



## ReefSAM - Reef Sedimentary Accretion Model: A new 3D coral reef evolution model/simulator

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Coral reefs show characteristic morphological patterns (e.g. coral dominated margins with detrital carbonate dominated lagoons/back-reef) and temporal development (e.g. Hopley et al. 2007). While the processes which lead to predictable patterns on a range of scales have been discussed qualitatively, a full quantitative understanding of the range of processes and parameters involved requires modelling. Previous attempts to model complex Holocene reef systems (i.e. One Tree Reef, GBR - Barrett and Webster 2012) using a carbonate stratigraphic forward model (Carbonate3D - Warrlich et al. 2002) identified a number of important but unsimulated processes and potential model improvements. ReefSAM has been written from scratch in Matlab using these findings and experiences from using Carbonate3D. It simulates coralgal accretion and carbonate sand production and transport. Specific improvements include: 1. a more complex hydrodynamic model based on wave refraction and incorporating vertical (depth) and lateral (substrate dependent) variations in transport energy and erosion. 2. a complex reef growth model incorporating depth, wave energy/turbidity and substrate composition. 3. Paleo-water depth, paleo-wave energy and bio-zone (combination of paleo-water depth and wave energy) model outputs allowing coralgal habitat changes through time and space to be simulated and compared to observational data. The model is compared to the well studied One Tree Reef - tests similar to those undertaken in Barrett and Webster 2012 with Carbonate3D are presented. Model development coincides with plans for further intensive drilling at One Tree Reef (mid 2013) providing an opportunity to test the model predictively. The model is still in active development.

### References:

Barrett, S.J., Webster, J.M., 2012. Holocene evolution of the Great Barrier Reef: Insights from 3D numerical modelling. *Sedimentary Geology* 265-266, 56-71.

Warrlich, G.M.D., Waltham, D.A., Bosence D.W.J., 2002. Quantifying the sequence stratigraphy and drowning mechanisms of atolls using a new 3-D forward modelling program (CARBONATE 3D). *Basin Research* 14, 379-400.

Hopley, D., Smithers, S.G., Parnell, K.E., 2007. The geomorphology of the Great Barrier Reef. Cambridge.