# Measuring the mean mass density of the universe using the Monge-Ampère-Kantorovitch reconstruction

G. Lavaux[1]

13 December 2006

[1] Institut d'Astrophysique de Paris, 98bis Boulevard Arago, 75014 PARIS, FRANCE

*Abstract submitted to EE250*

The Monge-Ampère-Kantorovitch (MAK) reconstruction method is a way to solve the mass transport problem for mixed boundary conditions. Assuming that displacement field of the fluid elements between the recombination time and the present time is deriving from a convex potential, the MAK reconstruction gives the unique solution satisfying those constraints. It has been tested with success on $N$-body simulations by Mohayaee et al. [**?**]. If one compares the reconstructed displacement field to the measured peculiar velocity field in galaxy catalogs it is possible to infer the mean mass density $\Omega_m$ of the universe. However galaxy catalogs suffer important observational biases such as redshift-space distortion, galaxy incompleteness in a given volume, unknown relation between the luminosity and mass of objects and both systematic and statistical error in the peculiar velocity field measurement. I propose here to prove that the MAK reconstruction is resistant to these biases provided one applies correction before, during and after the reconstruction of the displacement field. This work gives also some hints to the expected systematics and ways to avoid them.