Kateryna Marynets
kateryna.marynets@univie.ac.at
University of Vienna, Austria

On a Two-Point Boundary Value Problem in Geophysics

We present some results on the existence and uniqueness of solutions of a two-point nonlinear boundary value problem

$$\begin{cases} u''(t) = a(t)\,F(u(t)) - b(t)\,, & t \in (0,1)\,, \\ u(0) = u(1) = 0\,, \end{cases} \tag{1}$$

where $F : \mathbb{R} \to \mathbb{R}$ is a given continuous function and a, $b : [0,\infty) \to [0,\infty)$ are given bounded continuous functions satisfying

$$\int_0^\infty [a(s) + b(s)]\,ds < \infty\,, \tag{2}$$

that was recently derived as a model for the azimuthal horizontal jet flow components of the Antarctic Circumpolar Current.

The existence of nontrivial solutions is of considerable interest, since these correspond to azimuthal flows that feature variations in the meridional direction, being thus models that capture the essential geophysical features, confirmed by field data. In the current research we apply an approach that guarantee existence if the general initial-value problem does not present the finite-time blow-up phenomenon and if a somewhat more general associated boundary-value problem has at most one solution.