

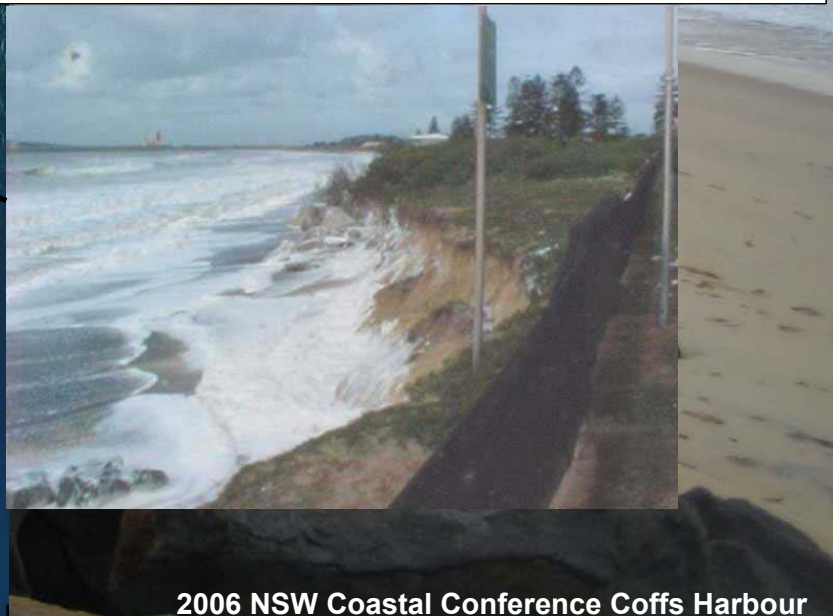
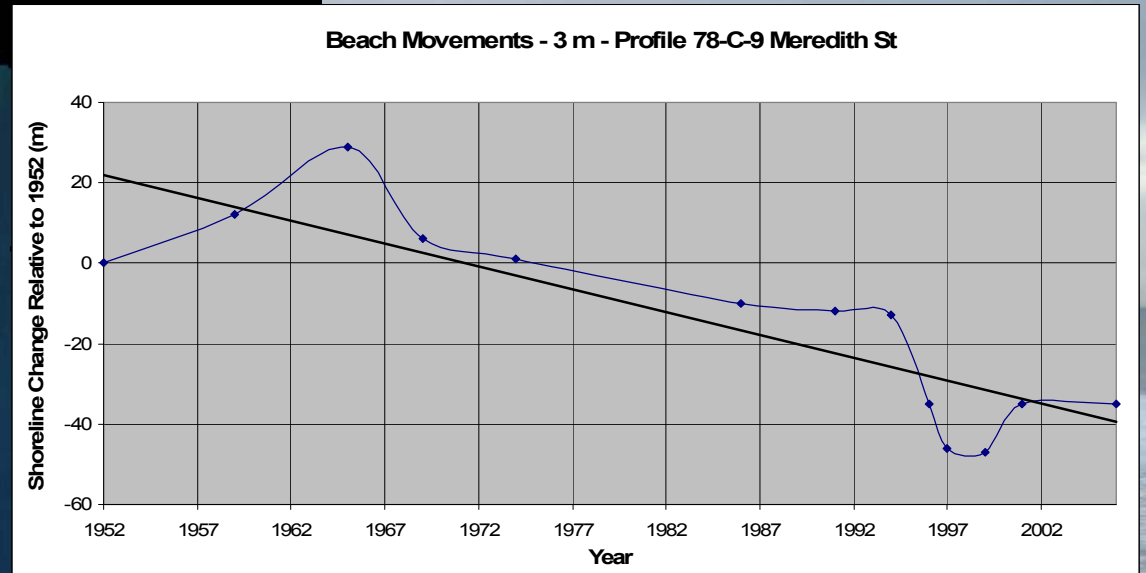
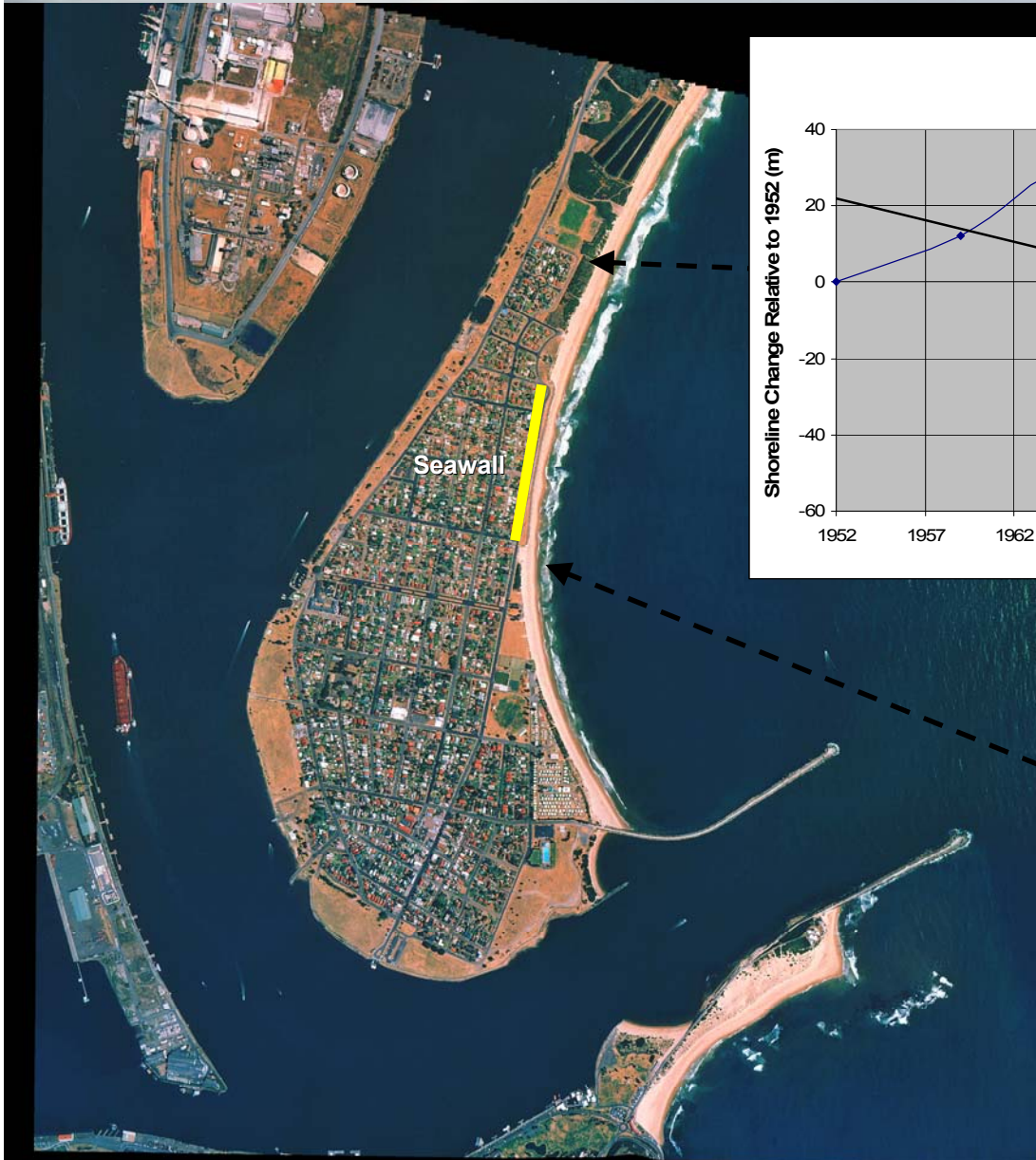


