1 Modifications

Here I go through my corrections to Chris's paper using the section titles as subsections

1.1 Abstract

- I think we should use conservation laws, or equations in conservative law form instead of hyperbolic equations in reference to the techniques we use.

1.2 Introduction

- "is used to solve the stiff source term, which contain the ..." should be 'contains'
- "with the water depth and a new quantity as conservative variables", should it be conserved instead of conservative?

1.3 Solving the Serre Equations Written in Conservation Law Form

1.3.1 Approximate Riemann Solver

Here the change is rather significant, I have changed the way we handle u assuming it is continuous. So basically we can use what is already written below equation (24) for all the variables except u. Then in addition we have to add how we handle u.
For the First and Second order method the derivative of u at the edge is:

$$\left(\frac{\partial u}{\partial x}\right)_{j+\frac{1}{2}} = \frac{u_{j+1} - u_j}{\Delta x}$$

For the third order method the derivative of u at the edge is:

$$\left(\frac{\partial u}{\partial x}\right)_{j+\frac{1}{2}} = \frac{-u_{j+2} + 27u_{j+1} - 27u_j + u_{j-1}}{24\Delta x}$$

Now for the u reconstruction. For the first and second order method we use

$$u_{j+\frac{1}{2}} = \frac{u_{j+1} + u_j}{2}$$

for the third order method

$$u_{j+\frac{1}{2}} = \frac{-3u_{j+2} + 27u_{j+1} + 27u_j - 3u_{j-1}}{48}$$

1.4 Numerical Simulations

1.4.1 Steady Flow over a Bump

Because of this change in the handling of u I think it is only appropriate to change the source term's gradient of u as well. So now in S_{ci} instead of

$$\frac{u^-_{j+1/2} - u^+_{j-1/2}}{\Delta x}$$

it should be replaced with

$$\frac{u_{j+1} - u_{j-1}}{2\Delta x}$$

This change has improved our results for conservation of the energy, also I think it is probably more informative to a reader to give both $\mathcal{H}(0)$ and $\mathcal{H}(50s)$ then report the relative error. From my experiments I have:

$$\mathcal{H}(0) = 2250.56717819$$

$$\mathcal{H}(50s) = 2250.56244098$$

So we have

$$\frac{|\mathcal{H}(0) - \mathcal{H}(50s)|}{|\mathcal{H}(0)|} = 2.1048960662740493 \times 10^{-6}$$