STUDY OF THE FORMATION OF TERRESTRIAL EXOPLANETS IN THE HABITABILITY ZONE OF ORANGE DWARF STARS: SUPER HABITABLE WORLDS. Francielle Maria Antônio Silva[1], Bruno Leonardo do Nascimento-Dias[2] and Bárbara Celi Braga Camargo[3], Observatório do Valongo, Federal University of Rio de Janeiro[1], Department of Physics, Federal University of Juiz de Fora[2] and Department of Physics, UNESP of Guaratinguetá [3]. (francielle19@astro.ufrj.br)

Introduction: The detection rate of new planets increases exponentially, with the passage of time due to technological development. 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. One very important point to note is that type K stars (orange dwarfs) represent about 13% of the Milky Way and live approximately 15 to 45 billion years. Within a radius of 100 hundred light years from our Solar System, there are about a thousand K dwarfs. In this context, the purpose of this project is to carry out an analysis of planetary systems, which orbit orange dwarf stars by means of computational modeling, and to build a database with possible candidates for terrestrial exoplanets in the Habitability Zone.

Methodology:

Usually, it is possible to calculate in a generalized way the flow of radiation emitted by a star through [2]:

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

Where F_{total} is the total radiation flow received by the planet, L_i it is the luminosity of the star, L_s the solar luminosity, d_i the distance from the planet to the star (AU) anda $W_i(T_{star})$ is the spectral weighting factor.

Initially the Gliese 892 and HD 40307 planetary systems were chosen for analysis, these systems were discovered by radial speed and analyzed by transit speed. Posteriormente, foi usado o site Habitable Zone in Multiple Star Systems (http://astro.twam.info/hz/) que através de dados fornecidos sobre o sistema, como temperatura, massa das estrelas type K (orange dwarfs), foi gerado um gráfico representativo da zona de habitabilidade. Finally, planetary systems discovered by radial velocity will be chosen that have not detected terrestrial exoplanets. In this way, the Rebound software will aim to discover terrestrial exoplanets that are in the habitability zone of these planetary systems [4].

Results and Discussion: Based on the information from the Gliese 892 system through the application used, it was possible to obtain the result of the habitability zone Fig.1:

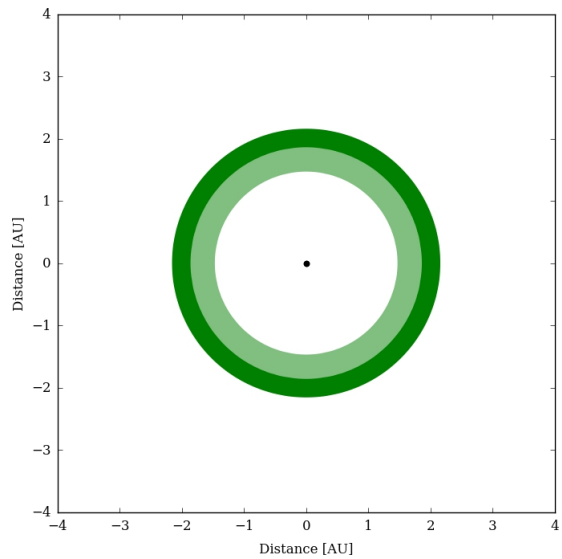

Fig.1 - System Habitable Zone Gliese 892

In the Same way, the HD 40307 system habitability zone was obtained, as shown in Fig.2:

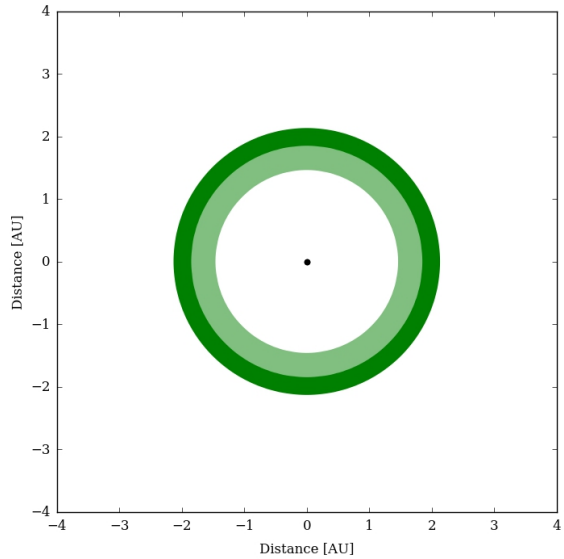

Fig.2 - System Habitable Zone HD 40307

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 type K stars (orange dwarfs). 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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