**A State-of-the-Art Modelling Approach to
Assess Coastal Processes at Stockton Beach**

Juan Savioli, David Hanslow, John Simpson,
Frank Cosgrove and R. Ranasinghe

November 9, 2006

Introduction



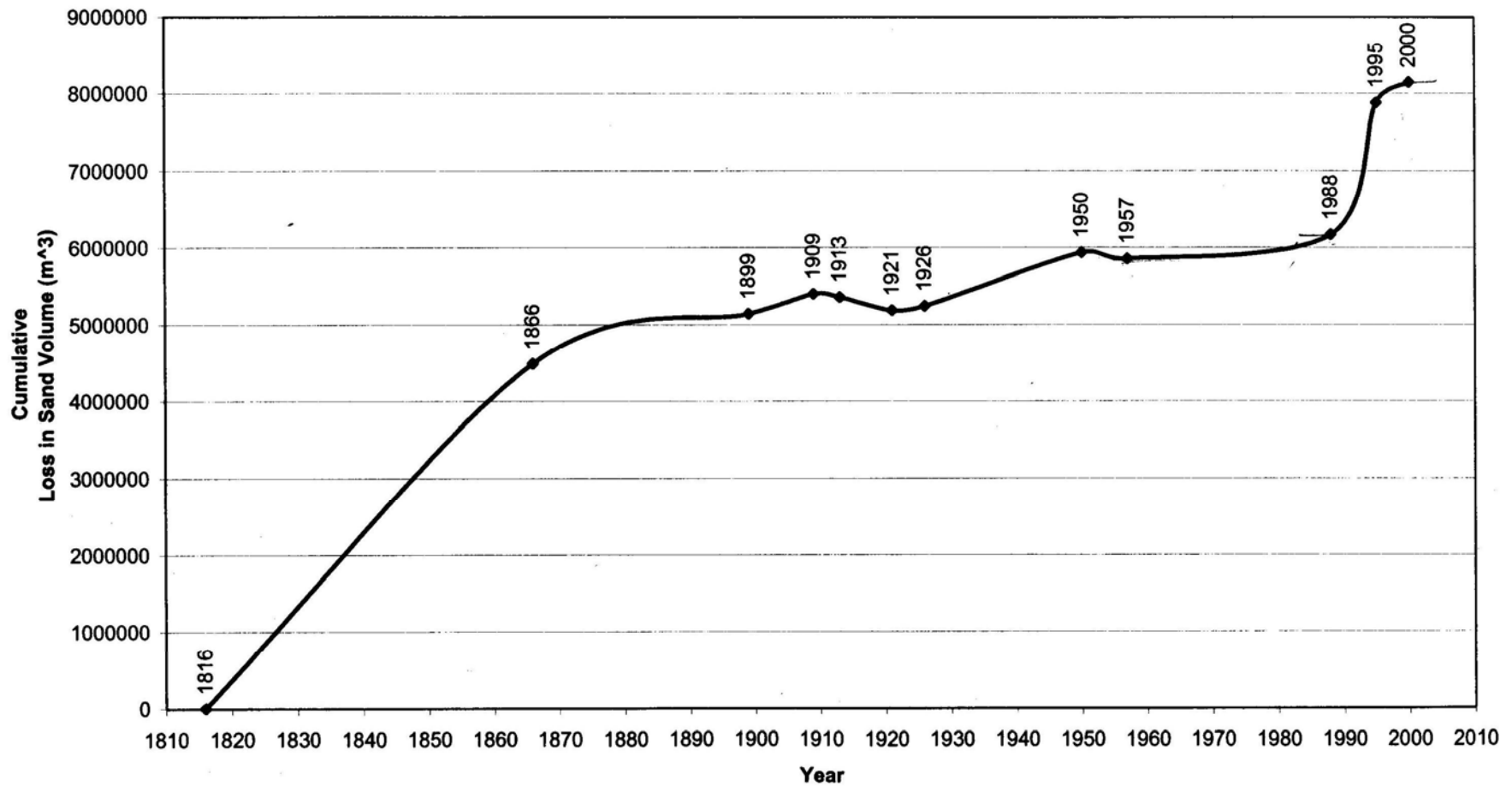
2006 NSW Coastal Conference Coffs Harbour

Some Previous Studies

- **Stockton Beach Coastal Engineering Advice - PWD (1985)
Addendum PWD (1987)**
- **Stockton Beach Coastline Hazard Study, DLWC (1995)**
- **Newcastle Coastline Hazard Definition Study, WBM (1998)**
- **Shifting Sands at Stockton Beach , Umwelt SMEC (2002)**
- **Newcastle Coastline Management Study, Umwelt (2003)**

Historical Evolution

Estimated Change in Sand Volume off Stockton Beach (1816 to 2000)
Umwelt (2002)



Proposed Study

Stage 1 - Process Study

Prediction of on-going beach processes;

Stage 2 – Management Study

Identification and assessment of management options;

Stage 3 – Coastline Management Plan Revision

Revision of the Newcastle Coastline Management Plan 2003.

