Supporting Information

for

Laboratory studies of molecular growth in the Titan ionosphere

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TABLE S1: Relative Intensities of the Four Major Ions Present in the Mass Spectrum of CCl_4.

		relative intensity	
m/z	ion	reference[a]	measured[b]
116.91	$C^{35}Cl_3^+$	1000	1000
118.90	$C^{35}Cl_2{}^{37}Cl^+$	958	963±33
120.90	$C^{35}Cl^{37}Cl_2^+$	306	229±15
122.90	$C^{37}Cl_3^+$	33	no signal

[a] The reference intensities are combinations of the natural isotopic abundances. [b] The measured intensities were obtained with an electron energy of 70 eV and an electron pulse time of 71 ms, corresponding to the maximum number of CCl_3^+ ions in the FT-ICR cell.

TABLE S2: Principal Production and Loss Reactions for the Ions Detected Experimentally.

reactions	k $cm^3\ s^{-1}$	R#
$CH_4^+ + CH_4 \rightarrow CH_5^+ + CH_3$	1.1×10^{-9}	k_1
$CH_3^+ + CH_4 \rightarrow C_2H_5^+ + H_2$	1.1×10^{-9}	k_2
$CH_2^+ + CH_4 \rightarrow C_2H_4^+ + H_2$	9.1×10^{-10}	k_3
$N_2^+ + CH_4 \rightarrow CH_3^+ + N_2 + H$	9.8×10^{-10}	k_4
$N_2^+ + CH_4 \rightarrow CH_2^+ + N_2 + H_2$	1.0×10^{-10}	k_5
$N_2^+ + CH_4 \rightarrow N_2H^+ + CH_3$	5.7×10^{-11}	k_6
$N_2H^+ + CH_4 \rightarrow CH_5^+ + N_2$	8.9×10^{-10}	k_7
$C_2H_5^+ + HCN \rightarrow HCNH^+ + C_2H_4$	2.7×10^{-9}	k_8
$C_2H_5^+ + NH_3 \rightarrow NH_4^+ + C_2H_4$	2.1×10^{-9}	k_9
$HCNH^+ + NH_3 \rightarrow NH_4^+ + HCN$	2.3×10^{-9}	k_{10}
$N^+ + CH_4 \rightarrow CH_3^+ + NH$	5.8×10^{-10}	k_{11}
$N^+ + CH_4 \rightarrow HCNH^+ + H_2$	4.1×10^{-10}	k_{12}
$CH_5^+ + C_2H_2 \rightarrow C_2H_3^+ + CH_4$	1.5×10^{-9}	k_{13}
$C_2H_3^+ + CH_4 \rightarrow C_3H_5^+ + H_2$	1.9×10^{-10}	k_{14}
$C_3H_5^+ + C_2H_2 \rightarrow C_5H_5^+ + H_2$	3.8×10^{-10}	k_{15}
$C_2H_4^+ + C_2H_2 \rightarrow C_3H_3^+ + CH_3$	3.8×10^{-10}	k_{16}
$C_2H_5^+ + C_2H_2 \rightarrow C_3H_3^+ + CH_4$	6.5×10^{-10}	k_{17}
$C_2H_5^+ + C_2H_2 \rightarrow C_4H_5^+ + H_2$	6.8×10^{-11}	k_{18}

