MATHEMATICAL ESTIMATIONS FOR IMPACT CONDITIONS ON HERTZSPRUNG BASIN, MOON

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Introduction: The Hertzsprung impact structure located at 2° N and 128° W is a relatively well-preserved impact basin on the far side of the Moon [1], with 570 km to 580 km of diameter approximately [1,2]. In this work will be estimated the impact conditions on the Hertzsprung basin according to the information mentioned in [1,2], are used here quantum formalism combined with Korteweg-De-Vries soliton theory for the calculation of the energy pulse in the impact point, and polynomial methods for the calculation of both mass distributions and ejected fragments. These models has been used in others craters too, on the Earth and Mars, which consider physical and orbital parameters, one example is mentioned in [3].

Results obtained with the models: According the models used for this basin [3], the diameter of asteroid is calculated in *~67.31 km*, with both velocity and impact angle on the lunar surface of *~3.02 km/s* and *~46.58°* respectively. The rim height is *~ 1.08 km*. The maximum and minimum melt volume is *~*1.33×10^{13} m^3 *(~13,308.12* km^3*)* and *~*2.21×10^{12} m^3 *(~2,210.11* km^3*)* respectively, the number of ejected fragments are estimated in *~*1.02×10^{12} or *~1,020.27 billion of fragments*, with average sizes of *~6.69 m*, the total energy in the impact is calculated in *~*3.68×10^{30} *Erg (~*8.77×10^{7} *megatons)*. Before of the erosion effects the diameter of the transient crater is estimated in *~388 km*. The possible hydrothermal zone is estimated in *~17.75 km* to *~194 km* from the nucleus of impact, *i.e.*, a hydrothermal band of *~176.26 km*. The lifetimes estimated for this hydrothermal band are of *~10.12 Ma* to *~15.8 Ma* with uncertainties of *~ +/- 1.63 %* to *~ +/- 4.32 %, i.e.*, from *~ +/- 0.16 Ma* to *~ +/- 0.68 Ma*. Hydrothermal temperatures from *0.25 years* to *1,400 years* after of the impact are estimated in *~756.69 °C* to *~297.08 °C*. The final temperature to the *15.8 Ma* after of the impact is calculated in *~22.58 °C* + environment temperature. The fragments are ejected to *~72,372.63 m* or *~72.37 km* from the impact center, with a velocity of ejection of *~605.43 m/s*, minimal ejection angle of *~9.33°* and maximum height of *~2.97 km*. The density of this asteroid is calculated in *~1.25* g/cm^3 .The seismic shock-wave magnitude is calculated (using linear interpolation) as *>10.0* according the *Richter Scale*. The temperature peak in the impact is calculated in ~ 8.43×10^{14} *°C* (*~*5.62×10^{7} times the temperature of the solar nucleus), by a space of time of *~4.57 ms*. The pressure in the final crater rim is estimated in *~61.18 Gpa*; the pressure to *1 km* of the impact point is estimated in *~69,287.89 Gpa*. The maximum density for the fragments is calculated in *~1.97* g/cm^3. The both minimal and combined densities for these fragments are *~1.25* g/cm^3 and *~0.76* g/cm^3 respectively. The time of creation for the final crater is carried out from *~9.97 min* to *~124.4 min*.

References: [1] Stockstill K. R. and Spudis P. D. 1998. Abstract #1236. 29th Lunar & Planetary Science Conference. [2] Rodionova Zh. F. and Skobeleva T. P. 1980. *Lunar & Planetary Institute, Provided by the NASA Astrophysics Data System.* pp. 949–951. [3] Echaurren J. C. and Ocampo A. C. 2003. *Geophysical Research Abstracts,* Vol. 5, 04450, *EGS-AGU-EUG Joint Assembly*.