Coastal Processes in Robe, SA

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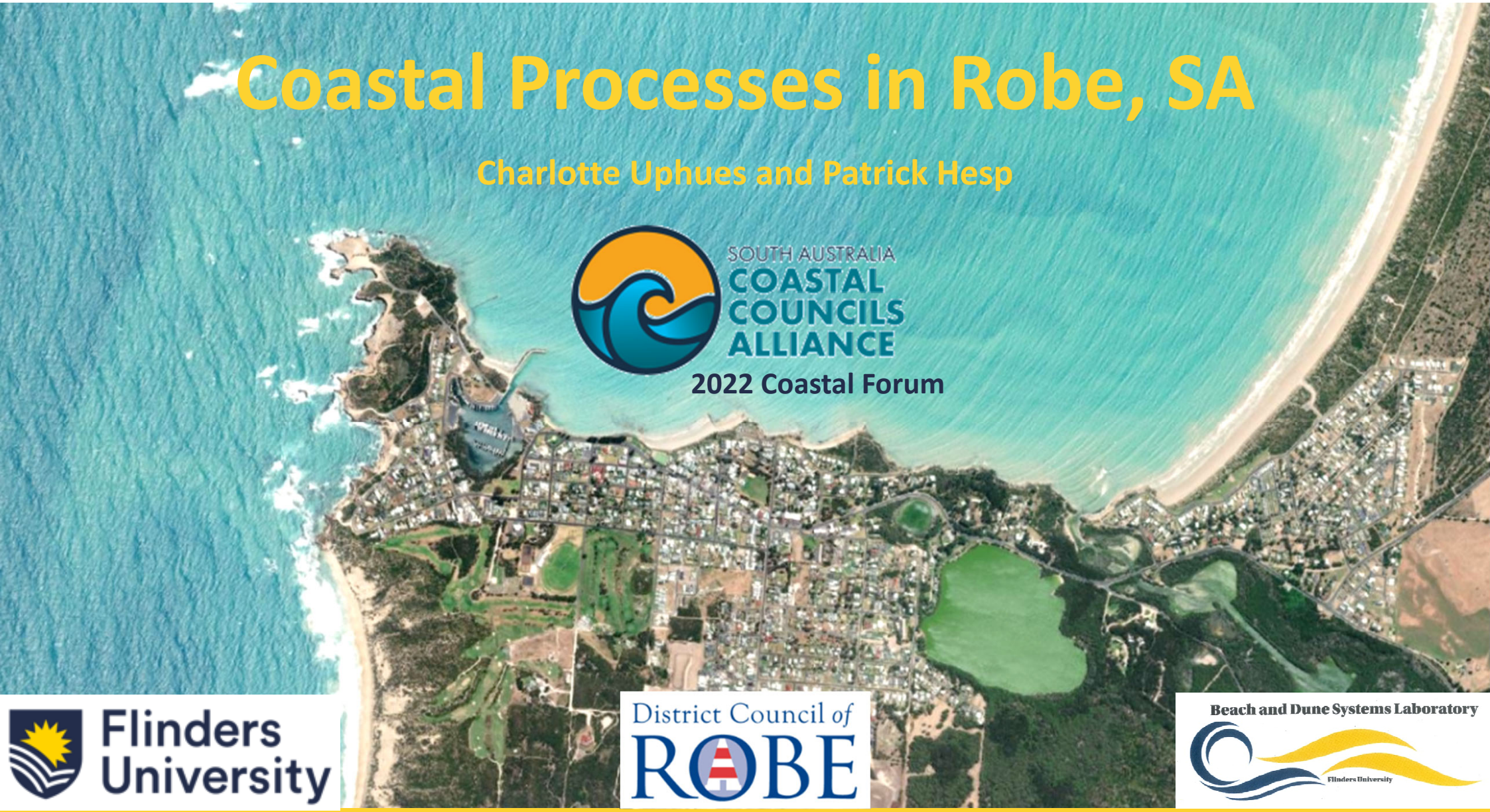
SOUTH AUSTRALIA COASTAL COUNCILS ALLIANCE

2022 Coastal Forum



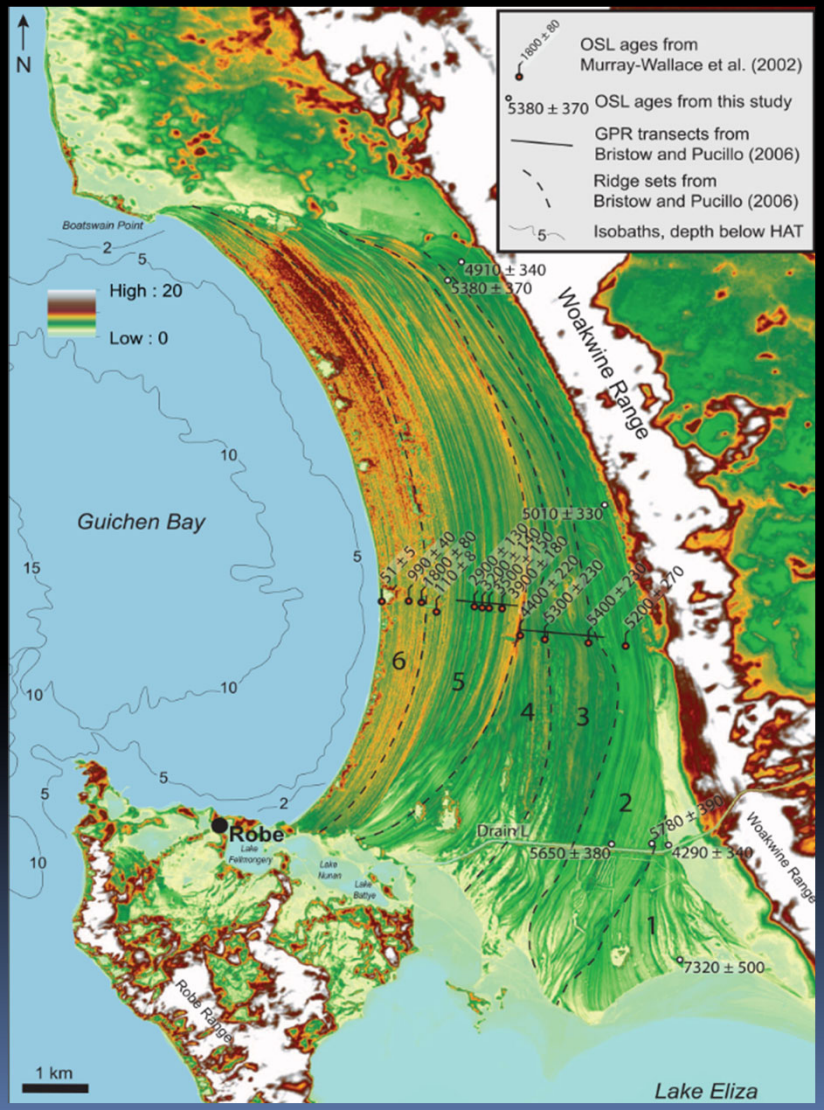
Flinders University

District Council of ROBE

Beach and Dune Systems Laboratory

Flinders University

Robe DC- BEADS Lab, Flinders University Collaboration



Initial discussions focused on developing a better understanding of coastal processes in the Robe region.

Robe DC- BEADS Lab, Flinders University Collaboration

ARC Linkage proposal developed first.