Proposed Methodology Stage I

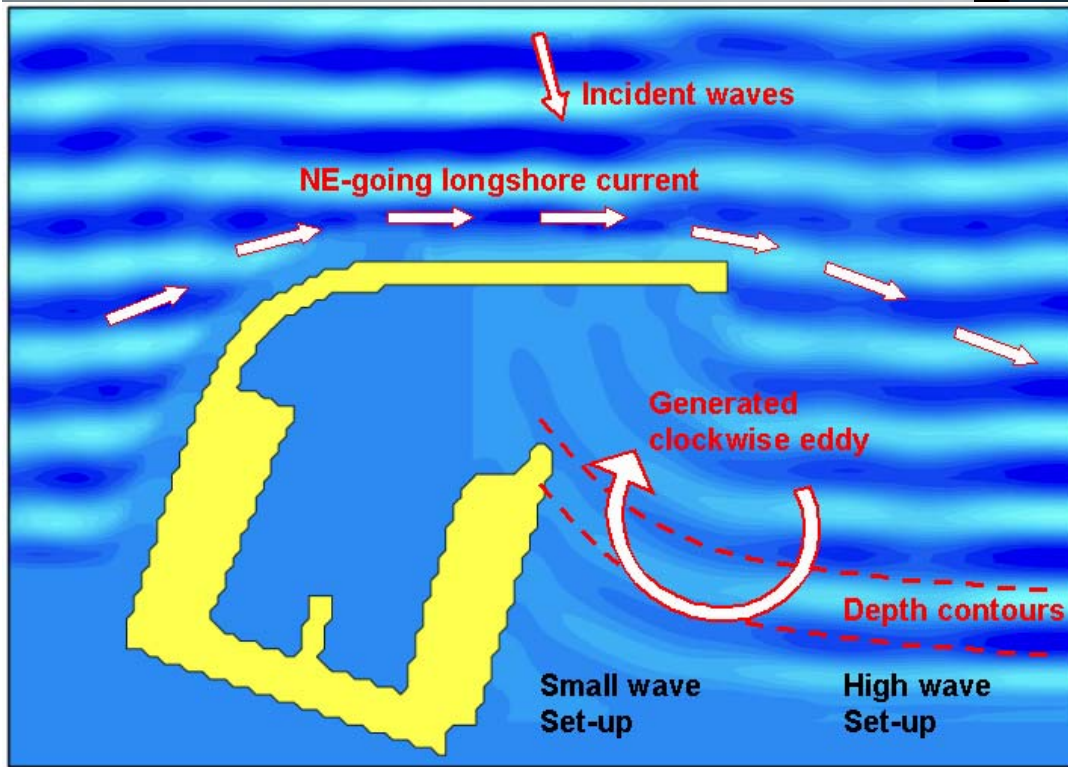
Data Collection and Analysis

**Development, Calibration and
Verification
of a Numerical Model**

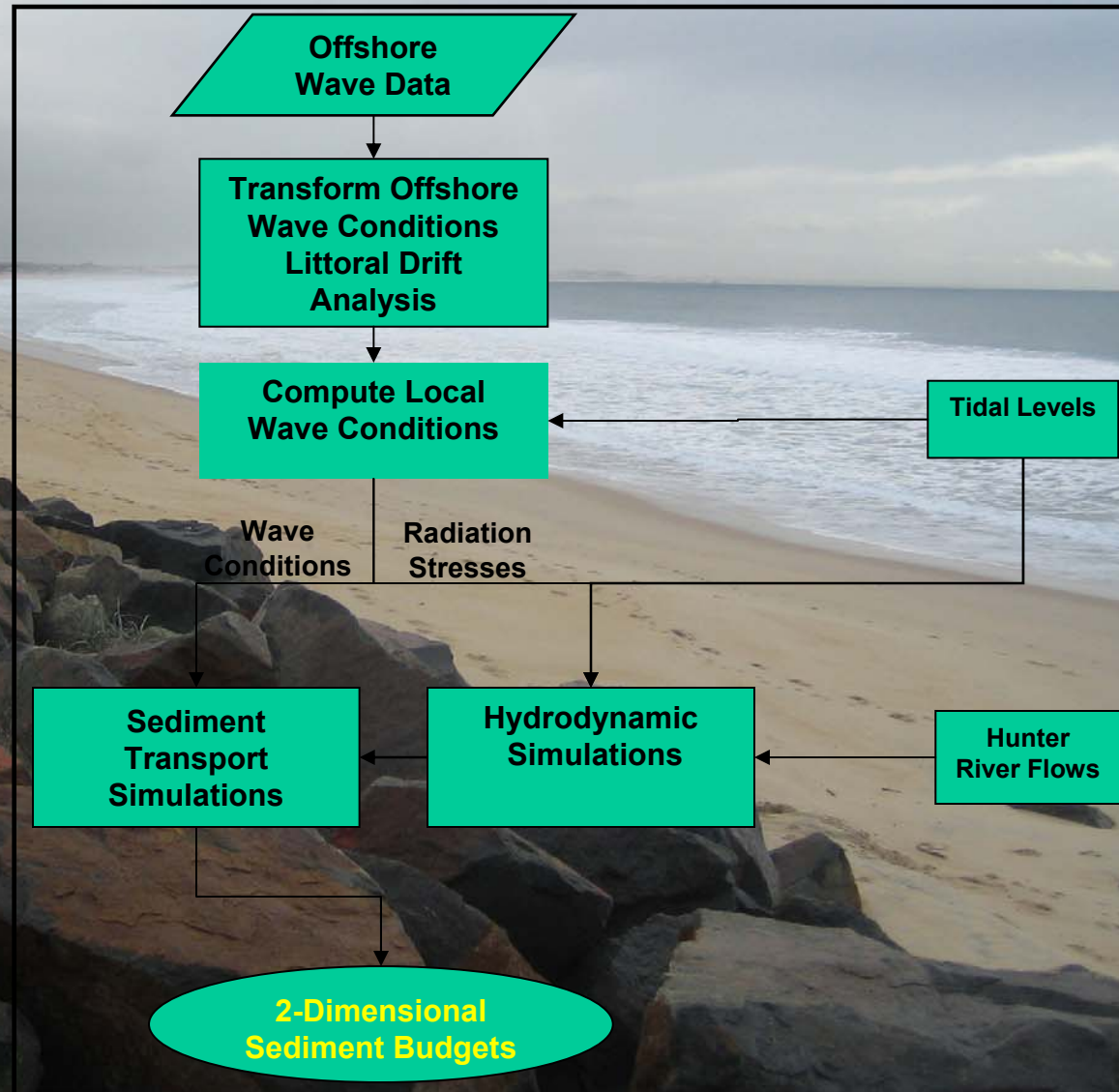
**2-D Modelling of Coastal
Processes**

**Analysis and Description of
On-Going Coastal Processes**

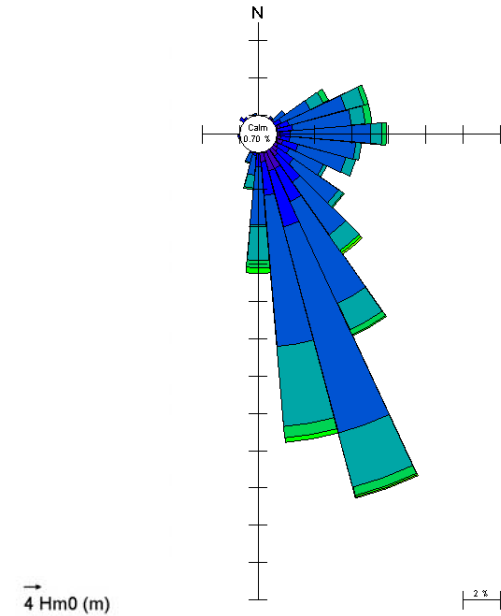
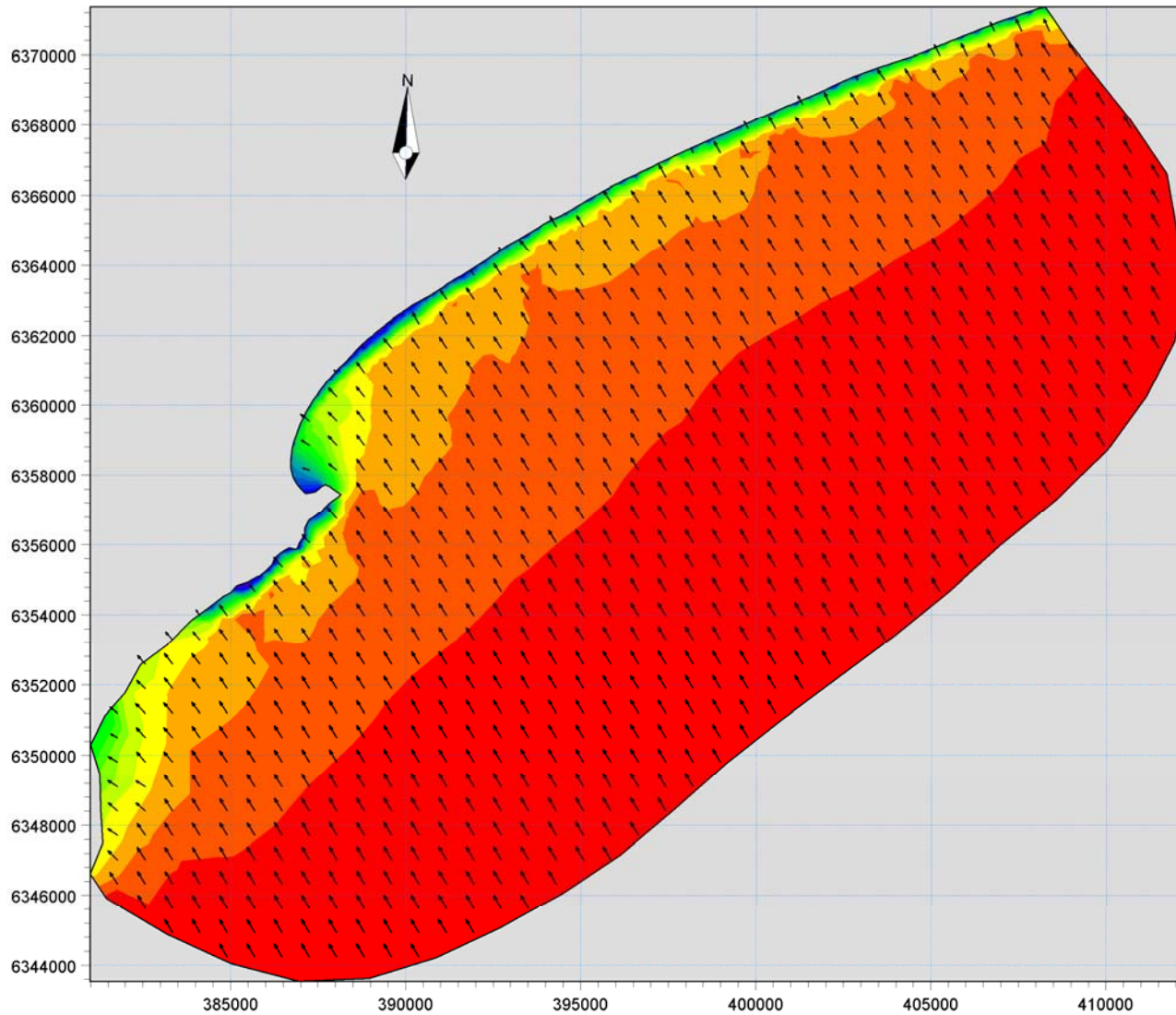
Physical Processes



