



Recent rockfalls on Mars

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Mars is known to have a plethora of active surface processes at the present day, and the role of water is vigorously debated. Here we study rocks falling from exposed outcrops of bedrock, which have left trails on the slope over which they have bounced and/or rolled. The presence of these trails shows that these rocks have fallen relatively recently because aeolian processes are known to infill topographic lows over time (estimations from rover-track erasure rates date these trails at <100My). Our initial hypothesis was that the presence of water ice should influence the rate of rockfall and therefore a systematic variation in the frequency of boulders-with-trails should be seen with orientation and latitude. We predicted equatorial craters should show no orientation preference and craters at mid-latitudes should have more rockfalls on pole-facing slopes, where water ice is expected. In order to reduce the influence of slope-inheritance from other longer-term processes, we have studied these rockfalls within impact craters which appear morphologically fresh. To account for variations in rockfall frequency related to lithology, we have studied both craters located in volcanic and non-volcanic terrains. Our initial results indicate trends in rockfall frequency with orientation, which depend on the latitudinal position of the crater. Craters in the equatorial belt (between 20° N and S) exhibit higher frequencies of rockfall on their N-S oriented slopes compared to their E-W ones. Craters >20°N/S have notably higher frequencies on their equator-facing slopes as opposed to the other orientations. These trends suggest that insolation plays a key role in determining the modern rockfall rate, indicating that thermal stress is playing a more important role than ice-presence in rock break down on modern Mars. To this end we use a Global Climate Model to assess the timescales over which these stresses are generated (diurnal, seasonal, etc).