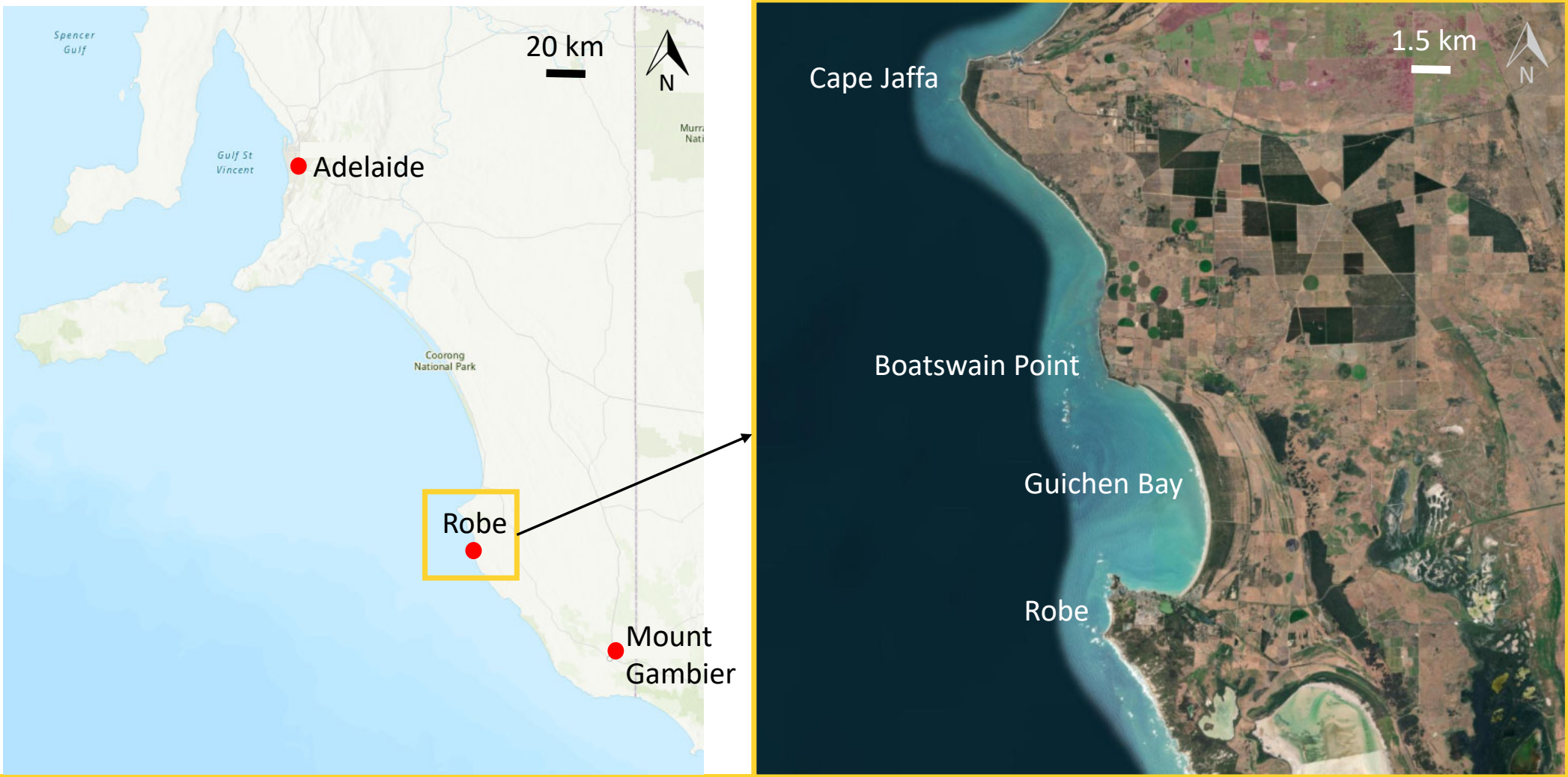
Funding from both ARC and Robe DC

Concurrently, produced a review of beach-surfzone historical changes utilizing DEW topographic profile data.

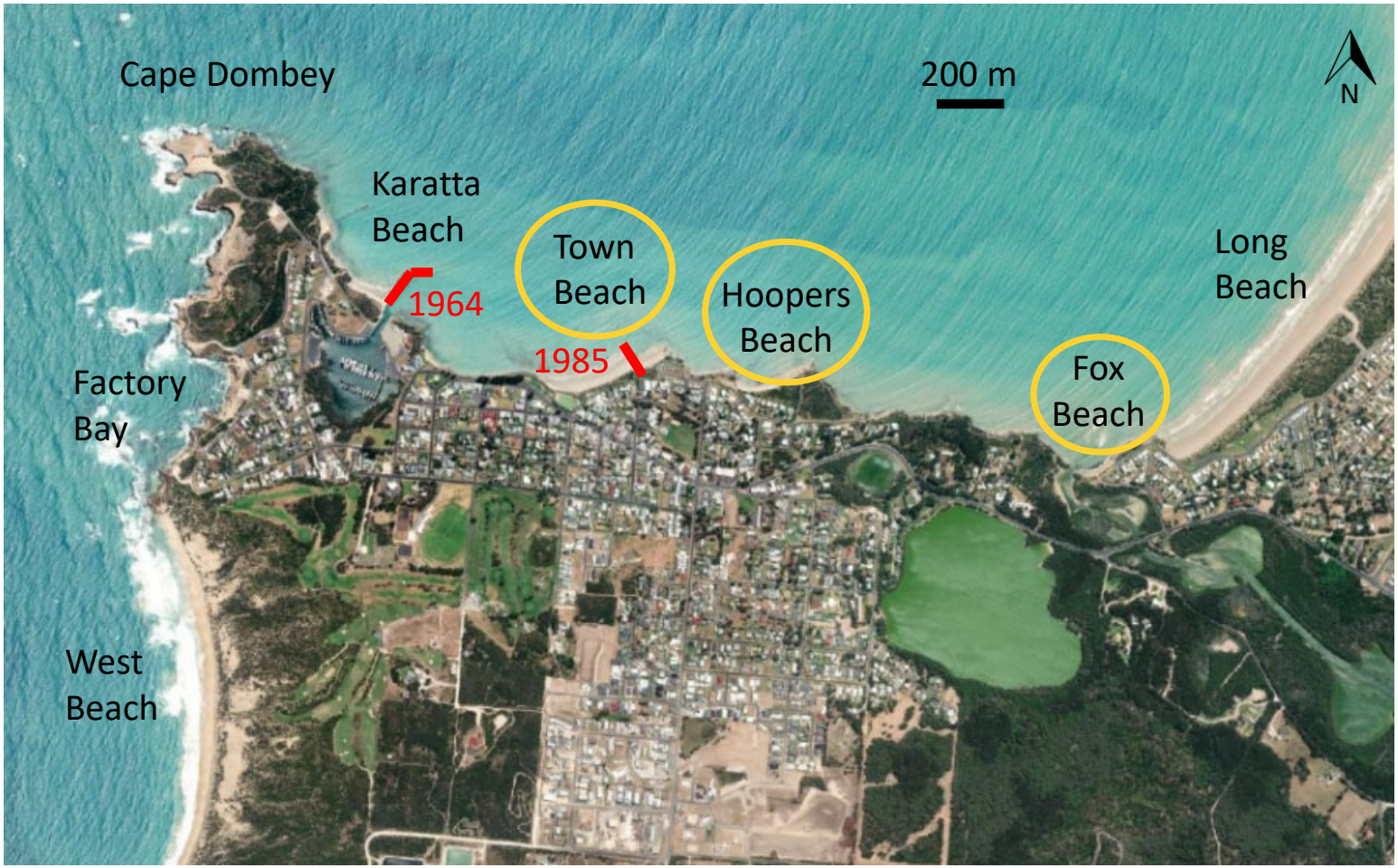
Subsequently, applied for a Flinders Univ Enterprise scholarship which comprises 50/50 funding from an Industry partner (Robe DC) and Flinders.

Funds originally applied to the ARC application then utilised to fund equipment and research expenses.

