

## A direct measurement of vaporized water ice during hypervelocity impacts in an open system

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Collisions between two icy bodies were expected to be one of the most fundamental processes in the early-outer Solar System. Recently, the equations of state for pure water ice has been constructed [1]. Then, the hydrodynamic behaviour after impacts on water ice has been investigated [e.g., 2]. Subsequent chemical reactions between water vapour and silicates /organics, however, have not been studied well.

Previously, we developed an experimental system to investigate degassing processes of calcite targets in an open system using a two-stage light-gas gun and a quadruple mass spectrometer (QMS) without a chemical contamination from the gas [3]. In this study, we conducted impact experiments using a pure-water ice target as the first step of research development for understanding post-impact chemistry on icy materials. The ion current of water ( $M/Z=18$ ) drastically increased to the >10-fold ion current after an impact, strongly suggesting that we successfully detected an impact-generated water vapor in the open system.

We also have performed a numerical calculation using the iSALE shock physics code [e.g., 4] to construct a model curve of the total vapour production as a function of impact velocity under the experimental conditions. A comparison between the experimental results and the theoretical production on the total amount of vaporized water ice will be presented at the conference.

[1] Senft, L. E. and Stewart S. T. (2008) *MaPS*, **43**, 1993. [2] Stewart, S. T. et al. (2008) *GRL*, **35**, L23203. [6] Kurosawa, K. et al. (2012) *EPSL*, **337-338**, 68. [11] Wünnemann, K., et al. (2006), *Icarus*, **180**, 514.