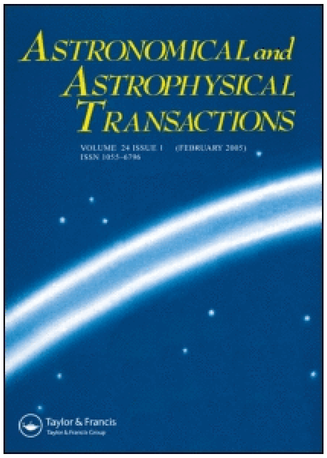

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"EXPLOSIVE" EVOLUTION OF GALAXIES AND QUASAR FORMATION EPOCH IN THE MERGER MODEL

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In the framework of the merger (coalescence) model (which is supported by many arguments) the explanation for "sudden" arising of quasars is suggested. Both the time dependence of their number during the formation epoch and the luminosity function are obtained in the simplest model.

KEY WORDS Galaxies, quasars, merger, coalescence, explosive evolution, luminosity function.

Our approach is based on the generalized Smoluchowsky kinetic equation which describes the mass and angular mementum distribution of the galaxies arising in a merging process. We use the model (Kats and Kontorovich, 1990) in which the activity is fueled by accretion on a compact nucleus owing to the momentum compensation in the merger process (the idea first proposed by A. Toomre). If the coalescence coefficient $U = \langle \sigma v \rangle$ (here σ is the cross-section, v is the relative velocity, the brackets $\langle\ \rangle$ denote averaging over the velocity) increases faster than the first power of the mass, then the formation of massive galaxies and active objects becomes "explosive," i.e., occurs in a short time interval at the critical moment (Kats *et al.*, 1991). This time of this event depends on the average matter density of the Universe, the characteristic mass of the original galaxy spectrum (localized in a small mass range) and the moment when low-mass galaxies had been formed.

We consider the "explosive" process in the differential approximation. It should be taken into account that the principal role is played by the interaction of massive galaxies with those of a smaller mass (which are much more numerous). The quasar luminosity function, which reaches a steady state at the moment t_{cr} has been obtained. It is a power law with the slope dependent on the exponent of the power-law mass spectrum of galaxies. For the solution obtained in the case of the contact collision with $U \propto (M_1 + M_2)^2$ (where M_1 and M_2 are the colliding galaxies masses), the power-law asymptotic form of the mass spectrum corresponds to a constant galactic number density flux along the spectrum. The obtained quasar luminosity function is $\varphi(L) \propto L^{-1}$, which agrees with the observational data of Koo and Kron (1988). Our results are discussed in more detail in Kontorovich *et al.* (1992).

For gravitational collisions with $U \propto (M_1 + M_2)(M_1^{1/3} + M_2^{1/3})$, the differential approximation is less reliable. There are certain reasons to believe that a power-law intermediate asymptotic form of the mass spectrum established due to the explosive process also corresponds to a constant galactic number density flux along the spectrum in a more general case, when $U \propto M^u (u > 1)$. For the activity model which we examine this leads to a universal quasar luminosity function ($\varphi \propto L^{-1}$) without any dependence on u. Specifically, for $u = \frac{4}{3}$ (in the case considered here) the mass spectrum of massive galaxies is proportional to $M^{-5/3}$ in the epoch of formation ($t \simeq t_{cr}$).

Note added in proof (10.09.92).

Of course in the direct vicinity of the t_{cr} the differential approach is not valid and the power spectrum may correspond apparently to the constant flux of mass along the spectrum, as it may be seen from the exact solution for $U \propto M_1 M_2$ (but not in the case $U \propto M_1 M_2$ where $t_{cr} = \infty$).

Note also that the elegant application of the similar idea (to formation the cD galaxies in the groups) have been published by A. Cavaliere, S. Colafrancesco & N. Menci, (1991). The merging runaway, Astrophys. J.Lett., **376,** L37–40.

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