Location of Robe, SA



Robe's Beaches



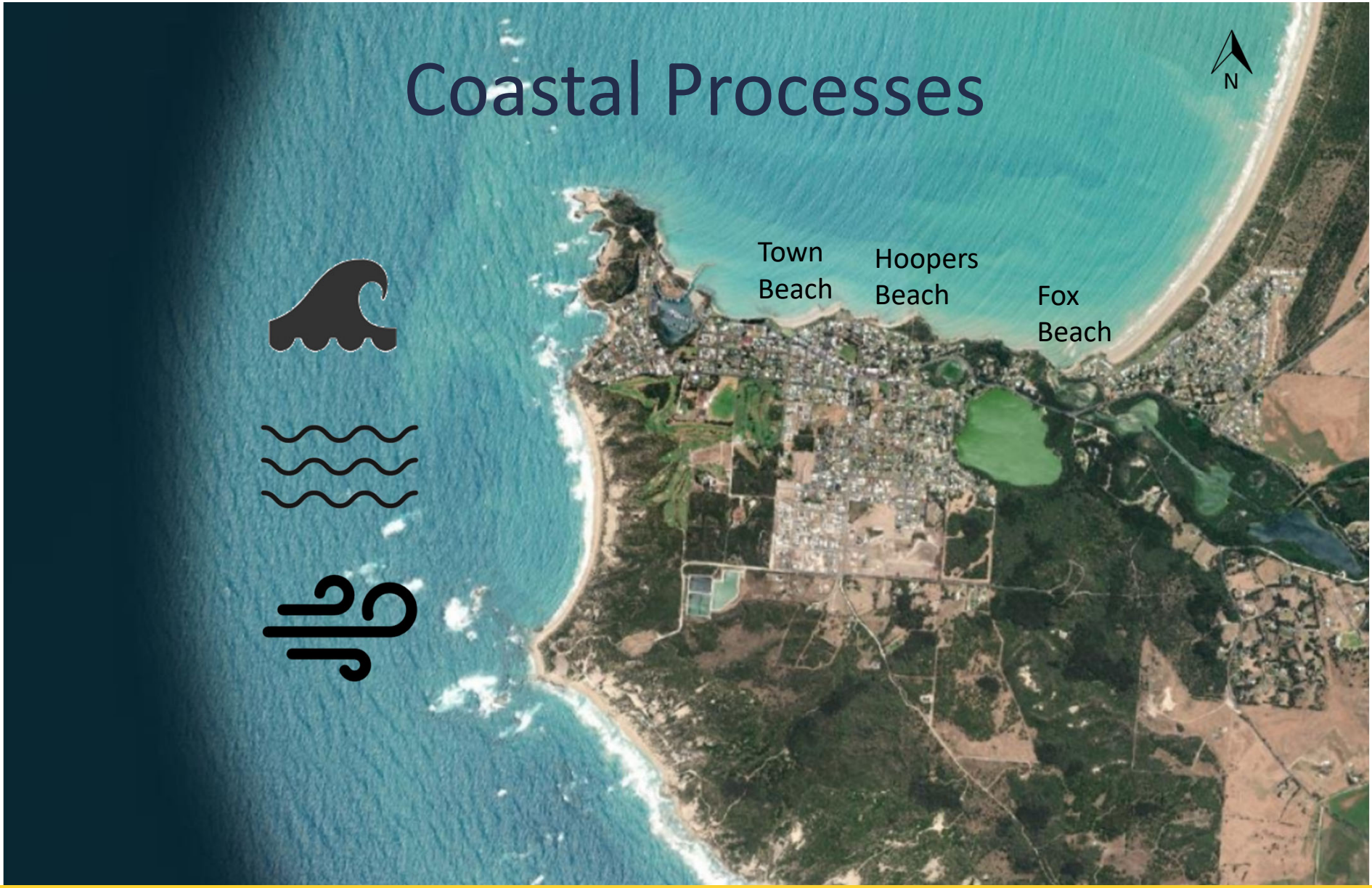
Erosion of Robe’s Beaches

Town Beach, March 2013

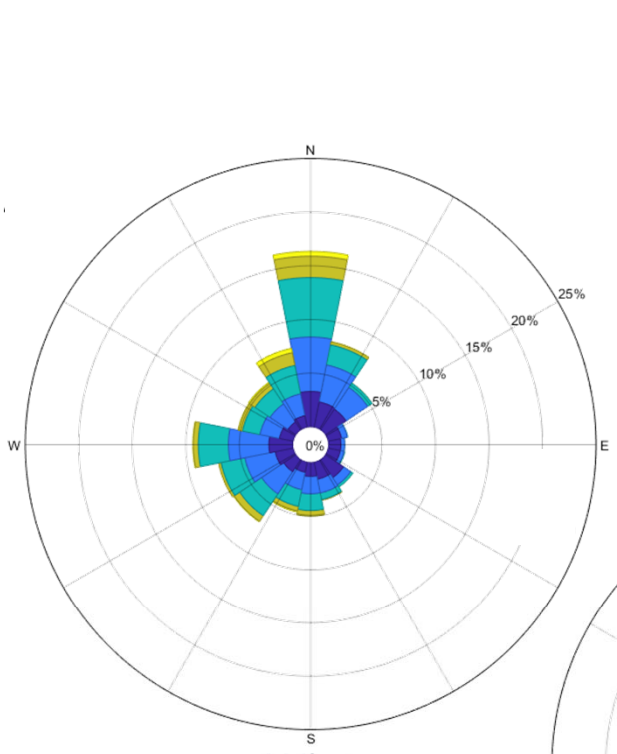
Fox Beach, June 2020

Hoopers Beach, June 2022

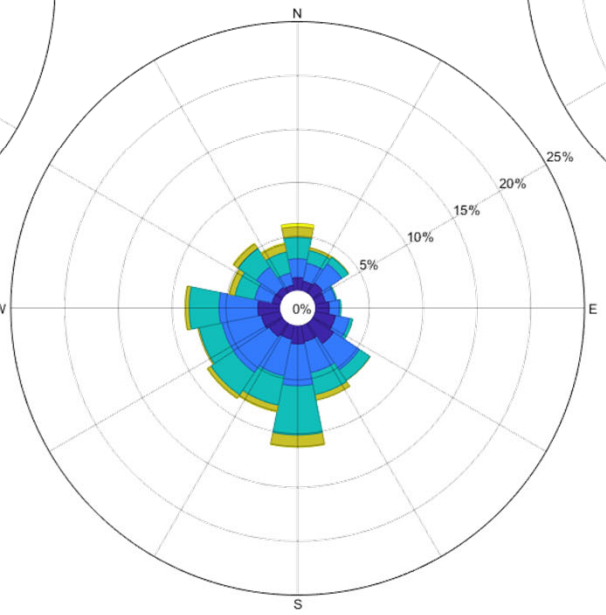
Coastal Processes



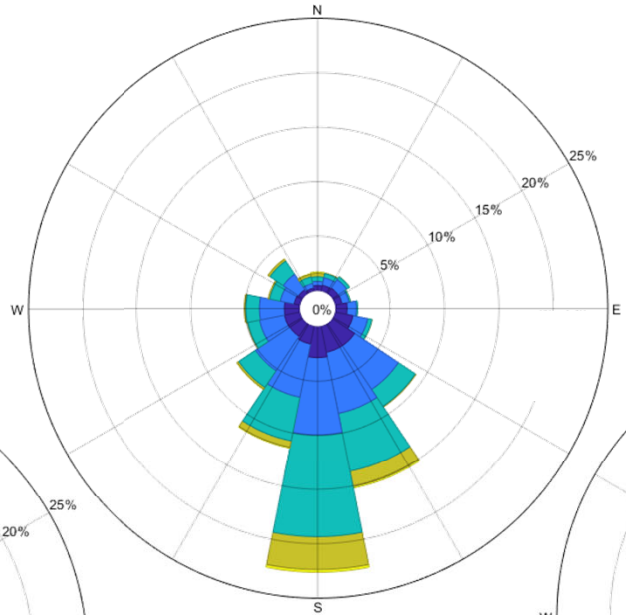
Wind climate



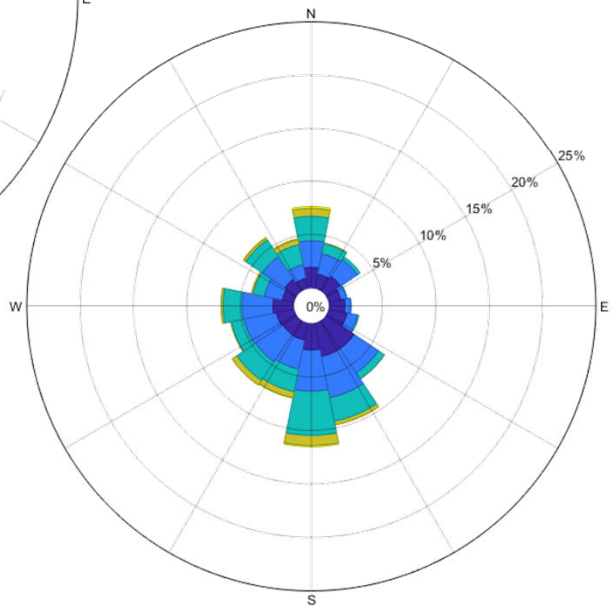
Winter



