Curl Mechanism of a Curling Stone on Ice Pebbles

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Abstract

We present a physical model that accounts for the curl mechanism of a curling stone on ice pebbles. The evaporation-abrasion model is based on the two essential features of curling: pebbles and running band. The ice friction coefficient at the rear half of a running band is larger than that at the front half because of cooling due to evaporation of pebbles. The asymmetry of the friction force is enhanced by mechanical interactions of ice debris produced by the front running band with the rear band, and result in the curl, or lateral deflection of the stone.

The asymmetry is larger, that is the curl distance is larger, at smaller velocity, higher temperature, lower humidity, and larger radius of a running band. However, it is independent of the angular velocity, that is the curl distance does not depend on the total number of rotations.

Key words: curling, pebble, friction coefficient, evaporation, abrasion