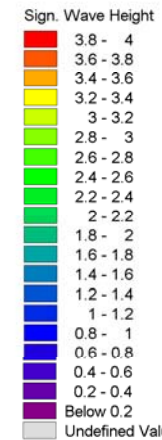
Modelling Framework



Wave Transformation

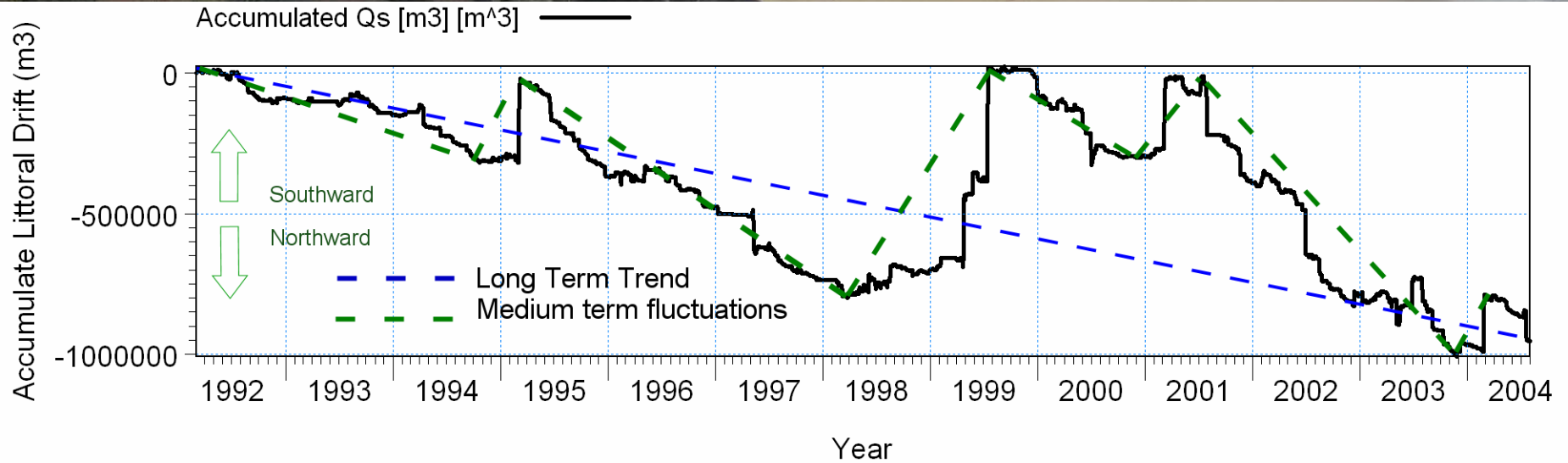
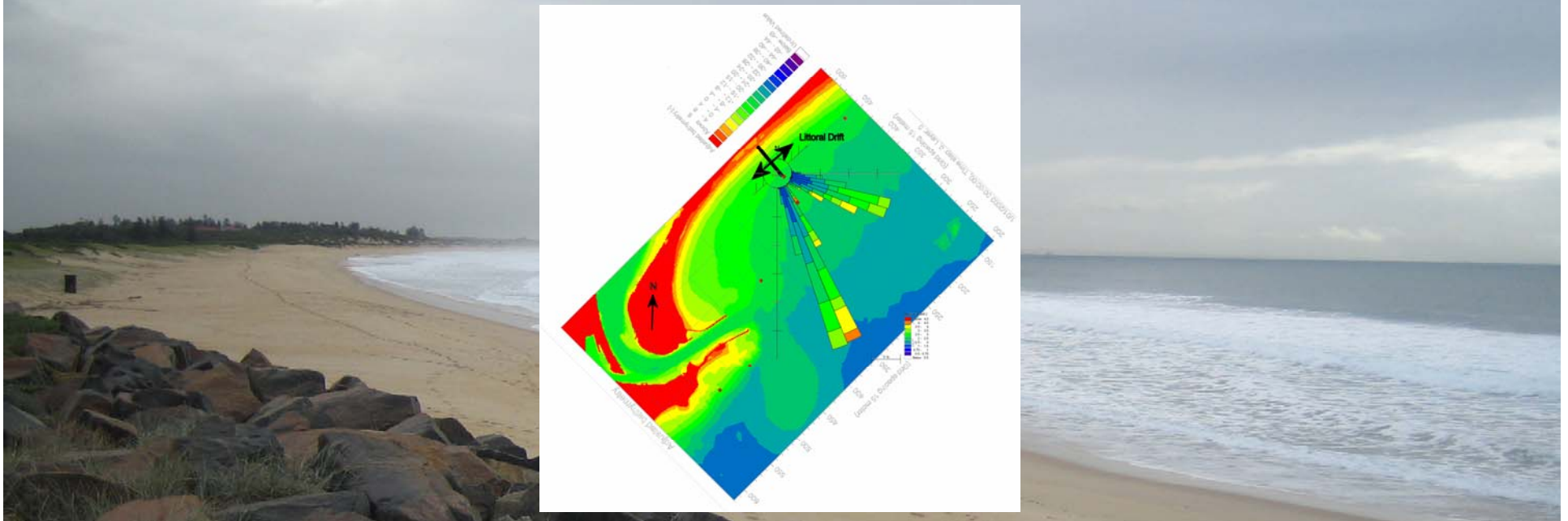


→
4 Hm0 (m)

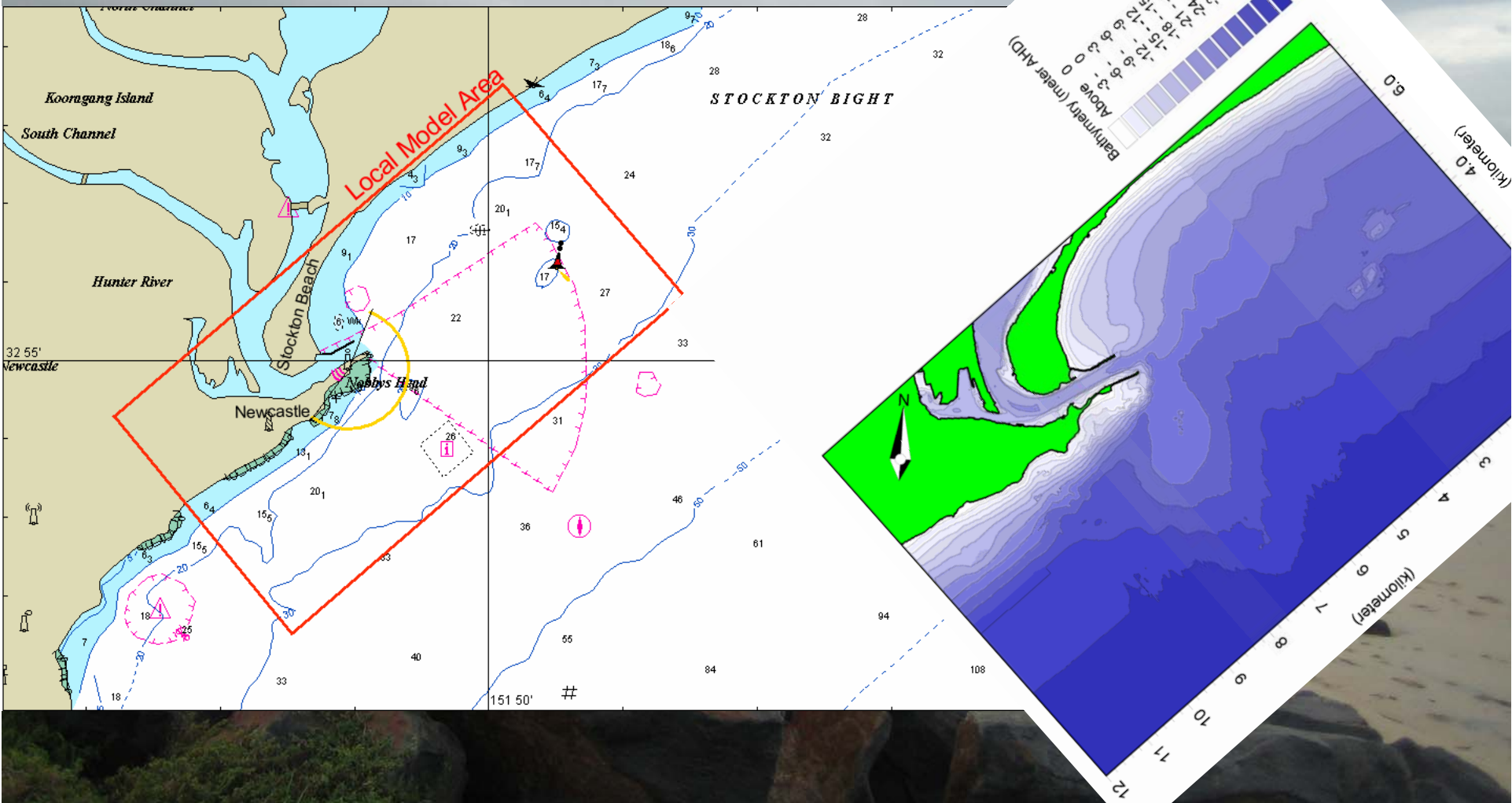


0:24:30 1/01/1990 Time Step 1470 of 2141.

