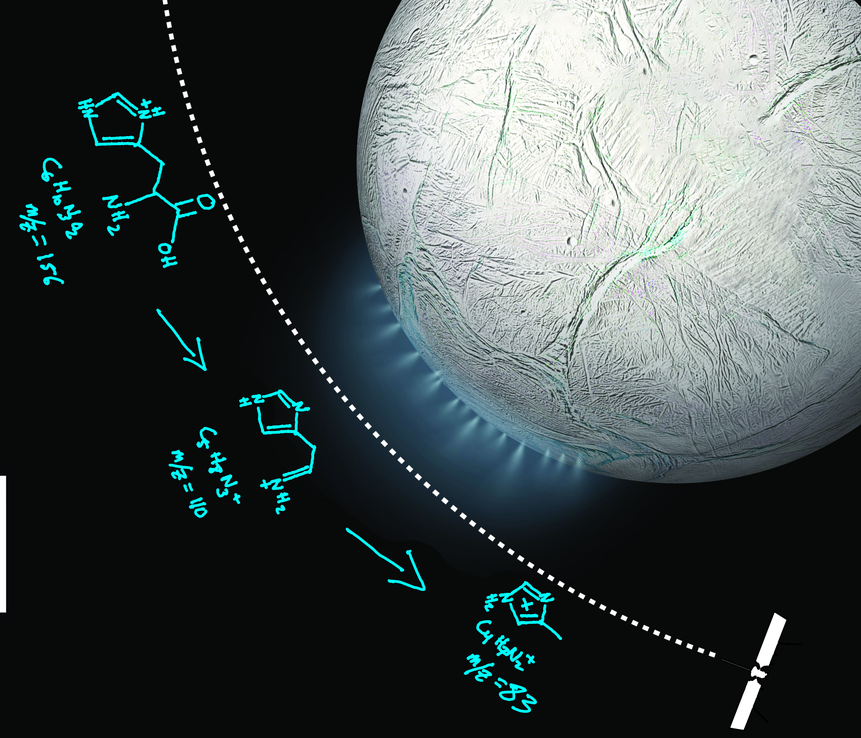
How fast is too fast?

Detection of the Amino Acid Histidine and its Fragmentation Products in Hypervelocity Impact Ice Spectra: Implications for Flyby Mission Velocities

Zach Ulibarri,[1] Tobin Munsat,[2] John Fontanese,[2] Mihály Horányi[2]
Sascha Kempf,[2] Zoltan Sternovsky,[2] Michael Voss[2]

1. Cornell University zulibarri@cornell.edu

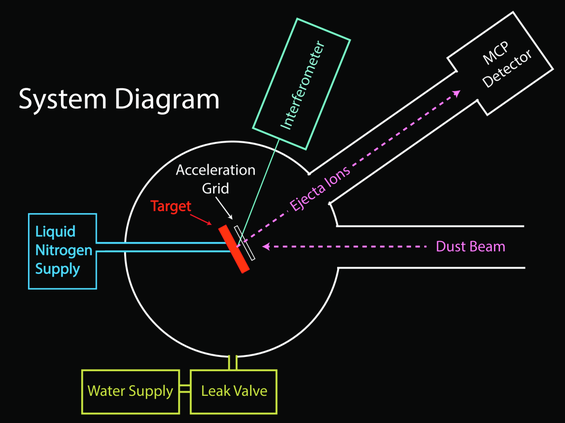
2. IMPACT, University of Colorado

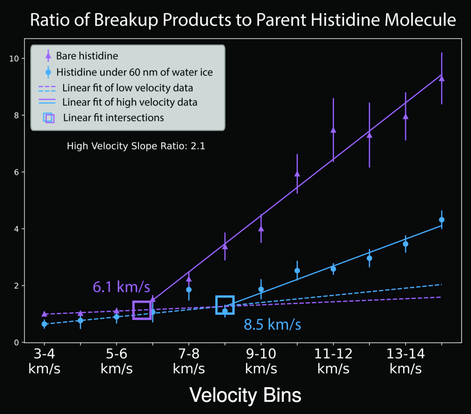


Read the paper! [1]
Read why it's important! [2]
Read more about the ice target! [3]
Read my thesis! [4]

