ASTR/ATOC-5410: Fluid Instabilities, Waves, and Turbulence

Project description November 14, 2016, Axel Brandenburg

Project on solitons

Background

Many soliton-containing equations have been studied by now. Particularly intriguing is perhaps the Camassa–Holm equation (Camassa & Holm, 1993), because its soliton solution contains a discontinuity in the derivative. For a recent review, see the paper by Johnson (2003).

Project details

1. Review the extensive literature in the field.
2. Implement an implicit solver for the Camassa–Holm equation.
3. Study numerically the collision properties of solitons of different heights.
4. Investigate the possibility of oscillatory solutions.
5. Discuss similarities and differences to the KdV equation.

References

Camassa, R., & Holm, D. D., "An integrable shallow water equation with peaked solitons," *Phys. Rev. Lett.* **71**, 1661-1664 (1993).

Johnson, R. S., "Camassa Holm, Korteweg de Vries and related models for water waves," *J. Fluid Mech.* **455**, 63-82 (2003).