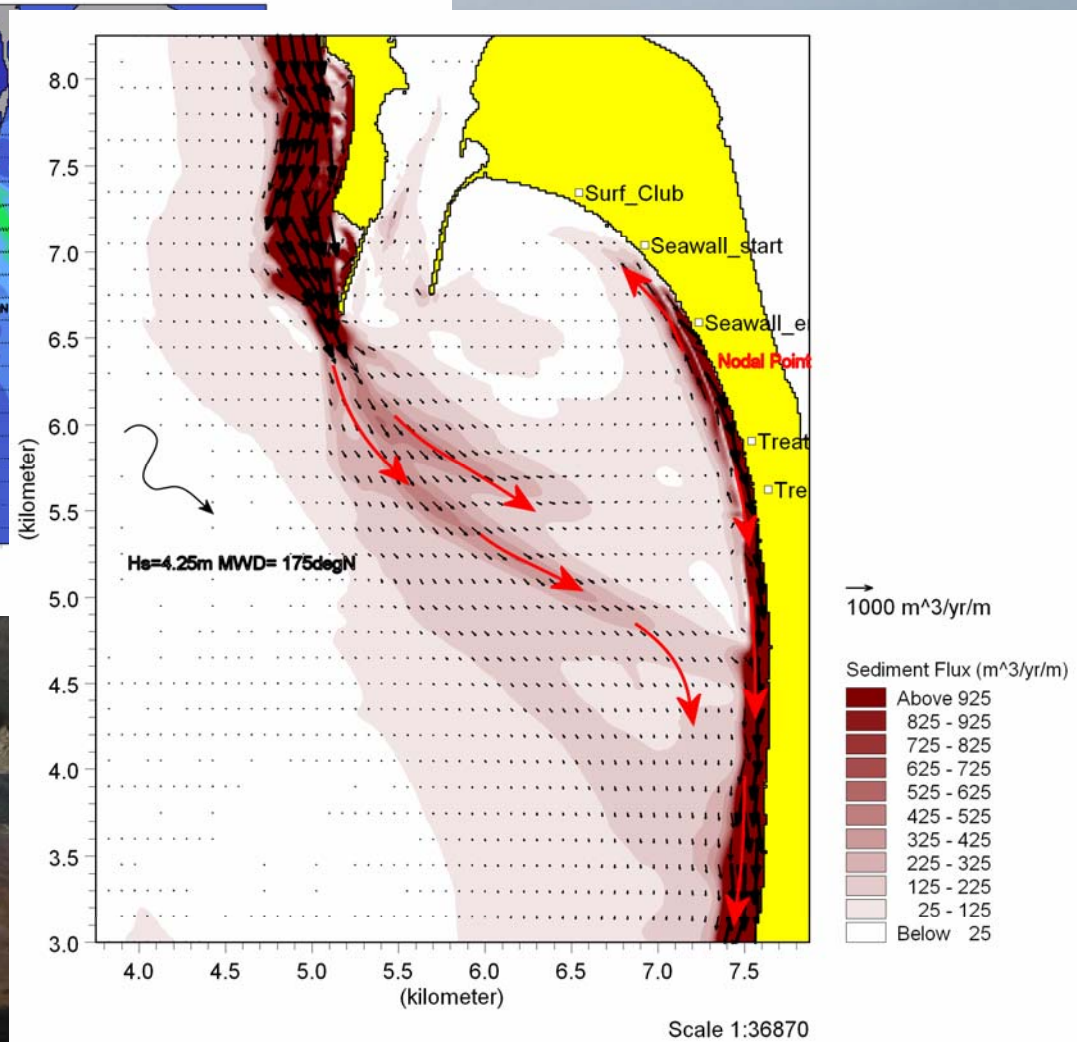
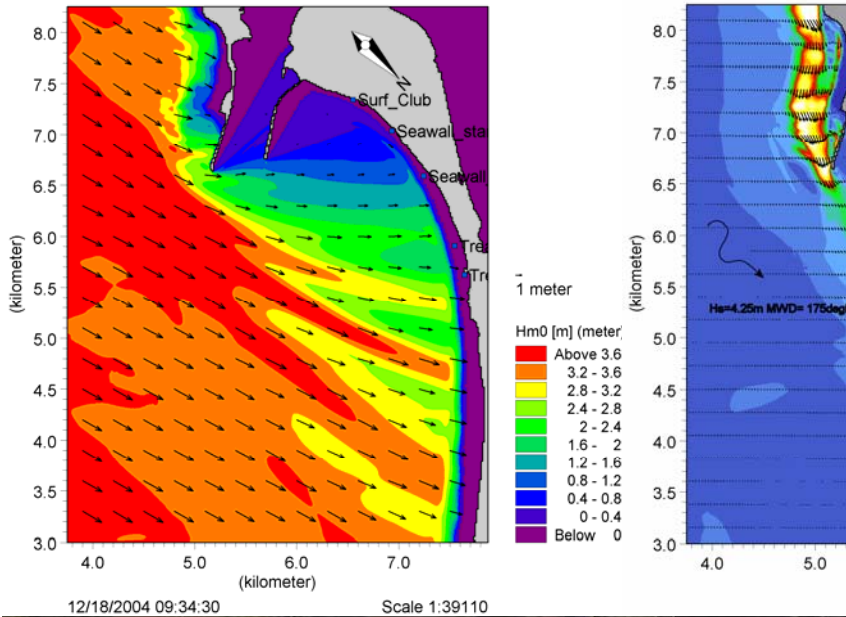
Littoral Drift 1992-2004



