



Atmospheres and plasma interactions at Saturn's largest inner icy satellites

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We explore the possible existence of atmospheres on Saturn's icy satellites, Mimas, Enceladus, Tethys, Dione, and Rhea. Only the most massive satellite Rhea has the potential to hold a thin oxygen atmosphere/exosphere. The masses of the other satellites are too small to retain gravitationally atmospheres in the presence of large thermal escape rates. If the temperature of Rhea's atmosphere is close to its surface temperature, then a molecular oxygen column density of $6 \times 10^{17} \text{ m}^{-2}$ is possible and causes a discernable plasma interaction with Saturn's magnetosphere that can be probed by close flybys of the Cassini spacecraft.