# Onto the correlation between exoplanet mass and Toomre's parameter

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Correlations of the exoplanet mass with the local Toomre's parameter of the model protoplanetary disk have been studied. Exoplanet database used for correlation analysis consists from 500 confirmed candidates with well known eccentricity, star radius and surface temperature. We employ the minimal mass extrasolar nebula approach to construct protoplanetary disk model. Temperature of the disk is calculated using radial power law stratification consistent with modern observations of protoplanetary disks. We use the surface density, temperature and sound speed of the protoplanetary disk to calculate local Toomre's parameter at the initial stages of the planet formation. By doing these we ignore the effect of radial migration and adopt planet formation *in situ* model.

Our analysis indicates a strong correlation between the planet mass and local Toomre's parameter Q. It seems that this dependence is well described by power law with index -4/3. Moreover, we see two distinct populations of exoplanets: first with higher mass and the second with lower mass at the similar Q parameter.

Derived statistical property of the planet mass to Toomre's parameter dependence can be used to predict exoplanets and their masses to be discovered in future in multiplanetary systems, where only one exoplanet is yet discovered. Moreover, direct correlation between the final product of the planet formation with properties of initial protoplanetary disk pose new constraints on the theory of planet formation and particularly, on the commonly accepted three stage core accretion model.

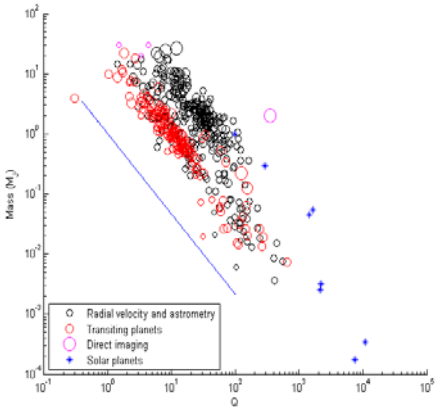


**Figure 1.** Exoplanet mass vs Toomre's parameter Q. Solid line indicates -4/3 power law slope for comparison.