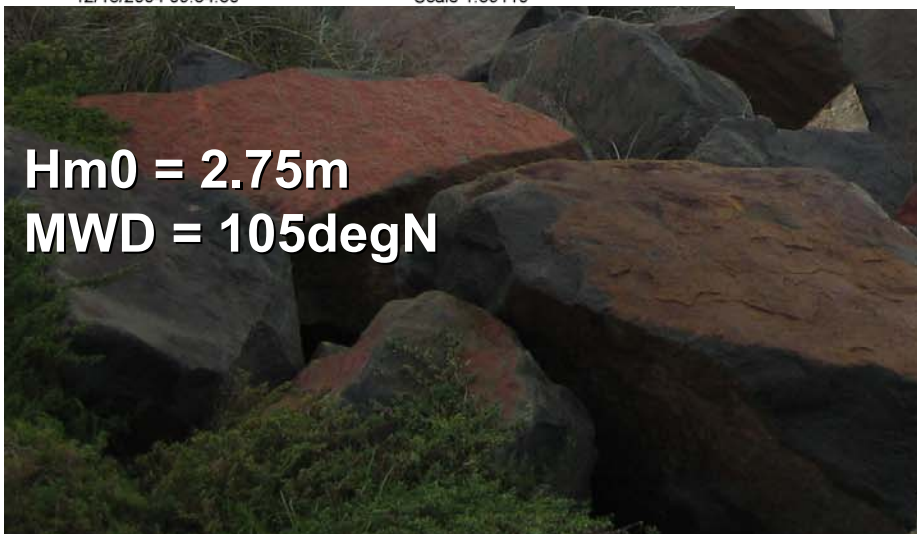
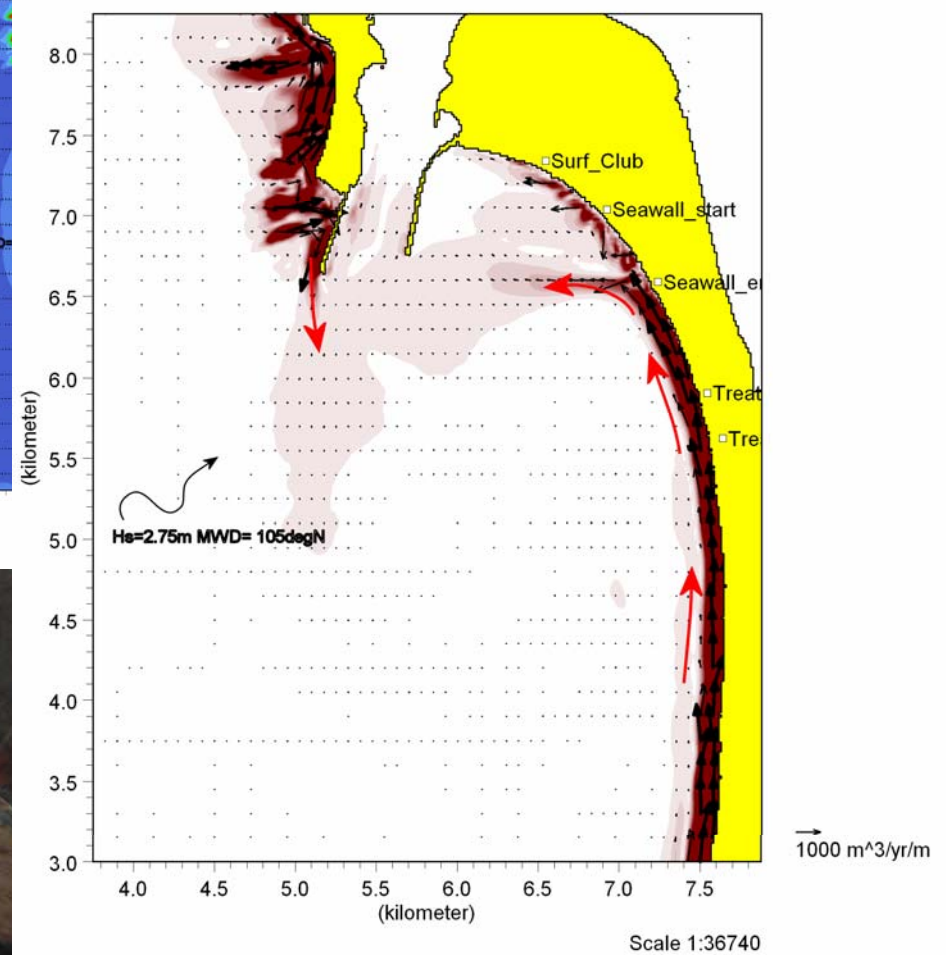
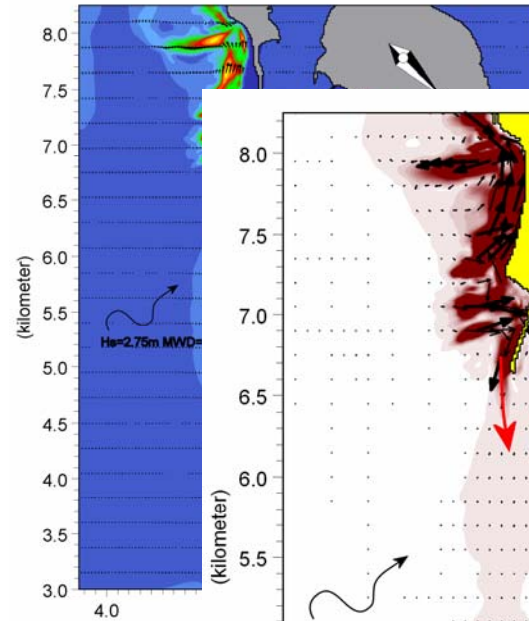
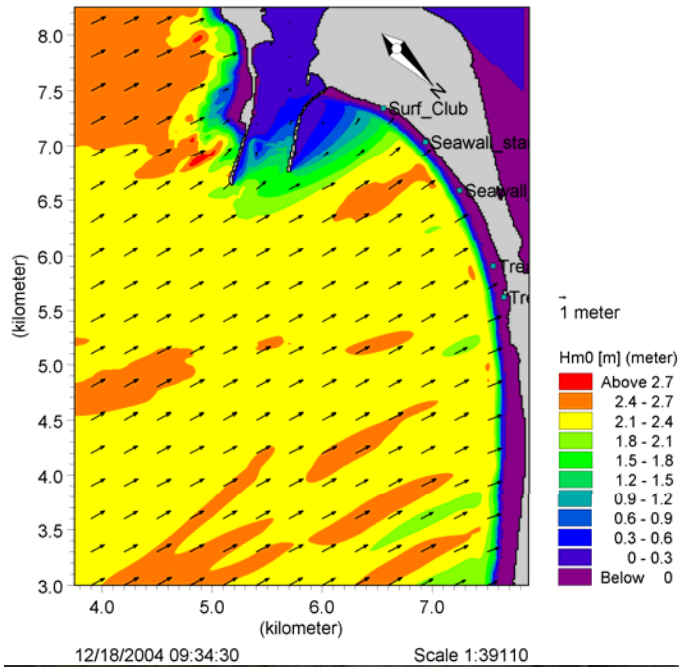
Model Setup