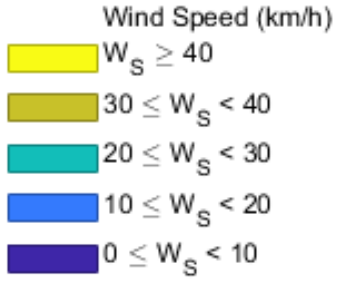
Spring



Summer

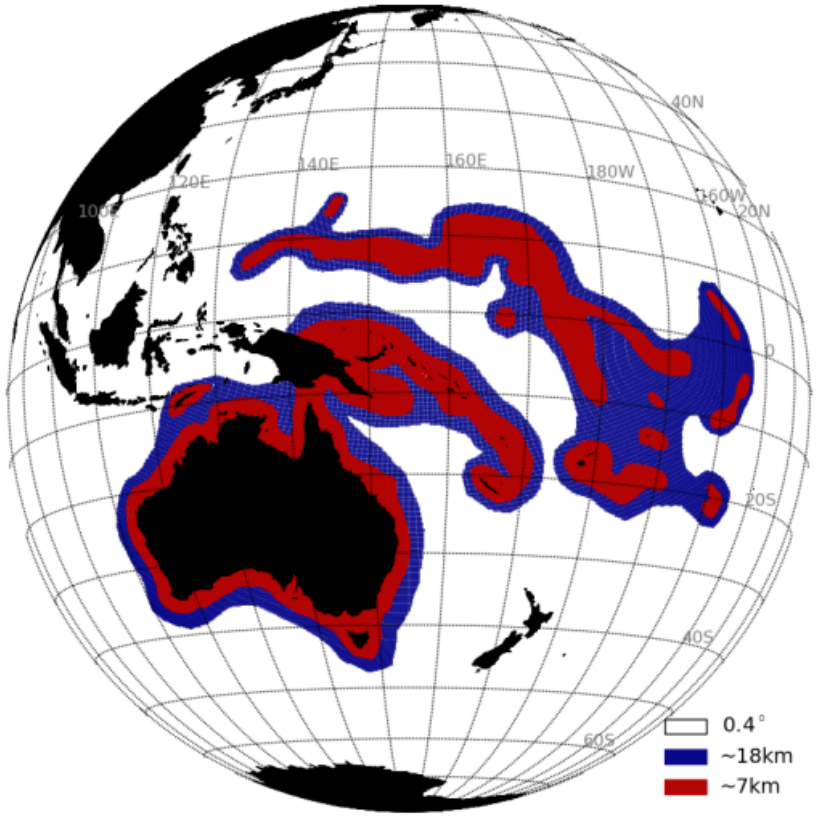


Autumn

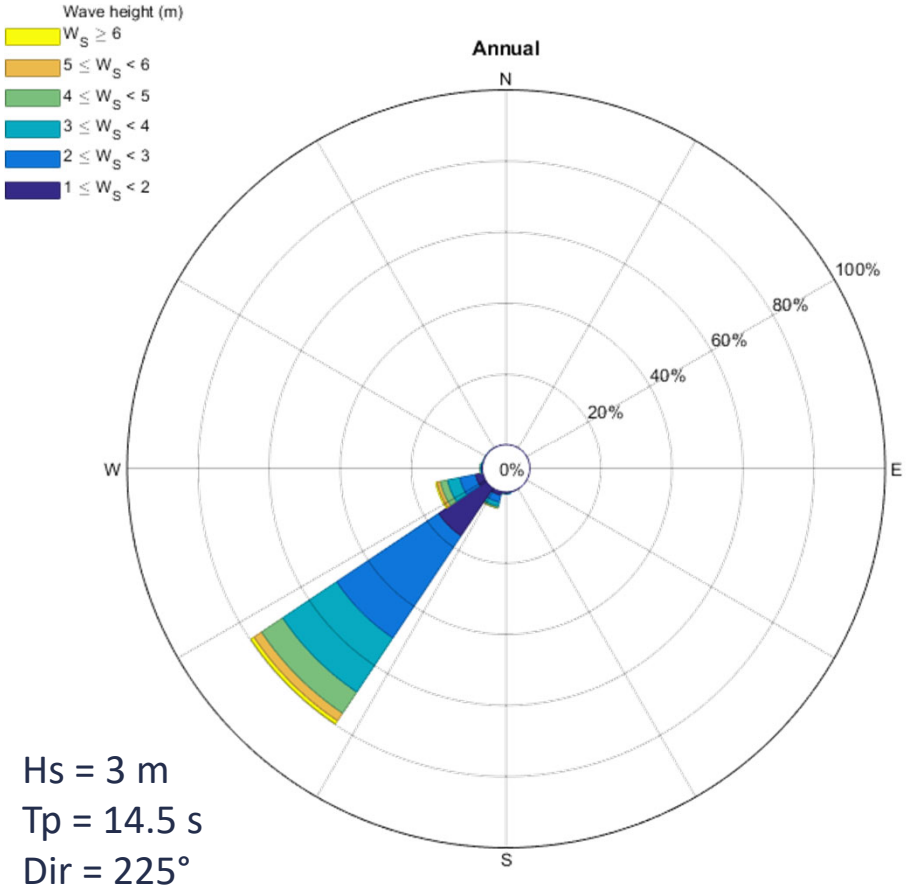


Wave climate

CAWCR* wave hindcast model



Wave rose for Robe based on 42 years of CAWCR data

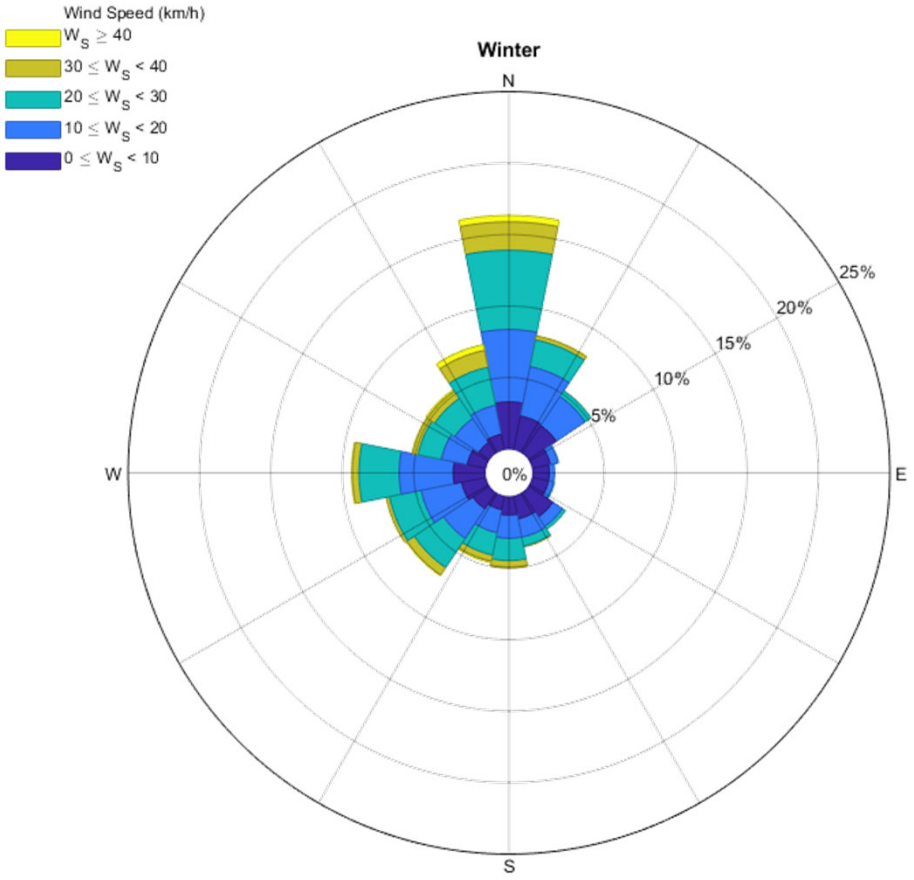


Hs = 3 m
Tp = 14.5 s
Dir = 225°

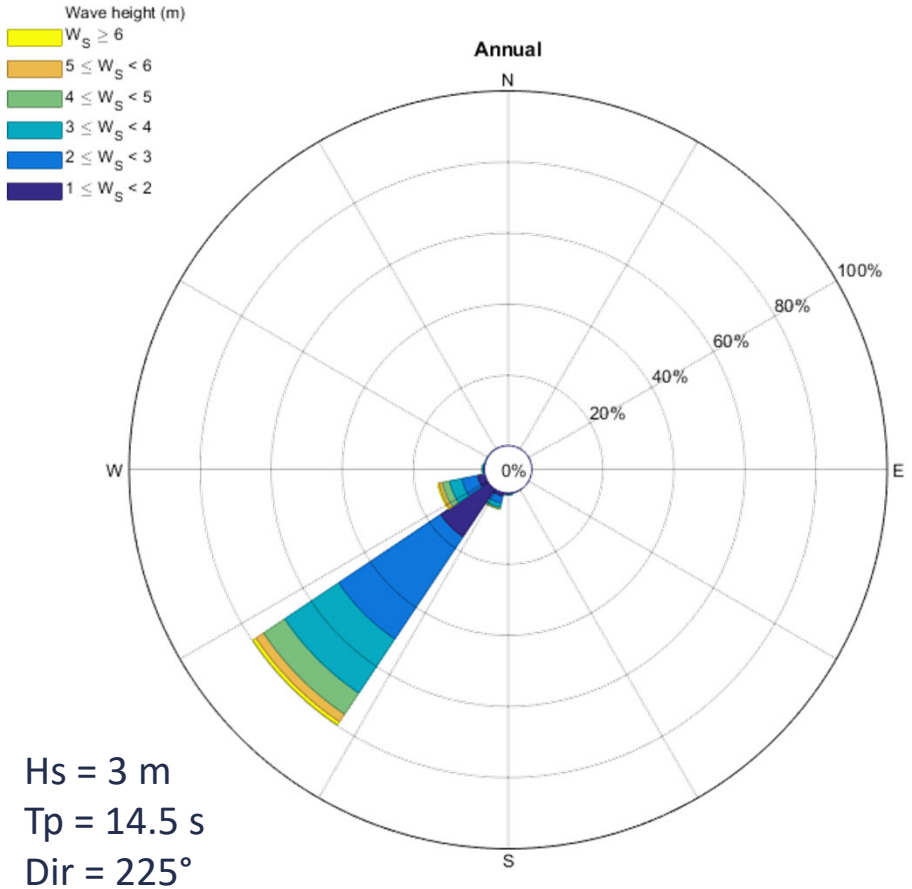
*Centre of Australian Weather and Climate Research

