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STABILITY ANALYSIS OF SHALLOW FLOWS WITH VARIABLE FRICTION FORCE

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Linear and weakly nonlinear stability analysis of shallow flows is presented in the paper. The combined effect of two factors is investigated: (a) small curvature and (b) variable friction in the transverse direction of the flow. The linear stability problem is solved numerically for different values of the parameters of the problem. Both spatial and temporal approaches are used in the analysis. Linear stability characteristics of the flow are obtained using collocation method based on Chebyshev polynomials.

Weakly nonlinear theory [1] is used to analyze stability of non-parallel flow. It is assumed that the base flow is slightly changing downstream (the small parameter in an asymptotic expansion characterizes non-parallelism of the base flow). Introducing an amplitude function which depends on a slow longitudinal coordinate, using shallow water equations under the rigid-lid assumption and the WKB method we derive an amplitude evolution equation for the unknown amplitude.

REFERENCES

[1] C Gordeche and P. Manneville. *Hydrodynamics and nonlinear instabiliites*. Cambridge University Press, Cambridge, 1998.