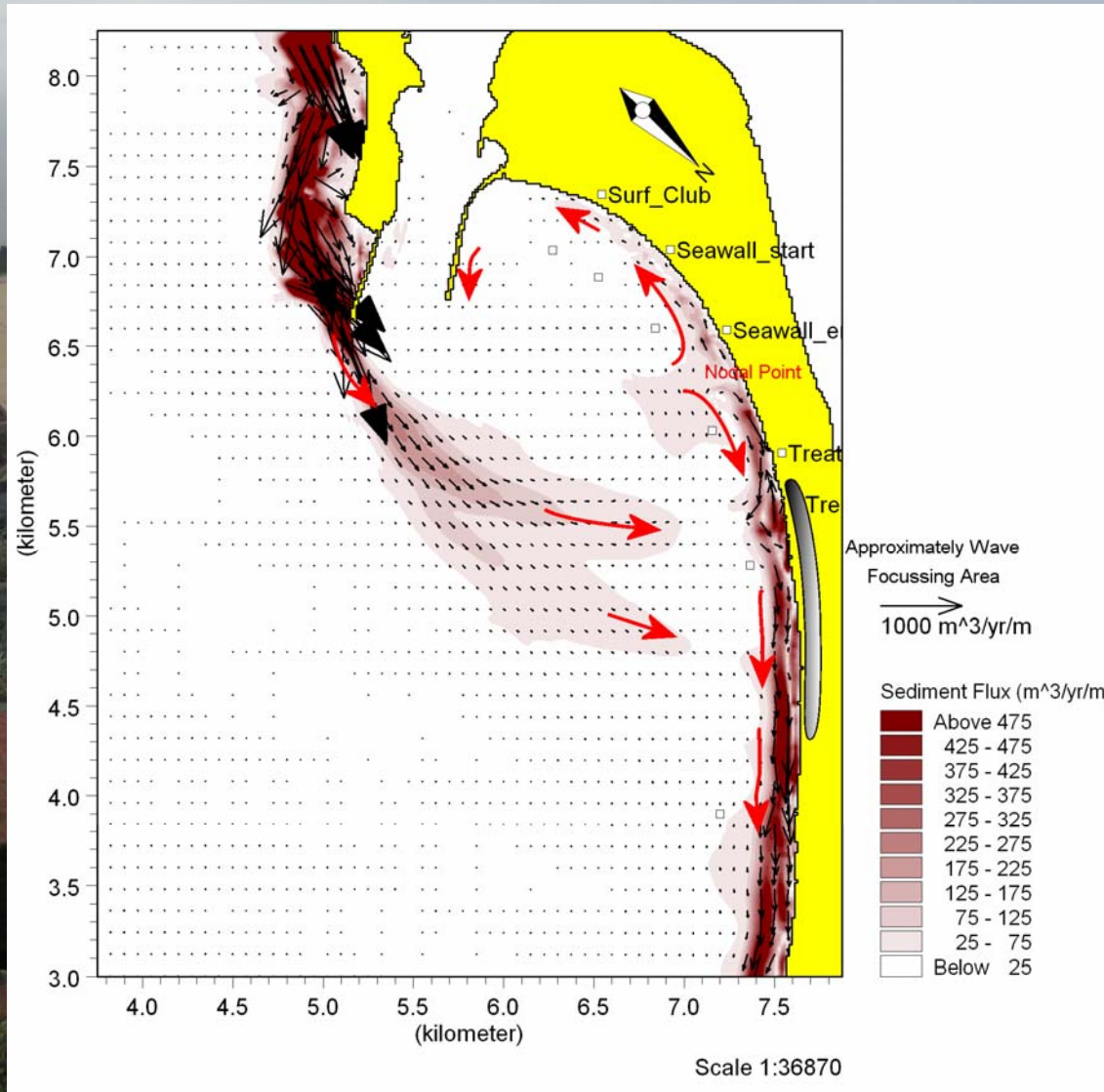
2D Model Results



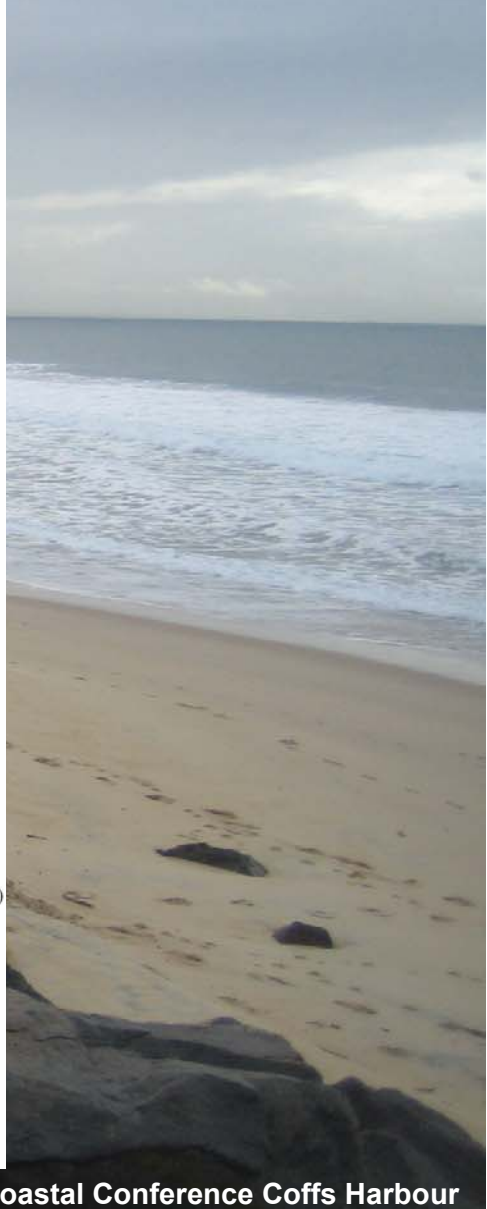
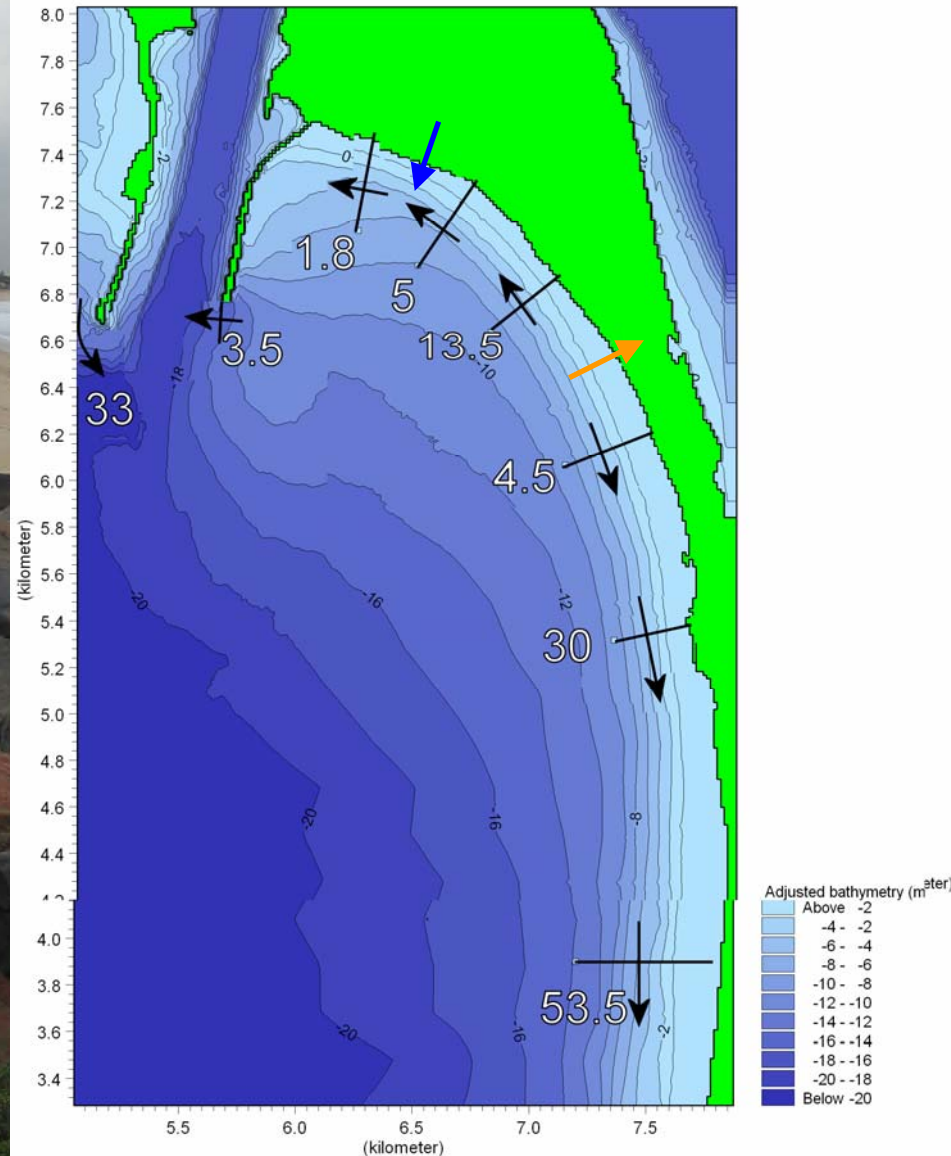
2D Model Results



Sediment Transport Path



Sediment Budget (Long Term) (1992-2004)



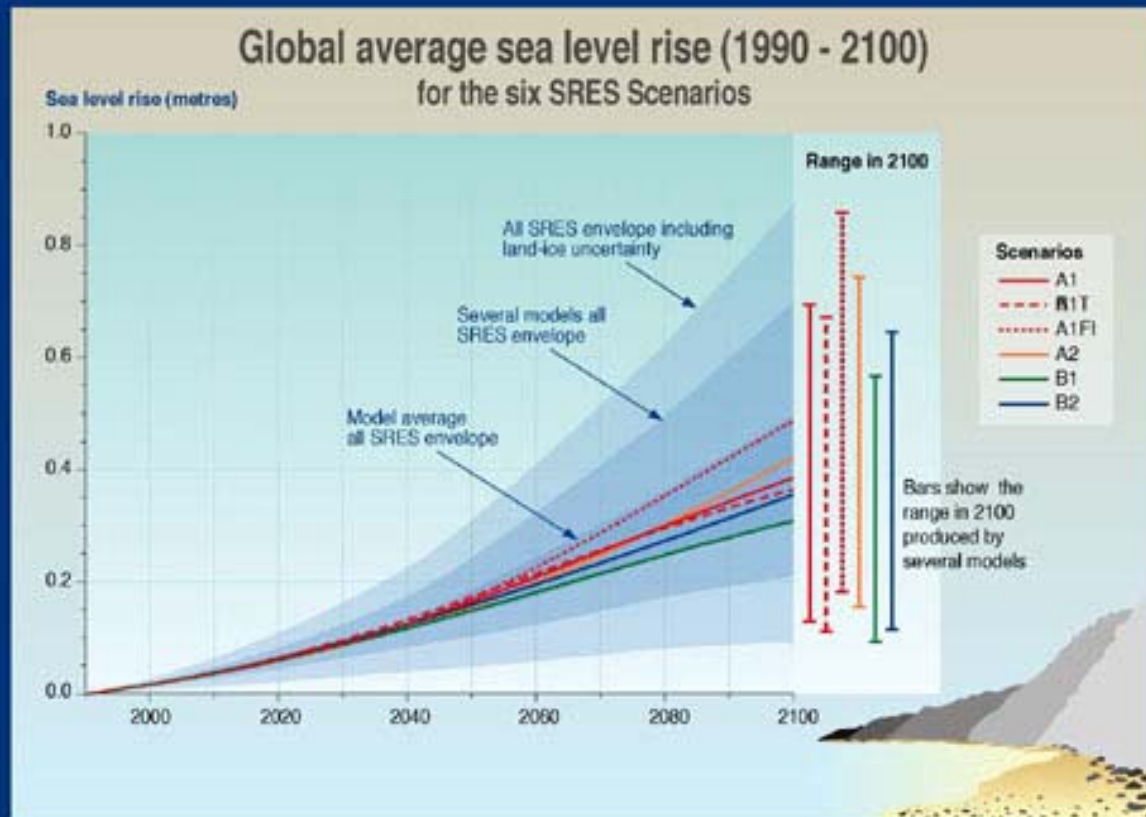
Short Term Events

Modelling based on the Impact Approach Larson et al. (2004)

Location	Stockton Tourist Park	Stockton Surf Club	Hereford St	Child Care Centre	Meredith St
Erosion (m)	1.2	4.1	8.6	12.1	17.0

Location	Sewage Ponds	Fort Stockton	Fort Wallace	Stockton Centre	Council Boundary
Erosion (m)	17.9	21.9	22.4	23.8	24.5

Greenhouse Effects



Greenhouse Effects

Bruun Rule (1962, 1988)

