1086-46-1954 **Alice Guionnet** and **Dimitri Shlyakhtenko*** (shlyakht@math.ucla.edu), Department of Mathematics, UCLA, Los Angeles, CA 90095. *Free monotone transport.*

By solving a free analog of the Monge-Ampere equation, we prove a non-commutative analog of Brenier's monotone transport theorem: if an n-tuple of self-adjoint non-commutative random variables $Z_1, ..., Z_n$ satisfies a regularity condition then there exist invertible non-commutative functions F_j of an n-tuple of semicircular variables $S_1, ..., S_n$, so that $Z_j = F_j(S_1, ..., S_n)$. Moreover, F_j can be chosen to be monotone, in the sense that $F_j = D_j g$ and g is a non-commutative function with a positive definite Hessian. In particular, we can deduce that $C^*(Z_1, ..., Z_n) \cong C^*(S_1, ..., S_n)$ and $W^*(Z_1, ..., Z_n) \cong L(F(n))$. We obtain as a consequence that the q-deformed free group factors $\Gamma_q(R^n)$ are isomorphic (for sufficiently small q, with bound depending on n) to free group factors. We also partially prove a conjecture of Voiculescu by showing that free Gibbs states which are small perturbations of a semicircle law generate free group factors. Lastly, we show that entrywise monotone transport maps for certain Gibbs measure on matrices are well-approximated by the matricial transport maps given by free monotone transport. (Received September 24, 2012)