Wind and wave climate

Winter wind rose for Robe



Annual wave rose for Robe



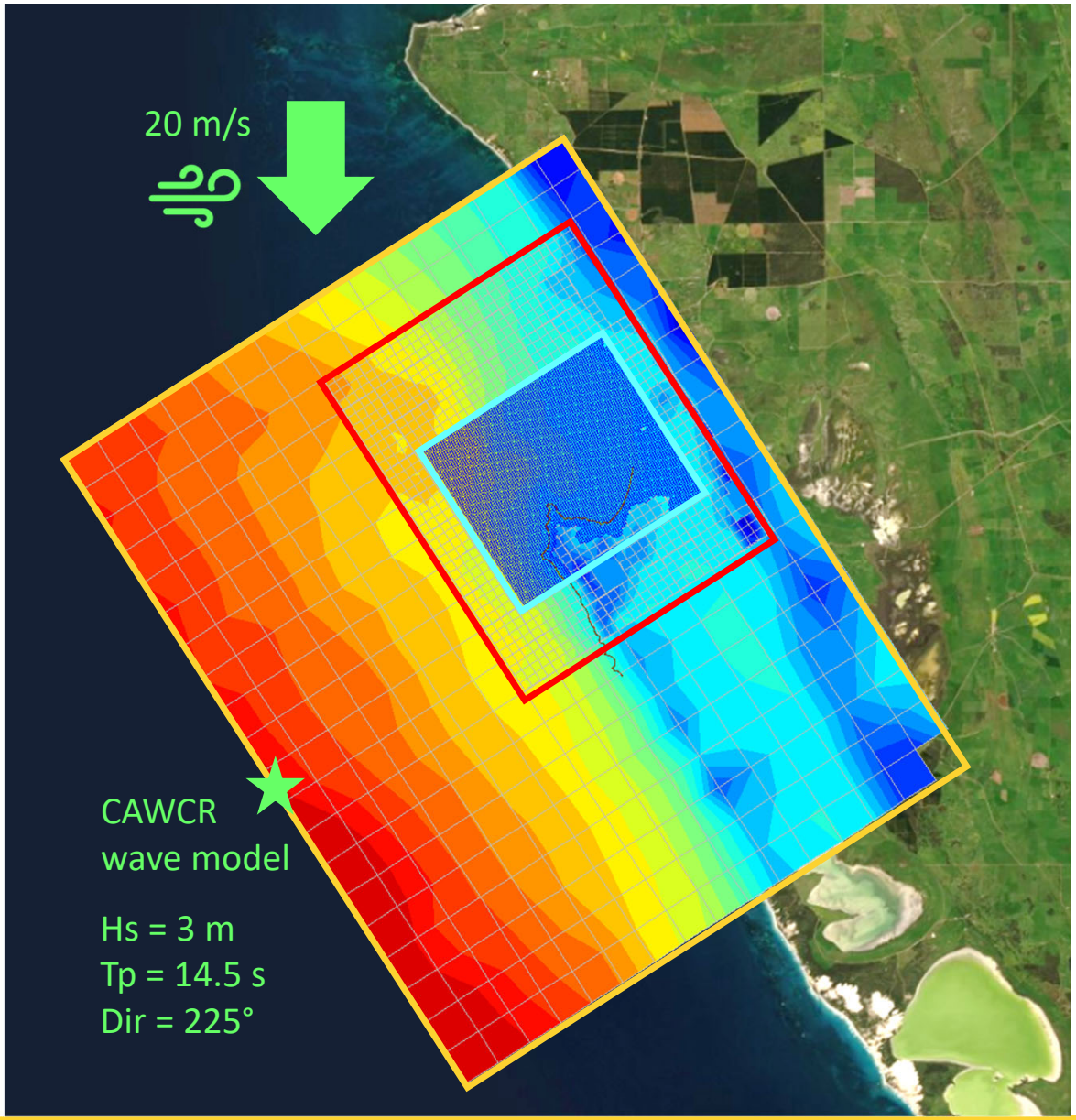
Hs = 3 m
Tp = 14.5 s
Dir = 225°

SWAN wave model

-Area Grid: 40 km x 32 km
2000 m x 2000 m resolution

-Medium Grid: 20 km x 16 km
500 m x 500 m resolution

-Local Grid: 12 km x 13.8 km
150 m x 150 m resolution



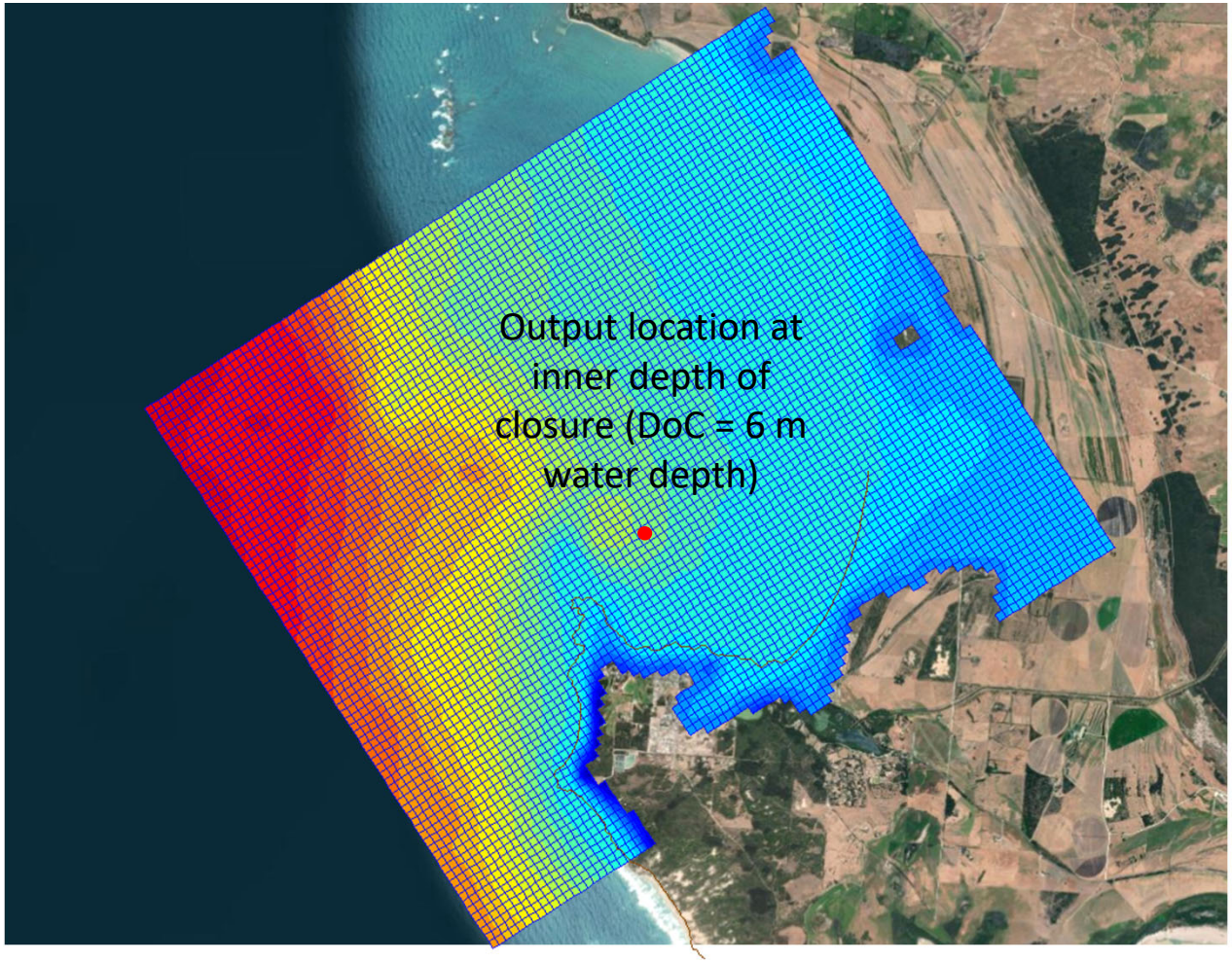
Simulation of 3 cases:

-South-west swell waves (CAWCR model)

-Northern wind waves (wind speed: 20 m/s)

