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Enceladus' control of densities in Saturn's neutral cloud

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A cloud of water-group (O, OH, H2O) neutrals extends outward from Saturn's main rings with a maximum density near the orbital location of the Enceladus. When the Cassini spacecraft flew by Enceladus, a plume of dust and water vapor was found to originate from a series of linear fractures at the moon's southern pole, explaining how Enceladus produced the neutral cloud. Model distributions have assumed azimuthal symmetry for the neutral cloud. We can use ion cyclotron waves observed by the Cassini magnetometer to test this assumption. These electromagnetic waves are produced by the ionization of the neutrals and their wave power is proportional to the local ionization rate. Assuming that the relationship between that rate and the local neutral density is constant at a given radial distance, we study the variation of the neutral cloud with longitudinal separation from Enceladus at different radial distances. Near Enceladus there is an order-of-magnitude enhancement in wave power above that seen far from the moon. The increase in wave power extends about forty degrees upstream and about one hundred and twenty degrees downstream, falling off with distance. This enhancement is confined to within about half a Saturn radius of Enceladus' orbit. We also look for enhancements in the wave power near the icy moons Tethys and Dione, but find that they do not exert any control over the spatial distribution of the wave power. Since the increase in power extends a significant distance (more than 60 Enceladus radii) outward from Enceladus, such rapid transport can only take place via fast neutrals. These particles are most probably created when the magnetospheric plasma charge exchanges with the neutral gas the Enceladus plume.