We consider the relaxation model

$$\left\{\begin{array}{lcc} u_t + v_x & = & 0 \\ v_t + u_x & = & (f(u) - v)/\epsilon \end{array}\right.$$

with $u \in I\!\!R^n$, $f : I\!\!R^n \mapsto I\!\!R^n$. We assume that Df is strictly hyperbolic with eigenvalues strictly less than 1 and the initial data (u_0, v_0) have small total variation.

We prove that the solution (u^ϵ, v^ϵ) is well defined for all $t > 0$, and its total variation satisfies a uniform bound, independent of t, ϵ. Moreover, as ϵ tends to 0, the solutions (u^ϵ, v^ϵ) converge to a unique limit $(u(t), v(t))$: $u(t)$ is the unique entropic solution of the corresponding hyperbolic system $u_t + F(u)_x = 0$ and $v(t, x) = F(u(t, x))$ for all $t > 0$, a.e. $x \in I\!\!R$.

The proof relies on the introduction of a new functional for the solutions of (u^ϵ, v^ϵ), corresponding to the Glimm-Liu interaction potential for the waves of same families.