-Combined

Wave model results



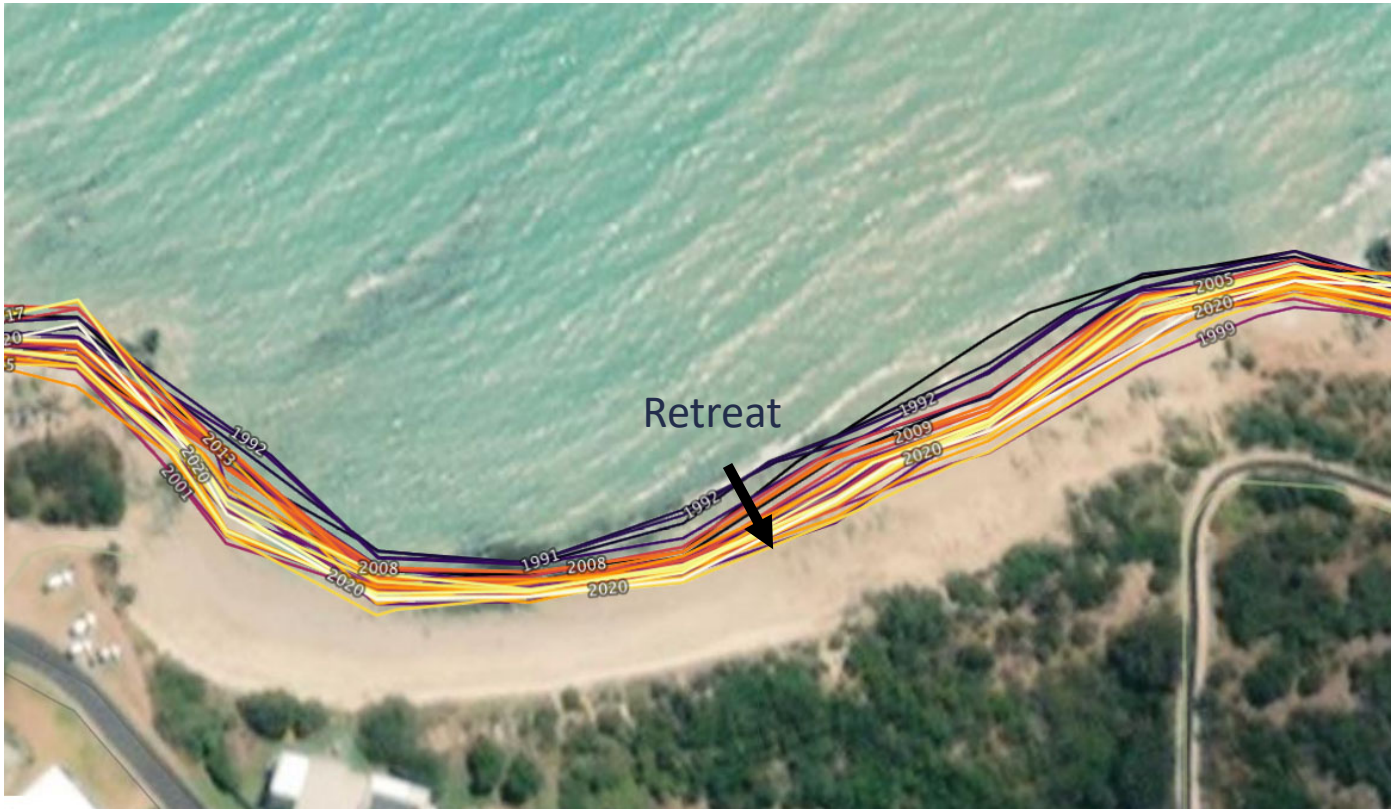
South-West swell waves:
-Offshore: 3 m, 225 °, 14.5 s
-At location: 1.415 m, 281 °, 17.5 s

Northern wind waves:
-20 m/s wind from North, no swell
-At location: 1.255 m, 329.5 °, 4.2 s

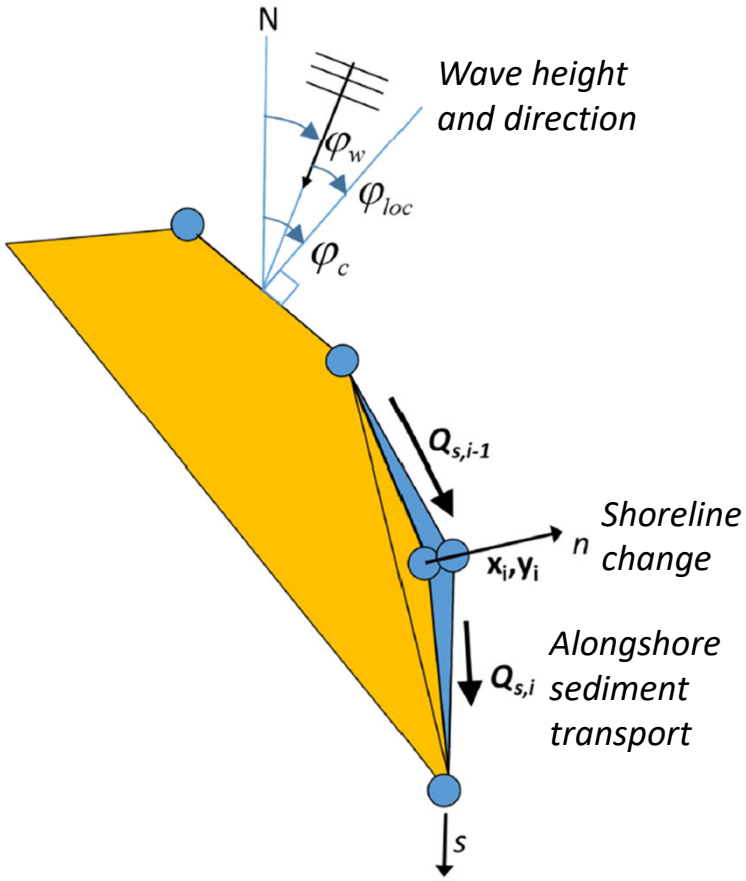
Combined:
-At location: 1.80 m, 296 °, 17.65 s

Long-term shoreline change

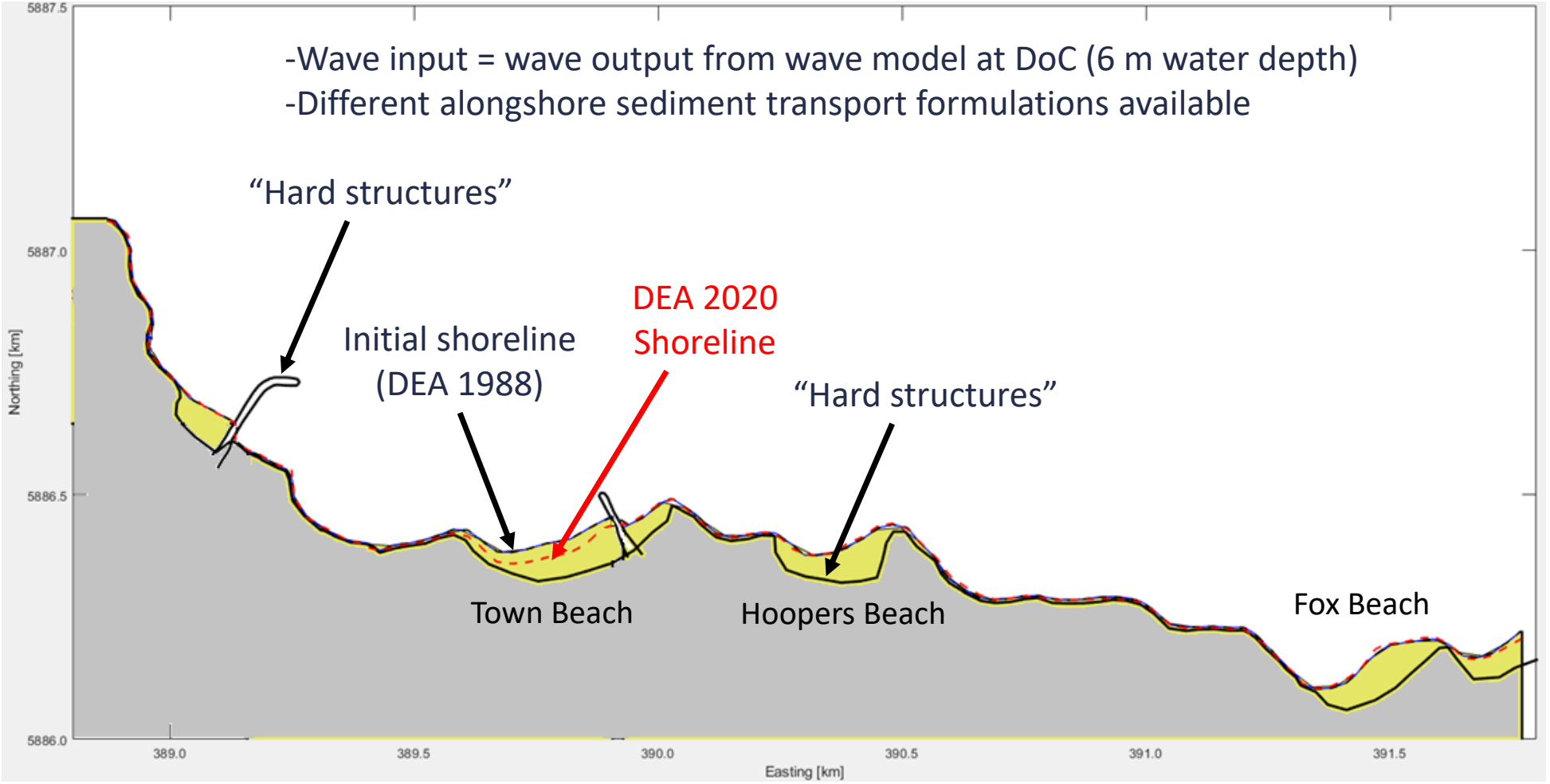
Digital Earth Australia (DEA) Coastlines for Hoopers Beach
1988 - 2020



