ANALYSIS OF PROTOPLANETARY DISKS BASED ON THEORETICAL MODELS AND OBSERVATIONS

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Abstract. Although it is now well accepted by world scientists that exoplanetary systems are not uniform, there is a debate about how to explain their formation and diversity. In particular, one of the main shortcomings of these works is the correct explanation of the properties of protoplanetary disks, the place where planets formed, in the current models of planet formation.

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In recent years, much effort has been devoted to models of disc evolution, planet formation, and population synthesis. The precise process that governs the properties of disks during planet formation and the growth from dust grains to life factors and from the interplanetary zone to planetary cores remains unknown.

Planets form from dust and gas in disks around young stars. These disks are a natural result of the star formation process, and this means that all young stars can have planetary systems. Circumstellar disks are observed to evolve over several million years, eventually spreading, and are compared with the times of the nuclear accretion process and the formation of planets. This means that the processes of disk evolution and spreading play a decisive role in the formation of new planetary systems and contribute to the development of interplanetary diversity.

The surface density of young rotating discs is governed by evolutionary accretion, where stellar evolution results in slow development and eventual dissipation. A class of objects with an optically thick (dust) disc and a disc-less one in an intermediate state known as "transition discs" provide us with important insights into scattering mechanisms. However, it is clear to us that transition disks are a different class of objects. The particles they captured as they spread out their disc could not have been short-lived, but instead formed from another unique and long-lived event.

In planetary population synthesis models, some key parameters of disk structure and mass accretion rate are compared to observations. Such a comparison means, on the one hand, that the assumptions of the models are confirmed, and, on the other hand, that the current models should be revised.

Although it is now well accepted by scientists of the world that exoplanetary systems are not the same, there is a debate about how to explain their formation and diversity. In particular, one of the main shortcomings of these works is the correct explanation of the properties of protoplanetary disks, the place of the formation of planets, in the current models of the formation of planets.

In recent years, much effort has been devoted to models of disc evolution, planet formation, and population synthesis. The exact process that governs the transition from the properties of disks during planet formation, from dust grains to life factors, and from interstellar space to planetary cores, remains unknown.

According to theoretical models, planets form from dust and gas in disks around young stars. These disks are a natural result of the star formation process, and this means that all young stars can have planetary systems. Circumstellar disks are observed to develop and eventually dissipate over several million years, and are compared with the times of nuclear accretion and planet formation. This means that the processes of disk evolution and spreading play a decisive role in the formation of new planetary systems and contribute to the development of interplanetary diversity.

Based on theoretical data, young stars are explained by their spectroscopy, a wide range of infrared wavelengths, continuous emission, and storms around the rotating dust star that form the star and form planets around it during the evolutionary stage. The process of planet formation is divided into the following stages:

1. Star formation.
2. A huge disc.
3. Protoplanetary disc.
4. Disc diffusion.

We know from theory that the planet is created, formed and dispersed during the protoplanetary disk stage. However, observational results indicate the presence of large planets in the giant disk phase.[8]

So, in theory, the planet is not formed in the third stage, but it is formed earlier in the second stage. The protoplanetary disk stage does not form a planet, but the planets formed during this stage determine the position of the planet. Only observational and theoretical data are relevant in the first and last stages. In the first stage, a star is born, and in the last stage, it becomes a complete system.

Based on tracking data, we divide young faces into two categories:

1. Classic stars.
2. Weak stars.

These data were obtained from spectral analysis of young stars and were based on the strength of the emission line.

Observational results show us that population models resulting from theoretical calculations can be used only in medium-sized protoplanetary disks. The meridian dimensions of these models show a lower value. Thus, their distribution models are not identical when the ratio of disc mass differences is compared to theoretical models. Because the disc diffusion process is very small in the viscous time interval.

In contrast to observational models, models based on theoretical data do not take into account the constraints on the development and propagation of disks at real distances to which dust gaps are compared during the gas diagnostic transition. According to observations, there is such a gap between the giant disc and protoplanetary disc stages that a planet falling into this gap weakens and disintegrates due to the accretion rate of the disc during entry into the protoplanetary stage.

Even the photoevaporative model, the most perfect of the theoretical models, did not include all the solutions of the planet formation processes. We need models that include hydgodynamics to profile the disc chemistry, dust evolution, wind speeds, transition periods, and emission lines of the stellar heating sources.

In the formation of planets, the relative values of gas and dust in the disk play the most important role in determining how the disk develops and spreads. The era of quantitative modeling of planets can begin only after the quantitative parameters of the distribution of the disk are determined through observationally limited modeling.

Most of the theoretical models are not very large, i.e. smaller than expected disks. These models are not considered critical models on massive drives.

Observational and theoretical models have been developing extensively in recent years, thereby challenging classical views of disc evolution and propagation.

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