Neutral OH cloud model originated from Enceladus' H2O plume: parameter survey

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Water group neutrals in Saturn's inner magnetosphere are considered to be dominated by water group neutrals (H_2O, OH, and O). Especially, plumes of water molecules from Enceladus' south pole are an important source of the neutrals [e.g., Waite et al., 2006], although a mechanism responsible for the plumes remains to be solved. Contribution to the global distribution of the plumes originated neutrals, however, has been still unsolved problems since chemical processes complicate understandings of comprehensive water group neutral distribution: the water group neutrals like OH and O are produced by dissociative reactions from parent molecules like H_2O. Johnson et al. [2006] suggested that only OH, through charge exchange, originated from the water molecule plume is not direct sources of OH distribution observed by the Hubble Space Telescope (HST). Tadokoro [2010] suggested that radial density distributions calculated for OH and O by adding energy increment wih 0.1 - 0.4 eV through photo-dissociation reactions cannot explain the observations although a calculated OH column density is consistent with the observation close to the source region due to the plumes. We have examined parameter surveys to further explain the discrepancy. Specifically, we have examined OH distribution, from H_2O distribution originated from the plumes, dependence of energy increment in the range of 0.4eV - 4eV. This energy increment may be produced by recombination reactions. Results show OH distributions extends to the radial direction with the energy increment. The calculated OH distributions are not consistent with the observed OH distribution. This would support the result that the plumes alone from Enceladus cannot explain the observed global distributions [e.g., Johnson et al., 2006; Tadokoro, 2010]. The released region dependence of the plumes will be also discussed in this poster.