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# The Plasmasphere, and a Model for Plasmaspheric Density on 29 August 2000

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The plasmasphere is a region surrounding the Earth with a relatively high density of ionized gas. The main ion constituent is hydrogen, but there are also significant populations of helium and oxygen. Embedded within the Earth's dipole magnetic field, the plasmasphere wraps around the Earth like a torus, typically within a distance of about four or five Earth radii from the center of the Earth. Until recently our only observations were from in situ measurements from single spacecraft, and it was unclear how structures observed by a spacecraft were connected to the plasmasphere. Since 2000, the Extreme Ultraviolet Imager (EUV) instrument on the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) spacecraft has been able to image the ultraviolet line emission of plasmaspheric helium, and this has led to many new insights about the global structure of the plasmasphere. The simplest picture describing the plasmasphere explains it as a region of closed convection paths circling the Earth. Here we describe the plasmasphere, explain why it exists, and how it typically evolves. Then we show how we develop a model for the global distribution of plasmaspheric density starting from an EUV image. The data from the image is supplemented with in situ electron density measurements and inferred mass density values based on oscillations of magnetospheric Alfvén waves (these waves are oscillations of the Earth's magnetic field, which vibrates much like a guitar string).