1116-00-818 **Hiromi Yasuda*** (hiromy@uw.edu), 107 Guggenheim hall, University of Washington, Seattle, WA 98195, and **Jinkyu Yang** (jkyang@aa.washington.edu), 311B Guggenheim hall, University of Washington, Seattle, WA 98195. *Nonlinear wave dynamics in origami-based mechanical metamaterials.*

We investigate unique wave propagation in two different types of origami-based mechanical metamaterials; the Tachi-Miura Polyhedron (TMP) and the Kresling pattern. The TMP is a bellows-like origami structure which can be made of rigid panels and hinges. We design a 1D system composed of multiple TMP unit cells whose crease lines are modeled as rotational springs. On the other hand, the Kresling pattern is a cylindrical origami which supports both axial and rotational motions. By replacing all crease lines by truss members, we model the Kresling pattern as a truss structure and design the Kresling-based mechanical metamaterials in the form of vertically stacked architectures. We conduct dynamic analysis on both types of mechanical metamaterials by applying compressive impact to the end of the systems. Our analysis shows that the TMP-based metamateirials are capable of generating rarefaction waves, which are characterized by a leading tensile wave front despite the application of compressive impact. Also, the Kresling-based system shows wave mixing behavior due to the coupling mechanism between axial and rotational motions. These origami structures have great potentials in impact mitigation and energy transportation by leveraging these unique wave propagation properties. (Received September 13, 2015)