Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Time-dependent mechanical response of ice adhesion on aluminum substrates MARINA MACHADO, VLADIMIR ALVARADO, JOHN ACKERMAN, WILLIAM RICE, University of Wyoming — Ice adhesion on aerospace-relevant materials is both complex and not well understood. Measuring and understanding the underlying physics requires reliable testing techniques that can yield accurate, multifaceted datasets. Important considerations include surface roughness and its spatial correlation structure, resolution of substrate-induced strain, and direct mechanical adhesion testing. To shed light on ice adhesion on relevant surfaces, we performed time-dependent stress ramps on aluminum specimens in the temperature range -20 to -7°C. Additionally, we characterized the spatial correlation surface roughness maps of the aluminum samples. Our stress-ramp test data using a stress-controlled rheometer showed that the apparent average critical stress depends on both stress-ramp rate and temperature. More specifically, the adhesion strength is higher for steeper stress rates and increases with decreasing temperature. The stress-ramp test appears to represent an upper bound of the time-dependent adhesive behavior of ice. These results take us a step forward to understanding ice adhesion mechanisms.

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Date submitted: 02 Aug 2020 Electronic form version 1.4