometer (PLS), which is NASA data. This instrument investigated the properties of plasma ions and measured electrons in the energy range from 5 eV to 1 keV. I primarily focus on plasma ion data of O+,O++,S+,S++,S+++,H+,Na+, as these are the species relevant to this research. The data I use includes the temperature and density of all of the aforementioned ion species. I also use the ephemeris (NASA) data that describes the location of the spacecraft at the times that it took the measurements. The ephemeris data provides the spacecraft's position relative to Jupiter, requiring three variables to describe its position. The remainder of my data I create using these two datasets. While the NASA datasets contain a few thousand data points, I use extrapolation and interpolation between them to create the many millions of data points that are used in my models.