

FACTORS WHICH DEFINE DISCS APPEARANCE NEAR THE SUBSTARS. V. A. Zakhzhay¹, A. P. Vidmachenko², O. V. Zakhzhay². ¹V. N. Karazin Kharkiv National University, 4 Svobody Square, Kharkiv 61077, Ukraine, zhk@astron.kharkov.ua. ²Main Astronomical Observatory Ukrainian Academy of Sciences, 27 Acad. Zabolotny st, 03680, Ukraine, vida@mao.kiev.ua, zhkholga@mail.ru

Circumsubstellar discs become available for observation [1]. Some questions which required answers and theoretical studies are arose. First: what are the minimal requirements for physical characteristics (and what kind of them) of protostar, for its further evolution lead to the appearance of substar with disc? Second: how long is the stage of substars with discs evolution? Third: what factors influence on the disc destruction and on what conditions its further evolution lead to the planet formation by coagulation process? Fourth: how to define a problem to find the partial content of substars with discs as a solution?

It is proposed to use graphs for the fourth problem. The group of problems which should be solved for obtain the analytical and numerical solution is analyzed.

Based on the modern interpretation about star evolution and stars system formation, the substar discs formation in the main is the same as circumstellar disks formation. In general case, such process can be accompanied by formation of stars and substars which are the components of star-substar multiple systems. "Scenario" of such process depends on the density of angular momentum distribution (AMD) and another channel statistics of initial protostar system. Statistical theory, which allow calculate the partial mass content of its key elements exists [2-4]. It is offered to extend the functionality of such method to take into account the multiplicity calculation of star system components, where elements are the substars with the discs.

For the solution of problem posed, on this stage, [directed graph](#) which describe key phases of protostar evolution from which multiple star-substar system formed is constructed. Subgraphs, which belong to the last level of basic graph, are taken into account, according to existing concepts about AMD distribution in the protostar [5], three possible variation of its final state: radial compression into single component, substar with disc formation and tore formation which further evolution lead to the formation of multiple system of lower level hierarchy in the star system. Graph junctions are probability of key event, multiplication of which in the special sequence (which is in accord with the replacement of one event by another in the chosen evolutional scenario) permit to calculate partial content of substars with the discs.

Conducting researches permit to find required relative distribution function of physical properties for the calculation of partial content of intermediate and last components of forming star systems, which together allow solve the assigned task. The distribution functions which are describe star-

substars systems are required: 1) components number; 2) orbit component eccentricity; 3) orbit major (or minor) semiaxes; 4) secondary component mass function; 5) AMD distribution functions, which describes observational and modulate (specific evolutionary scenario of cascade formation) star systems.

Based on the represented list of required distribution functions for the star systems analysis ones can see that there is great its deficiency. Star multiplicity distribution function, calculated for the circumsolar population, doesn't take into account substar component, and such function doesn't exist even for nearest star clusters. Eccentricity density distribution for the multiple systems doesn't exist. There are histograms simulated for the binary systems major semiaxes distribution and partially for the distant components of triple systems. The further analysis is required to determine observational selection and substars calculation in such systems. Further constriction of such functions and histograms should to take into account substars components and higher multiplication factor. AMD distribution functions for multiple systems description isn't exist. The strategy for such model corresponding to the distribution functions doesn't generate. On the one hand it is because of it haven't been required before, on the other hand because of the problems in the star and substar axial rotation definition.

Introduced special statistic properties of the star systems can be the task program, which is required for the objective solution of the important fundamental problem, connected with multiple star systems formation, and particular: the question about substar (and star) discs and planet systems existence.

References: [1] Liu M. C. et al. (2003) *Astrophys. J.* 585, L372-L391. [2] Zakhzhaj V. A. (1995) *Astron. Astrophys. Transact.* 6, 221-228. [3] Zakhzhaj V. A. (1996) *Astron. Astrophys. Transact.* 10, 321-328. [4] Zakhzhay V. A. (2007) *D.Sc. (phys.&math.) thesis.* – Karazin KhNU, Kharkiv, 317 p. [5] Ruzmaikina T. V. (1981) *Letters to the Astron. Journ.* 7, 188-190.