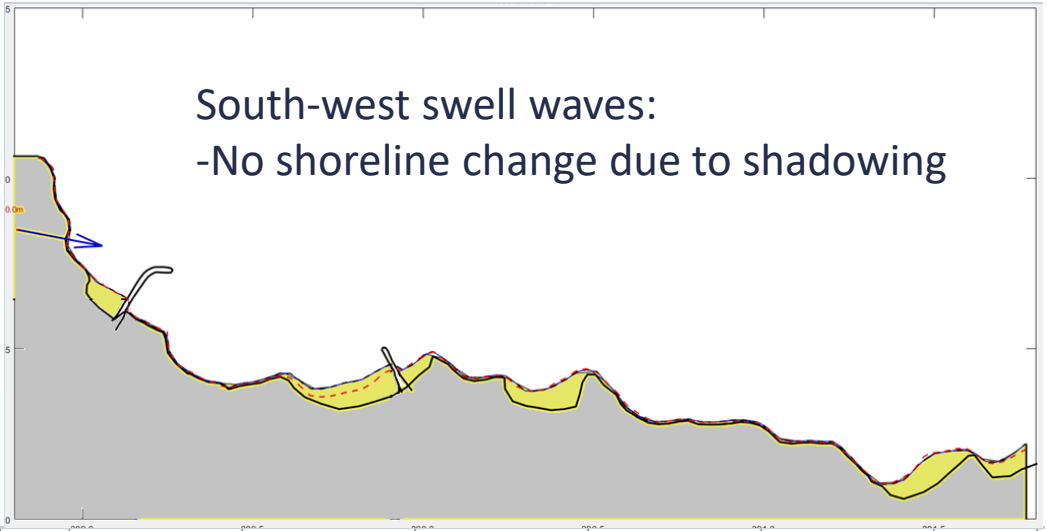
ShorelineS (Roelvink et al., 2020)



