A MATHEMATIC MODEL FOR THE ARAGUAINHA IMPACT STRUCTURE, BRAZIL, SOUTH AMERICA. J. C. Echaurren[1], A. C. Ocampo[2] and M.C.L. Rocca[3], [1]Codelco Chuquicamata, Chile, jecha001@codelco.cl , [2]European Space Agency, ESTEC Keplerlaan 1, 2200 AG, Noordwijk, Netherlands, adriana.ocampo@esa.int , [3]Mendoza 2779-16A, Ciudad de Buenos Aires, Argentina, (1428DKU), maxrocca@hotmail.com . This work was partially funded by The Planetary Society, CA, USA.

Synopsis: As 2004, the Araguainha impact structure (S 16°46' W 52°59') is South America's and Brazil's largest. Diameter: 40 km., Age: 246 Ma. Although it is eroded it still has the typical multi-ring shape configuration of large impact structures. Rocks exposed are Paleozoic sediments. The structure includes a 6 km central uplift of basement granite with heavily faulted and deformed rocks. Evidence for the origin of Araguainha in an impact event comes from breccia found near its center, shatter cones, shocked Quartz showing PDFs and melted rocks. Araguainha multi-ring shape it typical for impacts of its size [1, 2, 3]. The mathematical model is applied in quantum formalism, polynomial elements and Korteweg-DeVries (KDV) soliton theory [4], using a HP 49g, which is a Scientific Programmable Graphing Calculator with 1.5 Mb in RAM. For the impact event are used the following parameters: diameter ~ 40 km, circular shape, basement composition ~ granitic.

Analytical Method and Results: According this model the asteroid diameter is ~ 1.3 km, with a velocity and impact angle of ~ 21.71 km/s and ~ 88.74° respectively. The number of rings are calculated in ~ 1.41 with a crater profundity of ~ 2.7 km and melt volume of ~ 3,383 km³. The number of ejected fragments are estimated in ~ 64.24 millions with sizes of ~ 3.24 m, the asteroid density is ~ 5.46 g/cm³. The total energy in the impact is calculated in ~ 9.28E28 Ergs, i.e., ~ 44.18 millions of Hiroshimas (~2.21 millions of Megatones), and the pressures are ~ 22.33 Gpa. Before of the erosion effects the transient crater is estimated in ~ 26.83 km with an uplift of ~ 1.49 km, the hydrothermal zone (hydrothermal systems) is of ~ 6.37 km to 13.41 km from the nucleus of impact. The lifetimes estimated are of ~ 239,702 years to 356,910 years with uncertainties of ~ +/- 0.6545% to +/- 1.9195%, i.e., from +/- 1,569 years to +/- 4,601 years. Epythermal temperatures from 0.25 years to 1,400 years are estimated in ~ 191°C to 76°C (not epythermal). The fragments are ejected to ~ 238 km from the impact center, with a velocity of ejection of ~ 2.56 km/s, ejection angle of ~ 10.46° and maximum height of ~ 10.98 km. Finally the maximum density for the fragments is calculated in ~ 5.46 g /cm³ , the minimum density is estimated in ~ 4.08 g /cm³ , and the combined density for these fragments is calculated in ~ 2.34 g /cm³.

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