Abstract Submitted
for the OSS19 Meeting of
The American Physical Society

A Three Phase Model for Weathering Via Stochastic Fragmentation[1] DONALD PRIOUR, Youngstown State University — Through abrasion (e.g. collisions among neighboring rocks in a river or stream) stones lose mass while also changing shape. To model the evolution of the profile of rocks over the course of an extensive stochastically driven mechanical weathering process, we consider a scenario in which randomly oriented planes successively cleave away portions of a stone's volume. To take into consideration the aggressiveness of the weathering, the probability of the removal of a prospective fragment is considered to be proportional to $e^{-\gamma N_v}$, where N_v is the number of vertices in the fragment while γ is inversely related to the intensity of the abrasive collisions. With standard quantitative tools for identifying second order phase transitions, we find three distinct phases in the limit of many successful or sustained abrasive events. For very small γ, many sustained slices yield angular stones with clean planar facets. In the extreme $\gamma = 0$ case, the mean number of facets quickly tends to 8.50(2). On the other hand, for large γ, highly weathered stones have flat faces with rounded corners and edges. In the regime of intermediate γ values, initially angular polyhedral shapes are weathered into round stones with smooth surfaces.

[1]Support from the Ohio Supercomputing Center (OSC) is gratefully acknowledged.

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Date submitted: 11 Mar 2019 Electronic form version 1.4