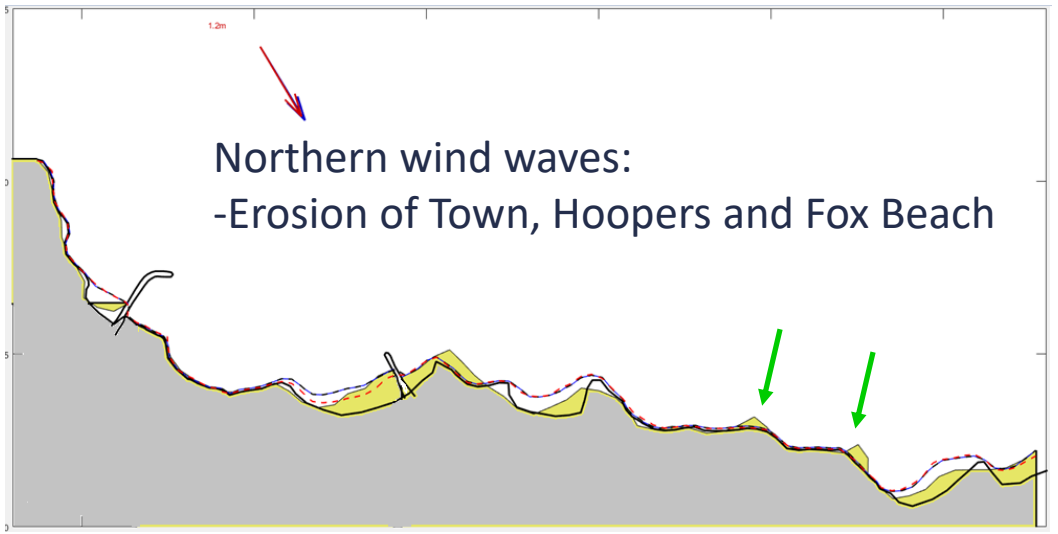
ShorelineS model for Robe



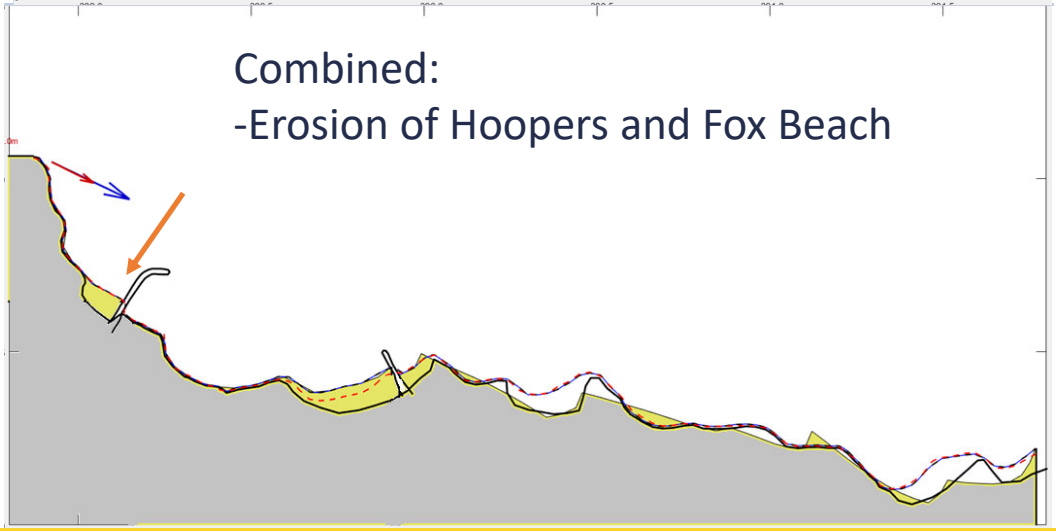
Results of ShorelineS model



South-west swell waves:
-No shoreline change due to shadowing



Northern wind waves:
-Erosion of Town, Hoopers and Fox Beach



Combined:
-Erosion of Hoopers and Fox Beach

-Unrealistic spit development

-Cliff bypassing not properly implemented in the model yet

-No accretion behind breakwater

More complex model needed

Delft3D morphological model

Wave model

-Area Grid: 1000 m x 1000 m resolution

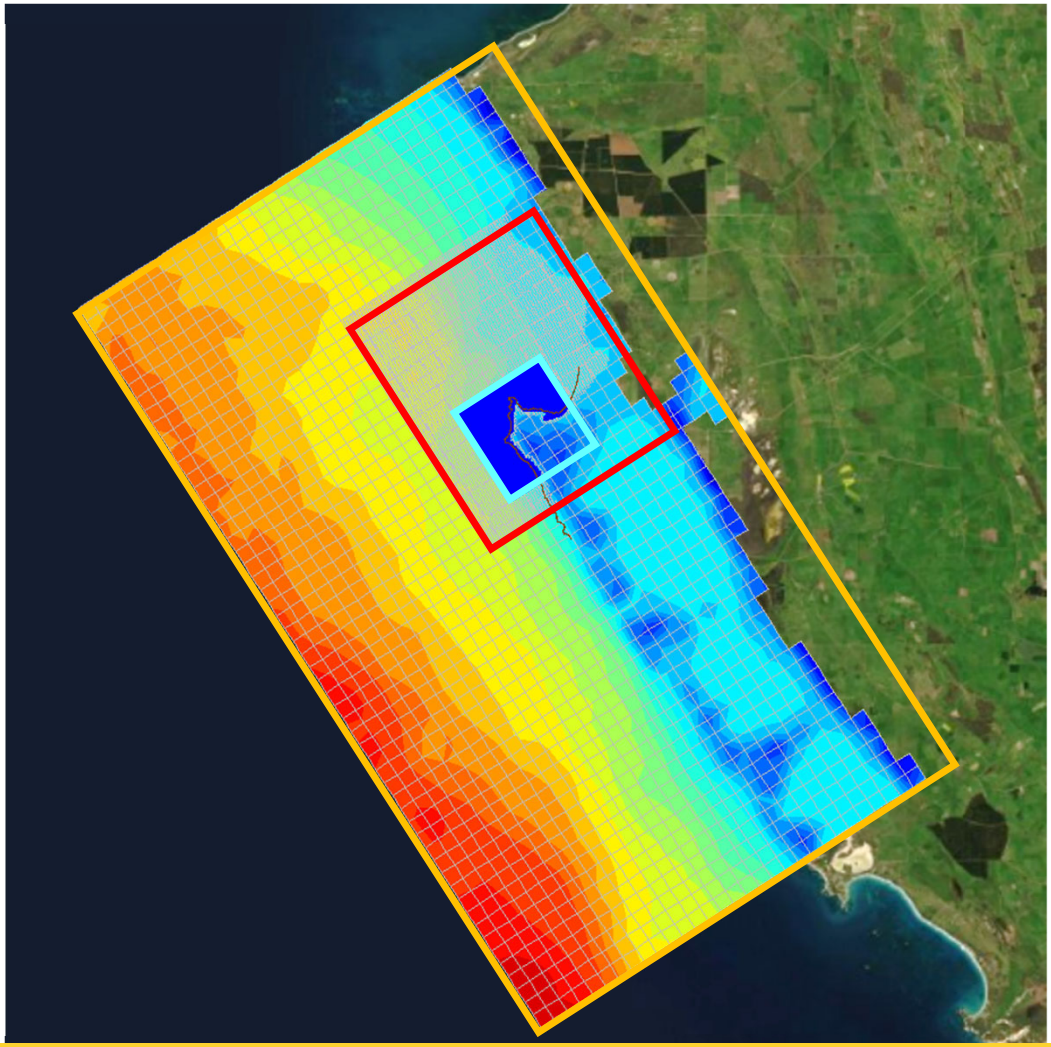
-Medium Grid: 150 m x 150 m resolution

-Local Grid: 30 m x 30 m resolution

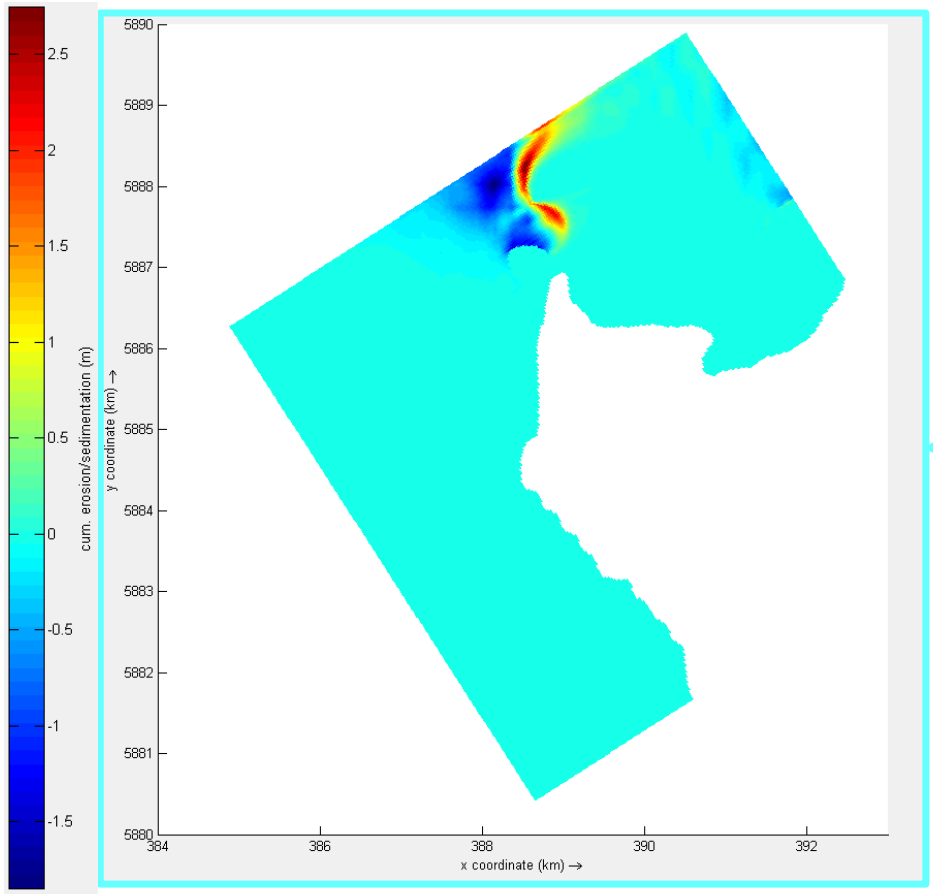
Flow model

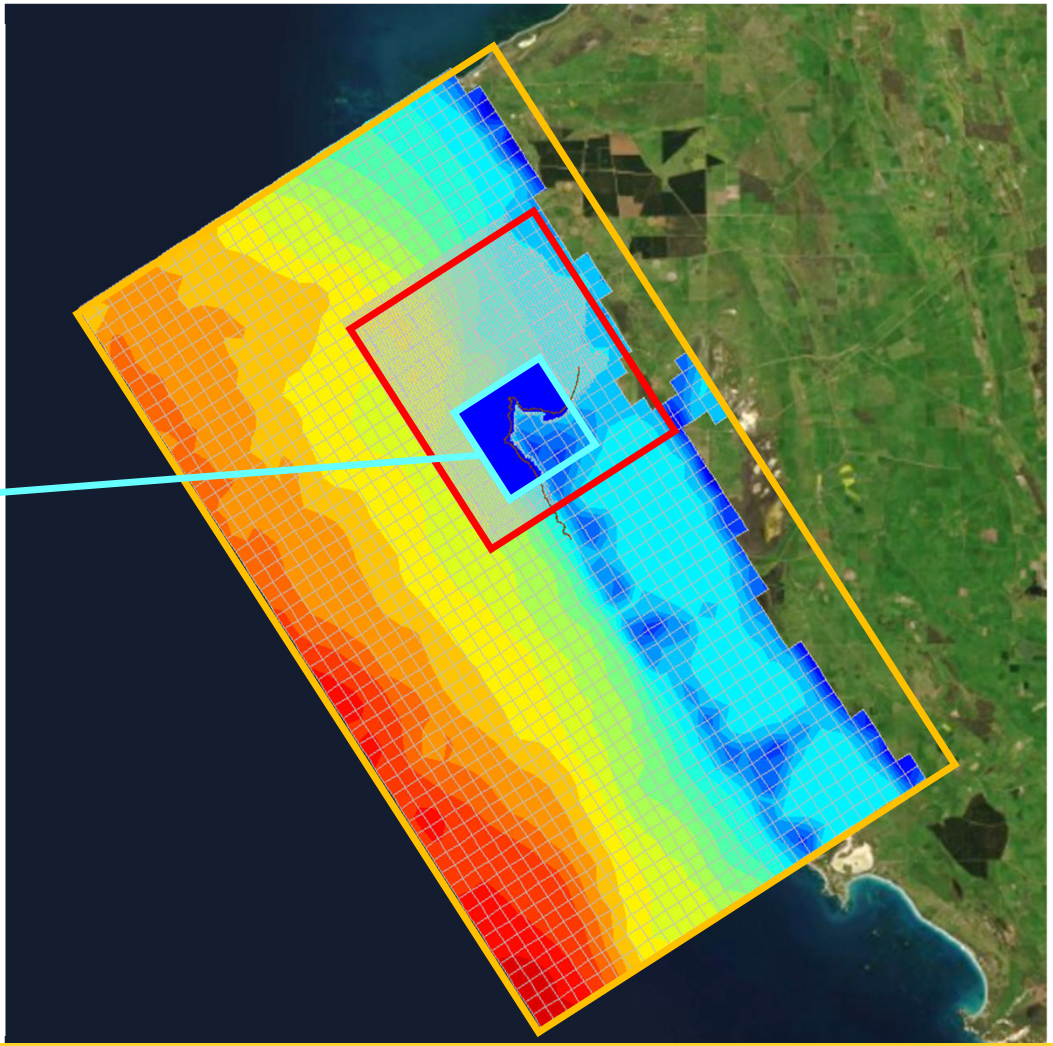
-Same as smallest wave grid

-Around entire headland

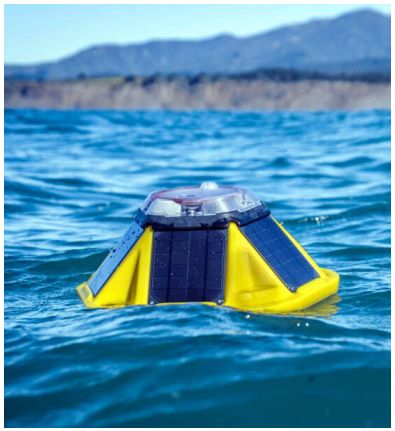


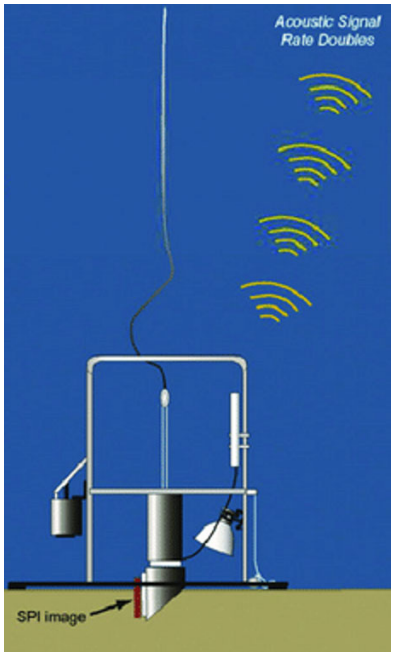
Morphological model





Field measurements





Future research

Sediment pathways
- Long-term, large scale
-Morphological model (e.g., Delft 3D), field measurements

Storm Erosion
- Short-term, smaller scale
-Morphological model (e.g., Xbeach), field measurements

Nature-based solutions
-E.g., artificial reef
Modellling in physical wave flume, numerical models