$N_2^+ + C_2H_2 \rightarrow C_2H_2^+ + N_2$	3.8×10^{-10}	k_{19}
$C_2H_2^+ + CH_4 \rightarrow C_3H_5^+ + H$	7.0×10^{-10}	k_{20}
$C_2H_4^+ + C_2H_4 \rightarrow C_3H_5^+ + CH_3$	7.0×10^{-10}	k_{21}
$N_2^+ + C_2H_4 \rightarrow C_2H_3^+ + N_2 + H$	8.6×10^{-10}	k_{22}
$C_2H_3^+ + C_2H_4 \rightarrow C_2H_5^+ + C_2H_2$	8.2×10^{-10}	k_{23}
$CH_5^+ + C_2H_4 \rightarrow C_2H_5^+ + CH_4$	1.5×10^{-9}	k_{24}
$C_2H_5^+ + C_2H_4 \rightarrow C_3H_5^+ + CH_4$	3.6×10^{-10}	k_{25}
$CH_5^+ + H_2O \rightarrow H_3O^+ + CH_4$	3.7×10^{-9}	k_{26}
$C_2H_5^+ + H_2O \rightarrow H_3O^+ + C_2H_4$	1.9×10^{-9}	k_{27}
$H_3O^+ + HCN \rightarrow HCNH^+ + H_2O$	3.8×10^{-9}	k_{28}
$N_2^+ + H_2O \rightarrow H_2O^+ + N_2$	1.9×10^{-9}	k_{29}
$H_2O^+ + CH_4 \rightarrow H_3O^+ + CH_3$	1.1×10^{-9}	k_{30}
$H_2O^+ + C_2H_2 \rightarrow C_2H_2^+ + H_2O$	1.9×10^{-9}	k_{31}

Figure S1. Comparison between the measured (symbols) and simulated (solid line) gas density variation with time for a 100 ms primary gas pulse followed by 4 secondary gas pulses of 20 ms each every 100 ms. The pulse sequence is presented by the boxes in the lower part, while the production rate necessary to provide the simulated density is presented with the dotted lines. The maximum density corresponds to a pressure in the apparatus of 7.5×10^{-5} mbar.

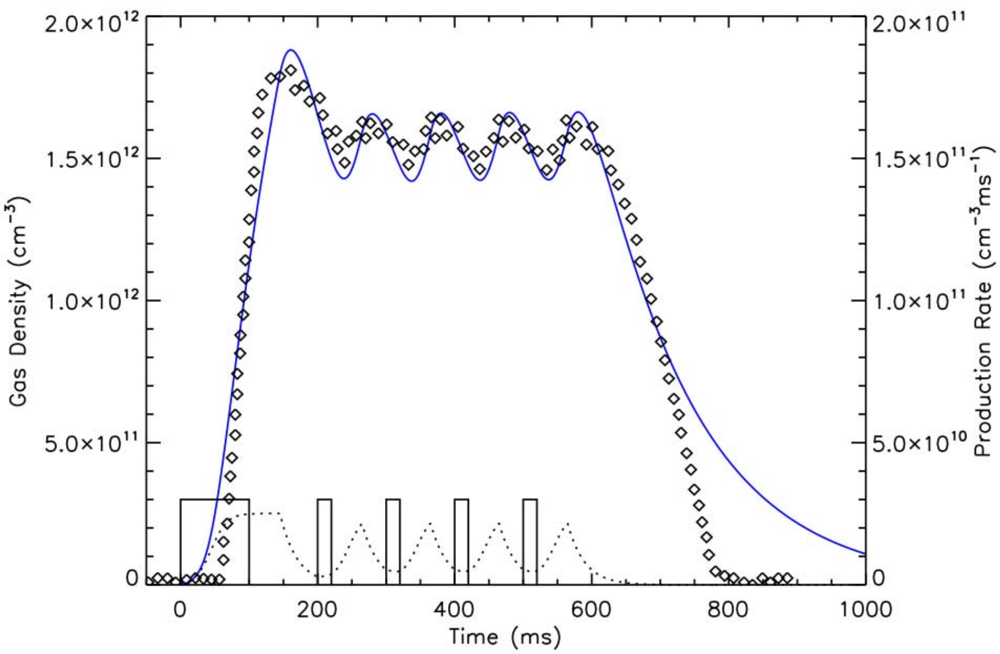

Figure S2. Variation of Elettra photon flux with photon energy (solid line) and the flux variation eventually applied in the model calculations after inclusion of saturation effects in the ion trapping efficiency (plus symbols).