IF A SCALAR FIELD IS INTRODUCED AS A THERMODYNAMIC STATE VARIABLE, THEN THE SECOND LAW OF THERMODYNAMICS CONSTRAINS THE FIELD TO BE ONLY GRAVITY.

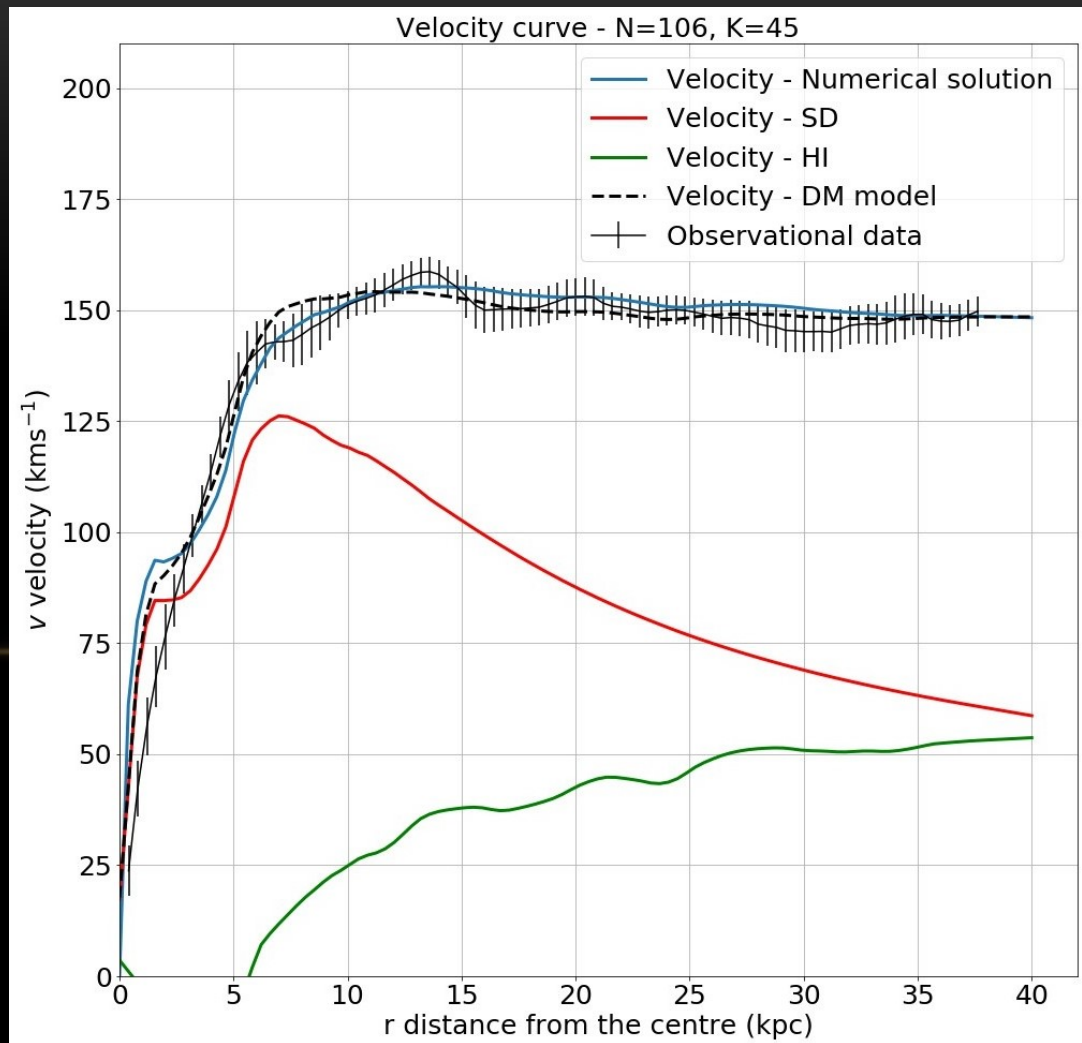Máté Pszota, Peter Ván and Sumiyoshi Abe

Thermodynamic modified gravity and dark matter

poster

$$\Delta\varphi = 4\pi G\rho + K(\nabla\varphi)^2$$

$$\varphi_{vacuum}(r) = \frac{1}{K}\ln\frac{r}{K + Cr} + \varphi_0$$

The obtained field equation includes an additional square gradient term, resulting in a modified vacuum potential.

Velocity curve - N=106, K=45

The solution with galactic density distribution
is similar to dark matter.