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Understanding the Implications of the Apparent Velocity Dependent Enceladus Plume Composition Measured by Cassini INMS

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Cassini INMS has measured the composition of the plume of Enceladus on eight occasions with varying flyby geometries and speeds. It was observed that the early high velocity encounters indicated a significantly different measured composition than the later low velocity flybys. The higher velocity flybys contained a higher ratio of molecular hydrogen to water and an increase in organic content relative to the low velocity flybys. Furthermore, the most recent low velocity flybys indicate a highly consistent plume composition that suggest that velocity and not temporal or spatial variations are responsible for the observed composition changes. We have traced these composition changes to the interaction of ice grains and large organic molecules with the titanium surface of the INMS closed ion source aperture. We describe in quantitative detail this interaction and provide the implications for the composition of the Enceladus plume.