LUNAR ORIENTALE BASIN: ESTIMATION OF IMPACT CONDITIONS.

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Introduction: The lunar Orientale basin, with a crater-rim diameter in excess of 900 km, is the best-preserved and youngest multi-ring basin on the Moon. It is located on the Moon's western limb and is centered at approximately 20ºS, 265ºE [1]. In this work are estimated the possible impact conditions, that could have given origin to this crater [2]. The models used here are based on: some equations postulated by *Holsapple* (crater depth) [4]; scaling; polynomial analysis; and an adaptation of quantum formalism for the mathematical representation of the energy pulse generated in the impact point, in where besides, is used one solution (soliton type) of the *Korteweg-De Vries's* equation [3].

Results obtained with the models: The development of this crater is realized in 4 stages [5], in which are specified the variables of impact more common [5], as follows: a). Contact/Compression Stage: In this stage the diameter of the impactor is estimated in ~ *111.62 km*, the velocity of impact is ~ *5.53 km/s*, the impact angle is ~ *80.30°*, the density of impactor is ~ *0.75* g/cm^3, the crater depth is estimated in ~ *8.84 km* [4], the melt volume is **~** *179,191.6* km^3, the total energy of impact is estimated in ~ 6.59×10^{31} *Erg* (~ 1.57×10^{9} *megatons)*, pressure to *1 km* of the impact point is ~ *237,472.5 Gpa*, and the seismic shock-wave magnitude is *>10.0* according the *Richter Scale*. b). Modification/Excavation Stage: In this stage the diameter of transient crater is ~ *623.56 km*, the number of ejected fragments *is* ~ 4.65×10^{12}, the average size of the fragments is ~ *12.53 m*, the average density of fragments is ~ *1.74* g/cm^3, the distance of ejection of the fragments is ~ *93.29 km*, the velocity of ejection is ~ *672.33 m/s*, the minimal angle of ejection is ~ *9.76°*, and the minimum height of ejection is ~ *4.01 km*. c). Collapse/Modification Stage: In this stage the pressure toward the final crater rim decrease to ~ *1.1 Gpa*. d). Final Crater Stage: The relation between the transient crater and the final crater is ~ *0.67* [5], the time of creation for the final crater can be estimated in ~ *4.46 minutes* according to *Schmidt* and *Housen* [4], the hydrothermal zone could spread from ~ *311.78 km* to ~ *440.8 km* from the nucleus of impact, i.e., a hydrothermal band of ~ *129.02 km*, the lifetimes estimated for this hydrothermal band are of ~ *16.23 Ma* to ~ *25.34 Ma* with uncertainties of ~ *(+/-) 0.74 %* to ~ *(+/-) 2.08 %*, i.e., from ~ *(+/-) 0.12 Ma* to ~ *(+/-) 0.53 Ma*, hydrothermal temperatures from *0.25 years* to *1,400 years*, after of the impact, are estimated in ~ *135.41 °C* to ~ *54.59 °C*, the final temperature to the *25.34 Ma* after of the impact is calculated in ~ *4.04 °C* + environment temperature. In this stage is also possible to estimate (hipothetically) the diameter of one dust cloud of ~ *399.78 km*.

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