STUDYING THE FORMATION OF TERRESTRIAL EXOPLANET IN HABITABLE ZONE REGIONS OF BINARY SYSTEMS. Mayra Meirelles Marques[1], Bruno Leonardo do Nascimento-Dias[2] and Bárbara Celi Braga Camargo[3] , Institute of Physics, Federal University of Rio de Janeiro[1], Department of Physics, Federal University of Juiz de Fora[2]. Department of Physics, UNESP of Guaratinguetá[3]. (may.mmarques@gmail.com)

Introduction: Large numbers of exoplanets are discovered every day and the natural question that arises is with respect to the habitability of these new planetary systems. That is why it is important to have computational tools that optimize the work of analyzing exoplanet systems in order to generate information that can contribute to this research. About it, one very important point to note that the habitability of a planet in a system of binary stars depends on numerous factors, in which each star will play a different role in determining the ZH [1]. In this context, the main idea of this work is to carry out the analysis of planetary systems, which orbit binary stars through computational modeling and to build a database with possible candidates in ZH.

Methodology:

Overall, it is possible to generally calculate the radiation flux emitted by a star by [2]:

$$F_{total} = \sum_{i=1}^{N} \quad W_i(T_{star})(L_i/L_s)/d_i^2$$

Where F_{total} is the total radiation flux received by the planet, L_i is the brightness of the star, L_s the brightness of the sun, d_i the distance from the planet to the star (AU) and $W_i(T_{star})$ é o fator de ponderação espectral. However, for this work we will use a generalization of the HZ calculation for multiple star systems that corresponds to the final formula [2-3]:

$$\frac{L_s}{l_{in-Sun}} \leq \frac{\Sigma_{i=1}^{N} \quad W_i(T_{star})\left(\frac{L_i}{L_s}\right)}{d_i^2} \geq \frac{L_s}{l_{out-Sun}^2}$$

Thus, based on the general HZ formula for multiple systems, two systems of interest were initially chosen, Kepler-34 and Kepler-35. Subsequently, the site was used Habitable Zone in Multiple Star Systems (http://astro.twam.info/hz/) hat through data provided about the system, such as temperature, mass and luminosity of both stars, as well as the eccentricity of the binaries and the semi-major axis, a graph was generated representing the habitability zone of Kepler-34 e Kepler-35. The results will be compared in the future with data developed by the Rebound software [4-5].

Results and Discussion: Based on the information from the Kepler-34 system through the methodology used was it is possible to obtain the result of the habitability zone Fig.1:

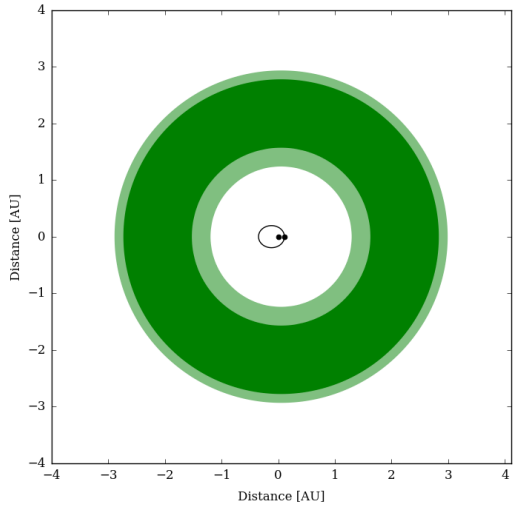

Fig.1 - ZH do sistema Kepler-34

Similarly the habitability zone of the Kepler-35 system was obtained, as shown in Fig.2:

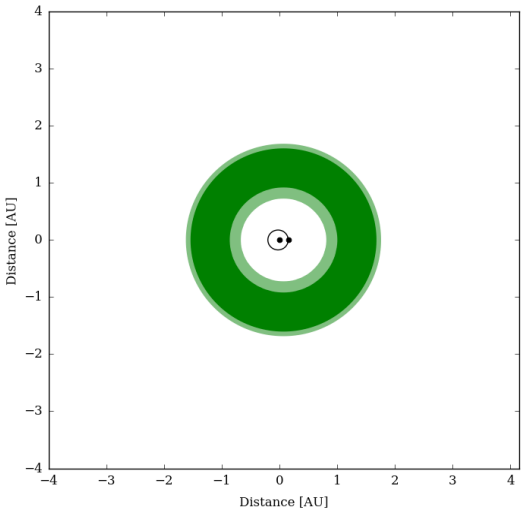

Fig.2 - ZH do sistema Kepler-35

Conclusions: In future expected to obtain data on the structural composition of the systems of interest, in

order to produce informational data that make it possible to understand the origin, formation and evolution of these planetary systems, mainly, on terrestrial planets in regions of the Habitability Zone of binary systems. Thus, with this information, databases of candidates will be built to be examined by observational missions in the future that can verify the data and simulations.

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References:

[1] E. Quintana V. et al. (2007). *The Astrophysical Journal*, p. 807. [2] Müller T. W. A.; Haghighipour N. (2014). *The Astrophysical Jou*rnal, p. 26-61, 2014. [3] Chambers, J. E; Quintana, E. V.; Duncan, M. J.; Lissauer, J. J. (2002) *The Astrophysical Journal*, p. 2884-2894. [4] Chambers, J. E. (2010). WSN. 263 p. [5] Chambers, J. E. (2001). *Icarus*, p. 205-224.