# A HYPOTHESIS ABOUT THE ROLE OF A REFLECTED SHOCK WAVE IN IMPACT CRATERING.

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When studying the formation of impact craters, a remarkable attention has been paid to the excavation stage and in detail to the horizontal displacement of target rocks and ballistic ejecta. From this point of view, the importance of a possibly huge phenomenon has perhaps been hitherto underestimated. Indeed the roughly hemispherical shock wave, which propagates downwards into the target sequence, may encounter a deep horizontal rock discontinuity (a stratum with different nature or mechanical characteristics) which generates a reflected wave, that travels in the opposite direction, namely upwards. Moving through the just shattered crater fill deposits, the reflected wave transmits to the rock fragments an upward impulse, whose effects depend mainly upon the fragments' size and position relative to the virtual center of the reflected wave. Even in the presence of reflection coefficients of small size, the broken rocks can receive an impulse which is sufficient to throw them upwards with variable speeds and slopes and to contribute to the creation of a rim.

Of course these statements needed to be validated through some mathematical and physical check. We have thus developed some basic calculations, with regard to the impact of a supposed 500 m wide lithic asteroid against limestone sedimentary strata overlying a deep cristalline basement. Based upon numeric assumptions which are open to debate but do not seem unreasonable, our rough calculations suggest that a lot of fragments of various size and mass can be thrown with oblique trajectories up to levels (much) higher than the original ground level and so can play a noteworthy role in the creation of a crater rim with circular symmetry, whatever the impact angle of the falling object has been. In our example, we have estimated the distribution of the heights of ejecta sediments as a function of the distance from the impact point. Moreover, due to the different flight times, deeper (geologically older) fragments can sometimes eventually land over less deep (younger) ones, creating a stratigraphic inversion. An energetic analysis, including also the energy employed in fragmenting the impacted rocks, shows that the example is energetically consistent.

Our conclusions have not, and cannot claim to have, the validity of a proof, because they are based upon a single, imaginary, schematic (and therefore questionable) example. But the only purpose of this paper is to stimulate doubts, discussions and sound scientific research concerning the verification of our suggestions, also in view of possible developments of new interdisciplinary studies about the very complex matter of impact cratering.