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## Observing the Unobservable? Modeling Coronal Cavities to Determine their Densities

Cavities in coronal helmet streamers can easily be seen in white light coronagraph images. However, they are difficult to observe without contamination from the obstructing presence of features along the line of sight such as the helmet streamer surrounding the cavity. Our goal is to find cases where such spurious non-cavity contributions are minimal, and can be incorporated in a density analysis as conservatively estimated uncertainties in the data. To that end, we present a model of coronal cavities in which a cavity exists as an axisymmetric torus that encircles the Sun at constant latitude. We use Mauna Loa Solar Observatory (MLSO) polarized brightness data to show that the cavity that exists from January 25–31 of 2006 fits the parameters of our model. By examining the geometry of the model and the physics of the polarized brightness of scattered white light in the corona, we show that it is possible to observe the cavity without significant contribution from surrounding material. Using a Van de Hulst inversion of polarized brightness measurements, we calculate a radial density profile for cavity material and for the surrounding helmet streamer. Our results show the cavity density to be roughly 30% lower than a helmet streamer and roughly twice as great as a coronal hole. We also discuss the geometry of cavities imaged using emission line data and provide guidelines for determining whether a given cavity is unobstructed enough so that it can be analyzed for density and temperature profiles of cavity material.