

## Studies of melting ice using laser for ice drilling

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We have studied the melting properties of ice using CO<sub>2</sub> laser at 10.6 micro-meter wavelength. At this wavelength ice strongly absorbs and a hole is drilled along the path of the laser irradiation. The melting speed of ice has been measured at several irradiation intensities and laser excitation angles relative to the horizontal axis. The melting speed of ice increased almost proportionally with the increasing laser excitation intensity. For the laser excitation intensity of about 50 W/cm<sup>2</sup>, for instance, the melting speed was estimated to be 4 mm/s and 0.8 mm/s for snow (0.15 g/cm<sup>3</sup>) and ice, respectively. Experimental results show that for elevated excitation angles melt-water accumulate in the hole adversely affecting the melting speed of ice. Though the problem of accumulating water during the drilling into ice is necessary to take into consideration, we believe that our concept of a fiber coupled IR laser drilling system could be employed for drilling ice sheets and glaciers.

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