Experimental Setup

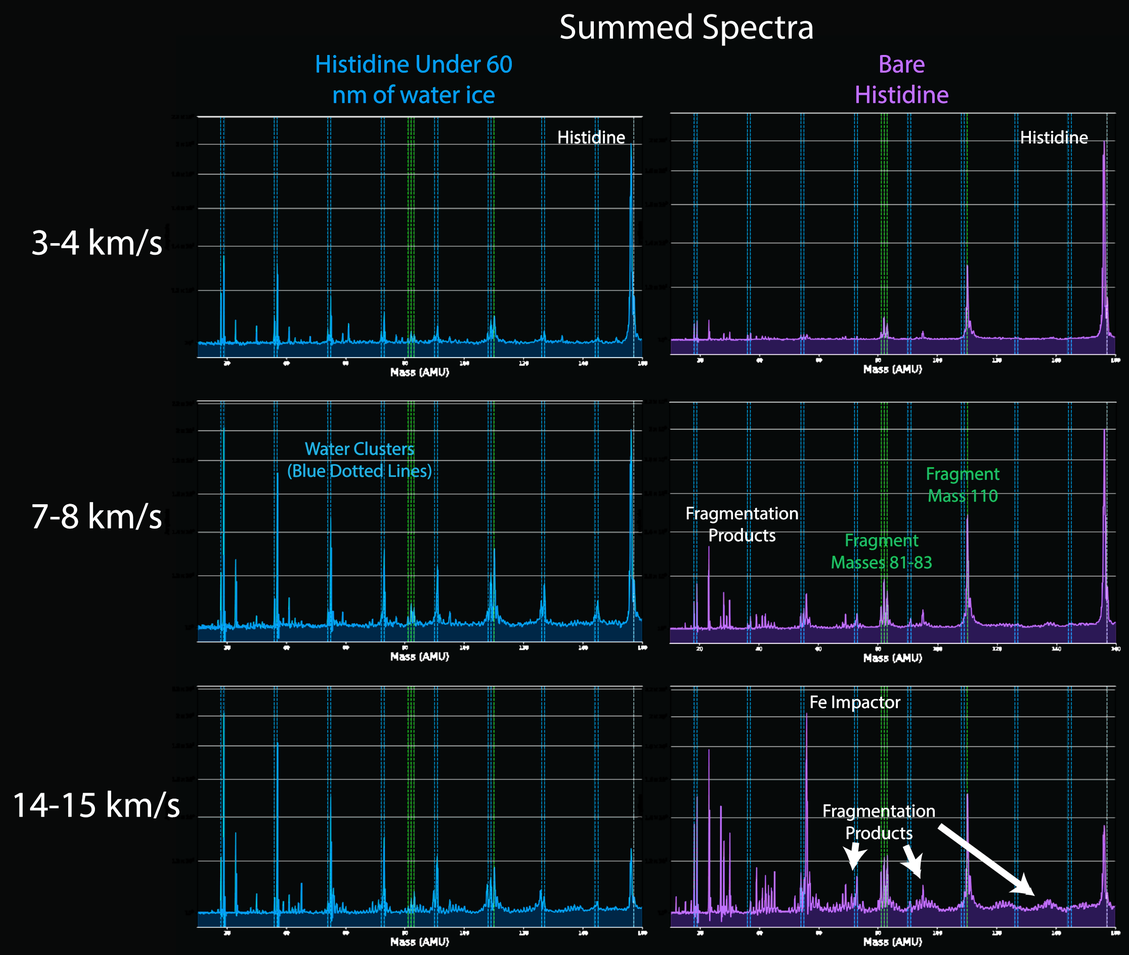
- Laboratory experiments performed at the University of Colorado IMPACT Dust Accelerator
- Micron scale iron dust impacted into histidine surfaces at velocities of 3-15 km/s
- One experiment performed with bare histidine, another with 60 nm of water ice grown on top
- Impact ionization time-of-flight mass spectrometry used to study the resuting impact plume
- Direct sampling of hypervelocity impact plumes with known, physical velocity





Results

- Below 6 km/s, organic fragmentation rates are largely constant
- For bare histidine, fragmentation rates increase dramatically beyond 6.1 km/s
- For histidine under 60 nm of water ice, fragmentation rates increase beyond 8.5 km/s
- The 60 nm water layer reduced fragmentation by a factor of about two
- Fragmentation products correlate with those found in electron ionization spectra (e.g., NIST)
- Characteristic histidine fragments were found at 81-83 and 110 AMU



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[2] Cable, M., et al. (2021). Plume grain sampling at hypervelocity: Implications for astrobiology investigations. Bull. AAS, 53. https://doi.org/10.3847/25c2cfeb.aef1b166
[3] Nelson, A. O., et al. (2016). New experimental capability to investigate the hypervelocity micrometeoroid bombardment of cryogenic surfaces. Review of Scientific Instruments, 87(2). https://doi.org/10.1063/1.4941960
[4] Ulibarri, Z. (2022). On the Genesis and Measurement of Complex Organics and Isotopic Ratios in Hypervelocity Impact Ice Spectra. PhD Thesis, University of Colorado at Boulder. https://www.proquest.com/docview/2672014382