A 3D baroclinic model of the Burdekin River Plume

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1. Introduction

The Burdekin River is the largest single source of sediment delivered to the Great Barrier Reef (GBR), Australia. Understanding its dynamics is crucial for studying the evolution of the ecological system in the GBR. Lewis *et al.* (2014) has shown recently that, according to field data, most sediment deposits within 50km of the river mouth, which contrasts with previous theories. A simulation of the Burdekin dynamics can support this new theory.

2. SLIM 3D model

SLIM 3D is a baroclinic discontinuous galerkin finite element model, developed to study coastal flow dynamics (Kärna *et al.* 2012). Up to now, it has only been applied to simple test cases. Applying it to the Burdekin river is a challenge due to the complexity of the geometry and the physical processes occurring there. One of the main drawbacks of SLIM 3D model is that in the presence of large density gradients, big overshoots appear. This problem can be solved with the use of limiters (Cockburn and Shu 1998, Aizinger 2011). However this approach leads to a loss of accuracy since the fields can be constant per element where they are limited. Increase the mesh resolution with an adaptive vertical grid (Burchard and Beckers 2002) at those places can help to recover a better accuracy.

3. Burdekin River Plume model

In the presentation, the effect of different limiters on the stability and tracer consistency will be presented and compared. The influence of the adaptive vertical grid will be studied through the Burdekin River Plume model. The results of the study will be expounded. As shown on Fig. 1., the thickness of the sediment deposit layer outside the region described by Lewis *et al.* (2014) is less than 0.1mm, two orders of magnitude lower than close to the river mouth. Through this application, the pros and cons of SLIM 3D will be exhibited.

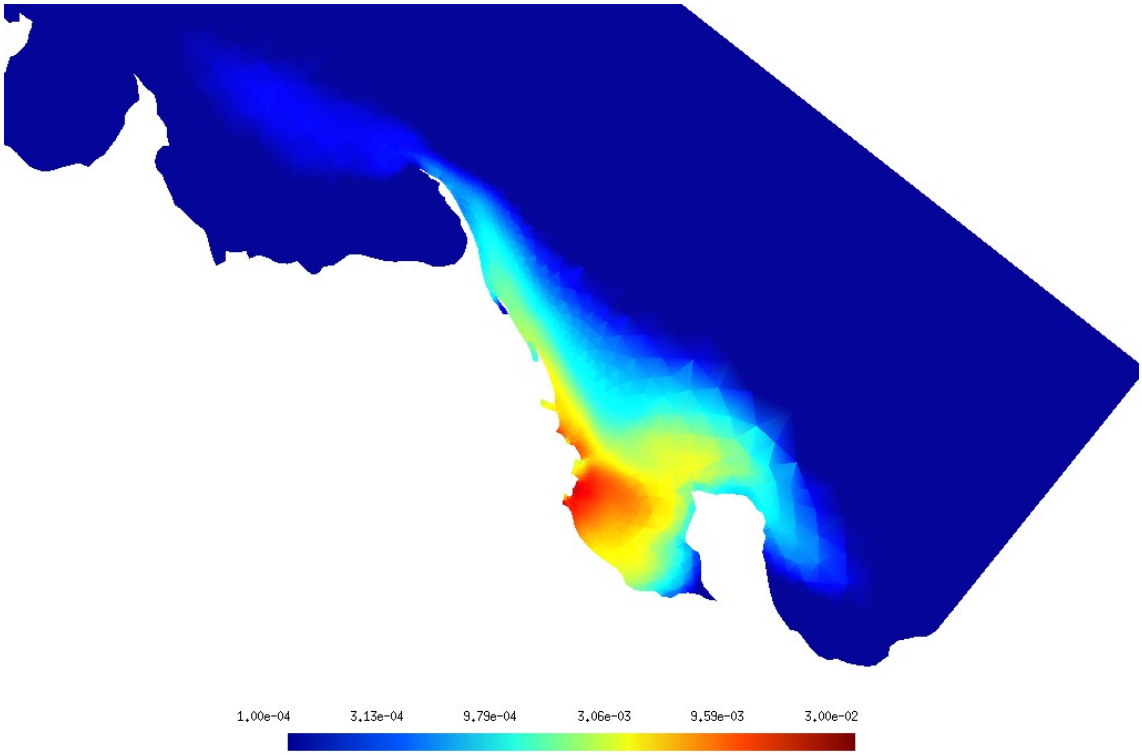

Fig. 1. Sediment deposition at the Burdekin river mouth simulated with SLIM 3D (units: [m])

4. References

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