**Reviewer 1:**

TITLE

Importance of Dispersion for Shoaling Waves

REVIEW

This paper compared the effectiveness of two sets of 1D equations for modelling near shore tsunami wave behaviour - Serre equations and the shallow water equations. The Serre equations include terms which account for wave dispersion which is important for accurately modelling near shore behaviour. Whilst the results are compelling, it would be beneficial to know at exactly what wavelength/depth-ratio the shallow water equations are no longer adequate.

I have included the standard wavelength to depth ratio limit in the paper H/ λ ≤ 1 / 20. I have calculated this ratio for the Beji and Battjes data.

Also it would be good to understand how much more expensive the Serre equations are than the shallow water equations - also in 2d. Overall I find the results of applying equations beyond their inherent derivation assumptions rather unsurprising, specifying more concisely the range of applicability of the equations will be more beneficial to others.

I have included a statement comparing the run-times of our methods for the SWWE and the Serre equations in 1D. We find that for our methods the Serre equations run 50% longer than the SWWE. Unfortunately we only have a method in 1D at this moment, and so we cannot comment on it in 2D.

While I agree that it is not surprising that the SWWE are unable to model this situation, I do think its surprising to see how inadequate the SWWE were, and how important dispersive effects were during shoaling. I think its also important to see in what ways these equations may fail as they form the basis of our current inundation modeling programs. In addition, it demonstrates that current inundation models should migrate to the Serre equations.

Minor comments:

\* Abstract line 3: What does "relatively" shallow mean? Is there a ratio normally specified?

Line has been modified.

\* Section 2: Please show the wave tank in a diagram with the wave gauges indicated.

Figure added.

\* Figures 1 & 2: Please merge together. Also fix so there is less white space.

Figures merged and white space removed.

**Reviewer 2:**

This study used serre and shallow water wave equations to model the dispersion of shoaling waves.The paper is logically structured and well written. The conclusions are supported by the results. Thus I recommend this paper to be published with minor revisions.

Minor comments:

Introduction: Clearly state what is the novalty of this study (which part has never been done before); briefly explain why you choose the experiments of Beji and Battjes (1994) for your study.

Although the paper is not novel it is a reminder that there are limitations in current modeling approaches that are based on the Shallow Water wave equations for modeling tsunamis. This is demonstrated with data from experiments that contain bathymetry. Beji and Battjes is one of a handful of experiments that are available to perform the comparison. Others are Dingemans (1994) and Roeber et al. (2012).

Section 2: How did the Serre equations perform at longer wavelength?

I have included the Serre equations results for the longer wavelength experiment, and included some lines to draw attention to the point that as wavelengths are increased the Serre equations will reduce to the shallow water wave equations.

Section 3: It feels like you are creating a situation to suit your equations. Try to write it the other way around: What is it like in reality? Certain equations are suitable for certain conditions.

We chose a solitary wave as an example because in this case the shallow water wave equations are valid and the bathymetry and solitary wave would be typical of a tsunami traveling from the continental shelf towards the shoreline. It has the added bonus of demonstrating the negligible effect of dispersion for long waves with small amplitudes, as the SWWE reproduce it well.

Figure 4: I assume the numerical solution of the shallow water equations is not able to replicate the amplifying undulations at the front of the bore, which is the main characteristic of shoaling waves. How does it compare to the observations?

Yes these undulations at the front of the bore are due to dispersive effects acting on the different frequencies contained in the steep wave. I have added a reference to an experiment by Chanson which demonstrates undulations on top of bores in addition to some numerical results that demonstrate these as well.