NUMERICAL ESTIMATIONS OF HYDROTHERMAL ZONES, TROUGH MATHEMATICAL CALCULATIONS FOR IMPACT CONDITIONS, ON THE SUDBURY STRUCTURE, ONTARIO, CANADA. J. C. Echaurren[1], [1]Codelco Chile-North Division, jecha001@codelco.cl .

Introduction: The Sudbury impact structure located at *46° 36' N* and *81° 11 W*, with *~1.85 Ga* of old, is modeled here using polynomial formalism for the calculation of mass distributions and *Korteweg-De-Vries* soliton theory (*KDV*) for the calculation of the pulse of energy in the impact point [1]. Taking the diameter (*~250 km*), shape and based on previous geochemical analyses of this basin [2], are calculated both impact conditions and hydrothermal zones through numerical estimations, which recreate the processes of formation of the Sudbury structure. The numerical simulations are generated in *11* stages, in where are obtained the main impact parameters and hydrothermal stages in the time.

Results obtained with the models. According the models used for this basin [1], the diameter of asteroid is calculated in *~8.11 km*, with both velocity and impact angle on the terrestrial surface of *~40.90 km/s* and *~81.95°* respectively. The number of rings on the crater are calculated in *~6.48* with both maximum and minimum crater profundity of *~16.53 km* and *~13.87 km* respectively. The both maximum and minimum melt volume is $\sim 2.38\times10^{13}\ m^3$ ($\sim 23{,}833\ Km^3$) and $\sim 1.23\times10^{13}\ m^3$ ($\sim 12{,}250\ Km^3$) respectively, the number of ejected fragments are estimated in $\sim 2.94\times10^9$ or *~2.94* billion of fragments, with average sizes of *~5.66 m*, and initial cloud of dust with diameter of $\sim 5.78\times10^6\ m$ or *~5,728.38 km*. The total energy in the impact is calculated in $\sim 2.31\times10^{31}$ *Erg* ($\sim 5.49\times10^8$ *megatons*). Before of the erosion effects the diameter of the transient crater is estimated in *~165.02 km*. The possible hydrothermal zone (hydrothermal systems) is of *~467.1 m* (*~0.467 km*) *to ~82.51 km* from the nucleus of impact, *i.e.* one hydrothermal band of *~82.04 km*. The lifetimes estimated for this hydrothermal band are of *~1.20 Ma* to *~1.90 Ma* with uncertainties of *~+/- 0.99 %* to *~+/- 3.22 %*, *i.e*. from ~*+/- 0.01 Ma* to ~*+/- 0.06 Ma*. Hydrothermal temperatures from *0.25 years* to *1,400 years* after of the impact are estimated in *~473.79 °C* to *~190.66 °C*, i.e. from *neumatolitic* activity (from *400°C* to *500°C*) to *epithermal* activity (from *100°C* to *200°C*). The final temperature to the *1.90 Ma* after of the impact is calculated in *~14.14°C* + environment temperature, i.e. *tele thermal* activity (from *0°C* to *100°C*). The fragments are ejected to $\sim 1.27\times10^6\ m$ or *~1,273.96 km* from the impact center, with a velocity of ejection of *~5.69 km/s*, ejection angle of *~11.39°* and maximum height of *~127.77 km*. The density of this asteroid is calculated in $\sim 4.68\ g/cm^3$.The seismic shock-wave magnitude is calculated (using linear interpolation) as *> 10.0* according the *Richter Scale*. The maximum time of permanency for de cloud of both dust and acid in the atmosphere is *~2.5 years* and *~12.5 years*, respectively. The temperature peak in the impact is calculated in ~ 5.28×10^{15} *°C* ($\sim 3.52\times10^8$ times the temperature of the solar nucleus), by a space of time of *~1.20 ms*. The pressure in the final crater rim is estimated in *~2.84 Gpa*; the pressure to *1 km* of the impact point is estimated in $\sim 4.44\times10^4$ *Gpa*. The maximum density for the fragments is calculated in $\sim 4.68\ g/cm^3$. The both minimal and combined densities for these fragments are $\sim 3.81 g/cm^3$ and $\sim 2.10\ g/cm^3$ respectively.

References: [1] Echaurren J.C. and Ocampo A.C. (2003) *Geophysical Research Abstracts*, Vol. 5, 04450, *EGS-AGU-EUG Joint Assembly*. [2] Al Barazi S., Riller U. And Hecht L. (2009) *72nd Annual Meteoritical Society Meeting*, Abstract # 5379.