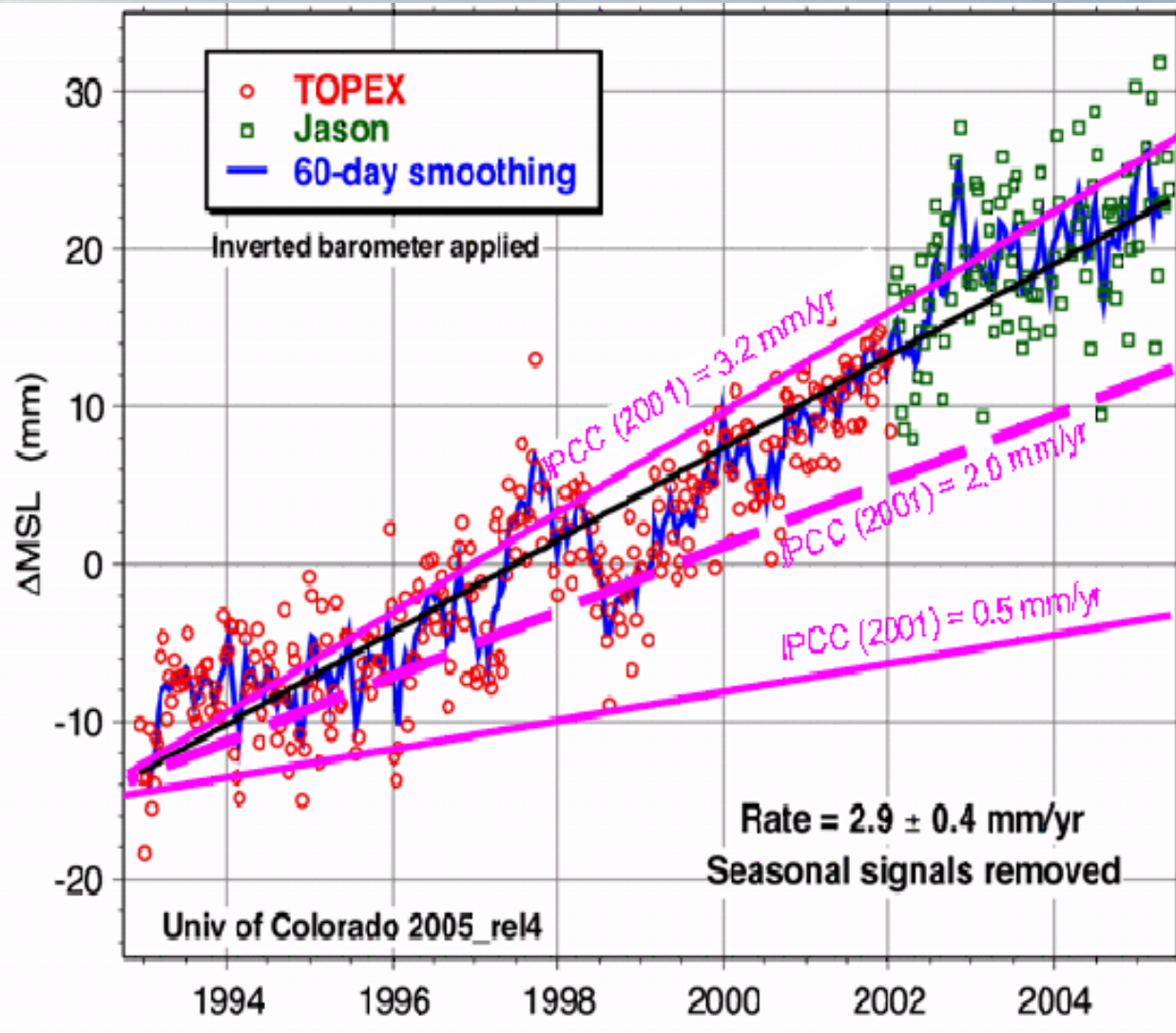
Water Levels (cm)

Year	Low	Mid	High
2006	1	2.5	4
2026	2	7	14
2040	3	12	23
2050	5	18	32
2056	5	20	36
2070	7	30	52
2100	9	48	88

Beach Recession (m)

Year	Low	Mid	High
2026	0.8	3.6	8.0
2056	3.2	14.0	25.6

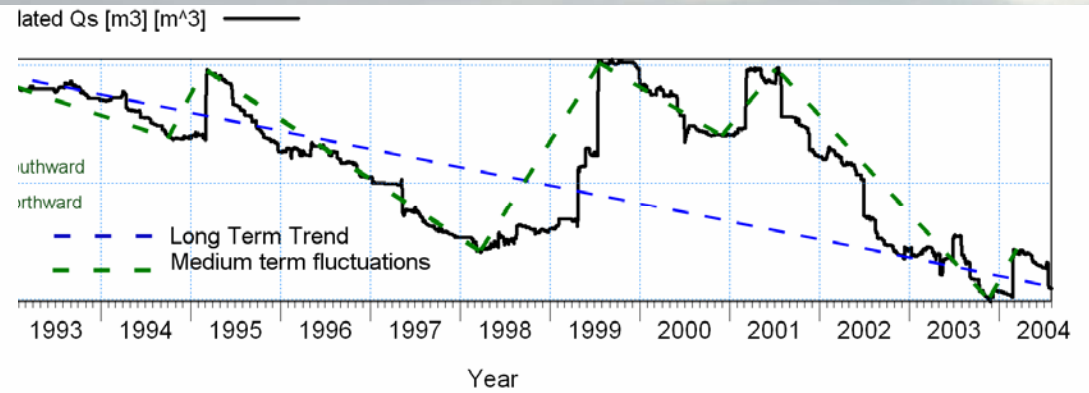
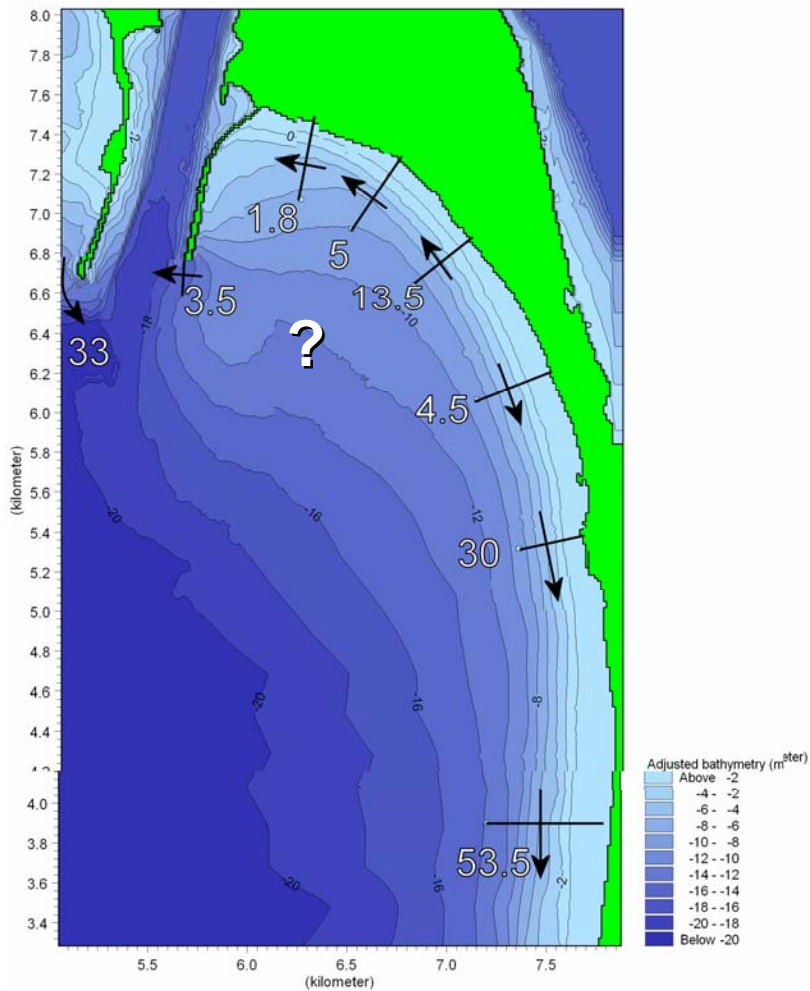
Greenhouse Effects



Cowell (2005)

Greenhouse Effects

Change in weather patterns



Conclusions

- A 2D numerical model has been successfully applied to determine the on-going processes at Stockton Beach
- It allowed determining the erosion-accretion patterns
- Medium and long term effects were analysed and the impact on the beach was investigated
- This methodology can be applied in diverse complex areas
- It can also provide estimations of the impact of climate change in coastal areas, which is relevant for planning purposes