

On the Maximum Principle for Pseudoparabolic Equations

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Introduction

Let A be an m -accretive operator in a Banach space X ; it is well-known that if its resolvents J_λ satisfy:

$$(1) \quad \forall \lambda > 0 \quad J_\lambda C \subset C,$$

for a given closed convex set C of X , then the solution of:

$$(P) \quad \frac{du}{dt} + Au \ni 0, \quad u(0) = u_0,$$

satisfies:

$$(2) \quad u_0 \in C \Rightarrow \forall t \quad u(t) \in C.$$

Here, we study the same problem for the associated pseudoparabolic equations:

$$(PP) \quad \frac{d}{dt} (u + \lambda Au) + Au \ni 0, \quad u(0) = u_0 \quad (\lambda > 0).$$

or, more generally, if $A(t)$ is a family of m -accretive operators satisfying (1):

$$(PP)_t \quad \frac{d}{dt} (u + \lambda A(t)u) + A(t)u \ni 0, \quad u(0) = u_0.$$

In order to exhibit a concrete situation, we remark that equation $(PP)_t$ contains as a particular case, the following problem:

$$(E) \quad \begin{cases} \frac{\partial}{\partial t} (u - \lambda \Delta u) - \Delta u = 0 & \text{in } \Omega \times [0, T[\\ u(t)|_{\partial\Omega} = g(t), & u(0) = u_0, \end{cases}$$