Meeting: 999, Nashville, Tennessee, SS 11A, Special Session on Nonlinear Partial Differential Equations and Applications

999-35-129 **J Ildefonso Diaz** and **Georg Hetzer*** (hetzege@auburn.edu), 304 Parker Hall, Department of Mathematics and Statistics, Auburn University, AL 36849-5310, and **Lourdes Tello**. *A Degenerate Parabolic Functional Differential Equation with Hysteresis.* Preliminary report.

Simple heuristic climate models lead to reaction-diffusion equations on the 2-sphere M with slow diffusion and memory. Additionally, the reaction part exhibits a jump discontinuity in case of so-called Budyko-type models. Here, we supplement such a model by a Babuška-Duhem hysteresis term as a tool for simulating the frequent repetition of sudden and fast warming followed by much slower cooling as observed from paleoclimate proxy data. Thus, we obtain (by passing to an upper semi-continuous "multi" in accounting for the jump discontinuity)

$$\partial_t[c(x)u + w] - \nabla \cdot [k(\cdot)\,|\nabla u|^{p-2}\,\nabla u] + g(u) \in F(t, x, u, v) \qquad x \in M,\ t > 0,$$

where the hysteresis term w is given by

$$\partial_t w(t, x) = h_I(t, x, v, w)[\partial_t v(t, x)]^+ - h_D(t, x, v, w)[\partial_t v(t, x)]^-$$

and $v(t, x) := \int_{-T}^{0} \beta(s, x)u(t + s, x)\, ds$ is a weighted long-term mean of the temperature u in Kelvin. Global existence for nonnegative initial conditions and the existence of a trajectory attractor are established in a climatologically appropriate setting. (Received August 18, 2004)