Impact fragmentation of thin ice plate: Direct observation of crack propagation

Toshihiko Kadono [1], Masahiko Arakawa [2]

[1] Earth and Planetary Sciences, Nagoya Univ., [2] Inst. Low Temp. Sci., Hokkaido Univ.

Fragmentation of thin ice plates is investigated by hypervelocity impact experiment. Crack propagation in ice plate is directly observed by a high speed camera. There are two types of cracks. The one is produced by impact induced compressive wave and the other is by tensile wave generated at boundaries. These cracks proceed with branching and connect each other. The fractal dimension of crack system increases with time. Also, the number of cracks initially increases with time but becomes to decrease as the structure of crack system becomes complex. Then we derive the power-law exponent in fragment size distribution. The results are similar to the previous results in the case of plaster plates.