

# **A RE-EXAMINATION ON THE MASS BUDGET OF THE SATURN'S RING ATMOSPHERE AND IONOSPHERE AT EQUINOX**

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For a long time, the Saturnian ring system has been suggested to be immersed in a neutral atmosphere. The related source mechanisms are the constant bombardment of the icy particles by interplanetary meteoroid (BIM) and irradiation by solar UV photons (ISP). Both effects release neutral molecules either in the form of impact water vapor (from BIM) or gas emission in the form of  $\text{H}_2\text{O}$ ,  $\text{O}_2$  and  $\text{H}_2$  (from ISP). The existence of an oxygen exosphere and ionosphere in Saturn's main ring region has been confirmed by the SOI observations of the Cassini spacecraft. In addition, Cassini RPWS found that a large amount of the Enceladus-originated water-group plasma would be deposited on the outer edge of the A ring. These icy materials could be recycled to neutral oxygen molecules via grain-surface chemistry. In this work, we have examined the mass budget of the ring oxygen atmosphere of Saturn taking into account such an "exogenic" source. The maximum  $\text{O}_2$  source rate from recycling of Enceladus-originated plasma is probably comparable to the one from photolytic decomposition of ices. In this case, the neutral  $\text{O}_2$  source rate would be independent of the solar insolation angle. Therefore, even at Saturn's equinox, the extended oxygen atmosphere still could be an important supplier of oxygen ions in the Saturnian magnetosphere. We have performed several studies for different recycling source rates from Enceladus. These predictions need further Cassini MIMI and CAPS observations to be verified in future.

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