

On the behaviour of a non-local problem modeling linear welding

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A non-local parabolic equation of the form

$$u_t = u_{xx} + f(u) / \left(\int_0^\infty f(u) dy \right)^{1+a}, \quad (1)$$

modeling linear friction welding is studied. The equation applies on the half line and is complimented with boundary conditions of the form

$$u_x = 0 \quad \text{on} \quad x = 0 \quad (2)$$

and

$$u_x \rightarrow -1 \quad \text{as} \quad x \rightarrow \infty. \quad (3)$$

For $f(u) = e^u$, global existence and convergence to the unique steady state are proved. Numerical calculations are also carried out for this case and for $f(u) = (-u)^{1/a}$