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On 3d kinetic approach to the global modeling of magnetotail/solar streamer

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In terms of Vlasov kinetic approach we consider a classical problem of "blow up" by solar wind flow of the 3D magnetic structures around specific external current sources. The developed methods are relevant to the analysis and interpretation of features of the 3D structure of magnetospheric tail, as well as that of the solar coronal streamer. The external source is taken as a superposition of the magnetic dipole and toroid, Plasma in the flow is assumed to be hot and collisionless, having the maxwellian distribution function. From the linear analytical approach we calculate a global 3D magnetic configuration, defined in terms of two different kinds of cylindrical harmonics. A dipole generates 3D "two wire" magnetic rope current configuration (cylindrical dipole harmonics) which is observed in the far down tail regions of the magnetosphere. Toroid generates classical 3D "theta type" current configuration (cylindrical toroid harmonics) with a neutral sheet inside typical for the near-source regions. Separation of two types of configuration in the magnetotail / coronal streamer structure we associate with difference and mutual perpendicular orientation of the sources: dipole and toroid. Toroid is spatially more complicated current system and its current is defined by higher order derivatives. Both kinds of harmonics are expressed via derivatives of the characteristic function which has a power law decay in the asymptotic case. Downward from the sources the "theta type configuration" decays in the plasma flow faster than the "two wire configuration". The developed kinetic approach taking account of a specific (not previously considered in the similar cases) plasma spatial dispersion features and parameters gives us a possibility to obtain a real selfconsistent 3D fine structure of the magnetic configuration in the far regions of magnetotail / coronal streamer.