# FIREWORKS AROUND NAKED T TAURI STARS

A.V.Vityazev and G.V.Pechernikova
United Institute of Physics of the Earth, Moscow,123810, Russia

Our investigations have revealed new possibilities for searches and observations of circumstellar protoplanetary disks at the intermediate stages of planet formations in addition to strategies of discovery and investigation of protoplanetary gas-dust disks and other planetary systems. According to our estimates [1,2] the high-energy collisions of the large 100-1000 km bodies take place in the disks similar to the early circumso- lar disk at the stage of planet formation with protoplanets masses more than $0.1M_{\oplus}$($M_{\oplus}$ is mass of the Earth). Such collisions are attended with explosive processes with energy in the range $30<\log(Q/erg)<35$.

The result of the collisions of two bodies depends on the impact energy. If the impact energy is sufficient not only for disruption of the bodies but and for other dissipative losses, heating, melting and partial evaporation of the matter take place. It was pointed out earlier by a number of authors that the high-temperature (up to 10000 K) gas jets can be formed at the high-velocity collisions. This effect is of importance to the evaluation of the luminosity fluctuations in the optical, and IR ranges.

The generalized Boltzmann equation with the modified Smoluchowski operator [3] is sufficient to find the distribution function n(m,v,x,t) and to obtain simple relations for intermediate asymptotics in the mass and velocity spectra, which are necessary to make the resulting estimates of the

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frequency and amplitude of the luminosity fluctuations.

For the standard model of Solar preplanetary disk [1,2] in the zone of giant planets it was obtained:

$\nu(Q) \approx 7.5[\sigma/\sigma_{\oplus}][R/a.e.]^{-5/2}[\delta/4.5 gcm^{-3}]^{-2/3}[M_p/M_{\oplus}]^{2/3}[10^{30} erg/Q]$

in year, where $\sigma$ is the surface density, and $\delta$ is the density of bodies matter. For $L \approx Q/\Delta t$, where $\Delta t \approx 10^3 sec$ is the time of the jet life, and supposing that about 50% of $Q$ goes to $L$ we can obtain $\nu(L) \approx \{81[(10^{28} erg/sec)/L]^{5/6} + 2(10^{28} erg/sec)/L\}$ in year

So for the collisions in the vicinity of a star possessed the disk with the mass about 0.1 solar mass the durations of individual flashes are in the range from tens of minutes to several hours and their frequency is in the interval from thousands in a year for the events with Jupiter's luminosity to ones in a year for the events with luminosity about 1000 times higher. Such phenomena named by us "Fireworks" take place in the vicinity of young stars previously possessed gas-dust disks.

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References: [1]Vityazev A. et al."Terrestrial Planets",Nauka, Moscow, 1990,296p.(in Russian), [2]Vityazev A., Pechernikova G. Late Stages of Accumulation and Early Evolution of the Planets in "Planetary Sciences",Eds. T.Donahue, K.Trivers, D.Abramson, Washington, D.C.,1991, [3]Vityazev A. et al. Generalized Coagulation Equation...LPSC 25,1994.