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We consider the evolution problem associated to the following infinity fractional Laplacian operator Δ_∞^s introduced by Bjorland, Caffarelli and Figalli as the infinitesimal generator of a non-Brownian tug-of-war game:

$$\sup_{|y|=1}\inf_{|\tilde{y}|=1}\int_0^\infty \left(\phi(x+\eta y)+\phi(x-\eta\tilde{y})-2\phi(x)\right)\frac{\mathrm{d}\eta}{\eta^{1+2s}}.$$

We first construct a class of viscosity solutions of the initial-value problem for bounded and uniformly continuous data. An important result is the equivalence of the nonlinear operator in higher dimensions with the one-dimensional fractional Laplacian when it is applied to radially symmetric and monotone functions. Thanks to this and a comparison theorem between classical and viscosity solutions, we are able to establish a global Harnack inequality that, in particular, explains the long-time behavior of the solutions. Finally, we propose a fully discrete and monotone finite-difference scheme, and support our theoretical results with numerical evidence.

The talk will be based on results appeared in [1, 2].

References

[1] F. del Teso, J. Endal, M. Lewicka. *On asymptotic expansions for the fractional infinity Laplacian*. Asymptot. Anal. **127**(3) (2022) 201-216.

[2] F. del Teso, J. Endal, E. R. Jakobsen, J. L. Vázquez. *Evolution Driven by the Infinity Fractional Laplacian*. (2022) Preprint: arXiv:2210.06414, 2022.

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