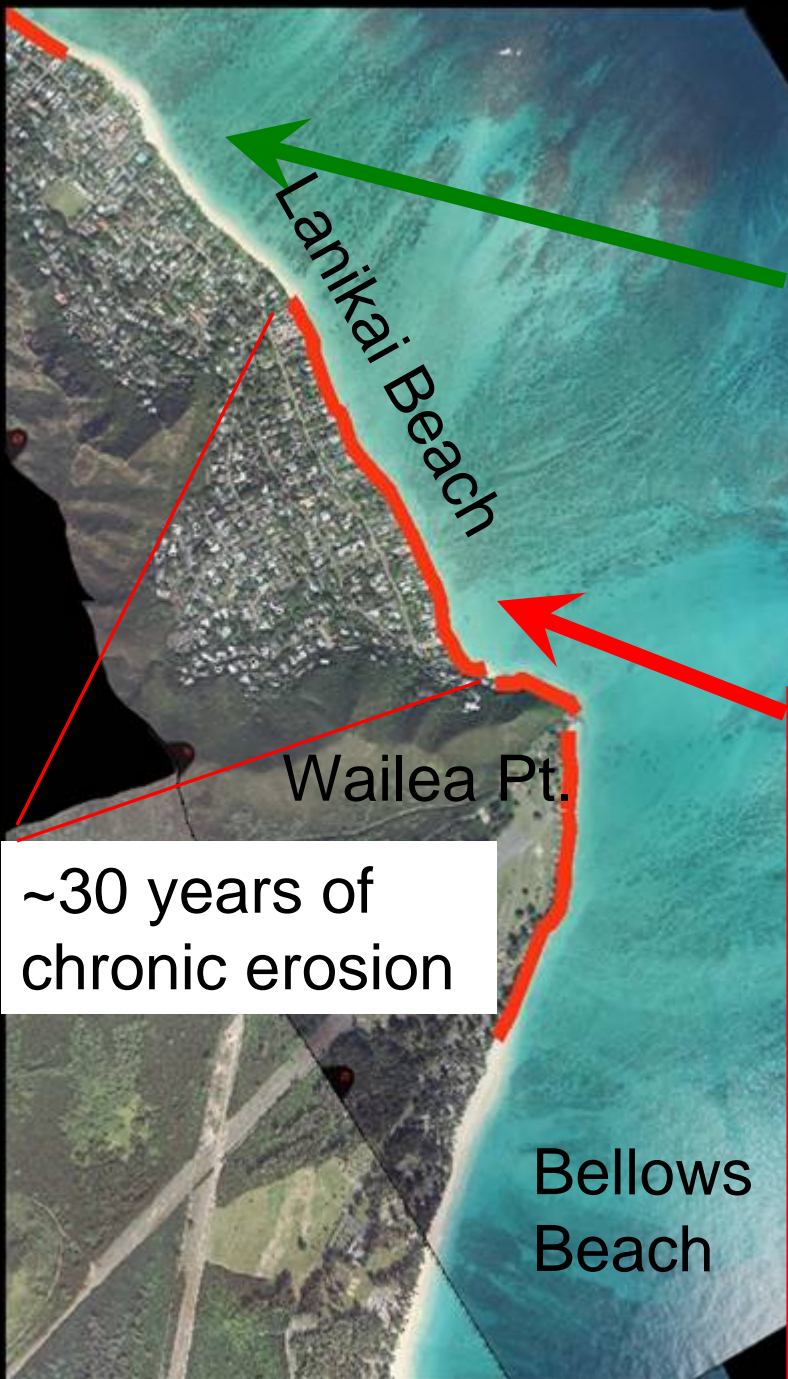
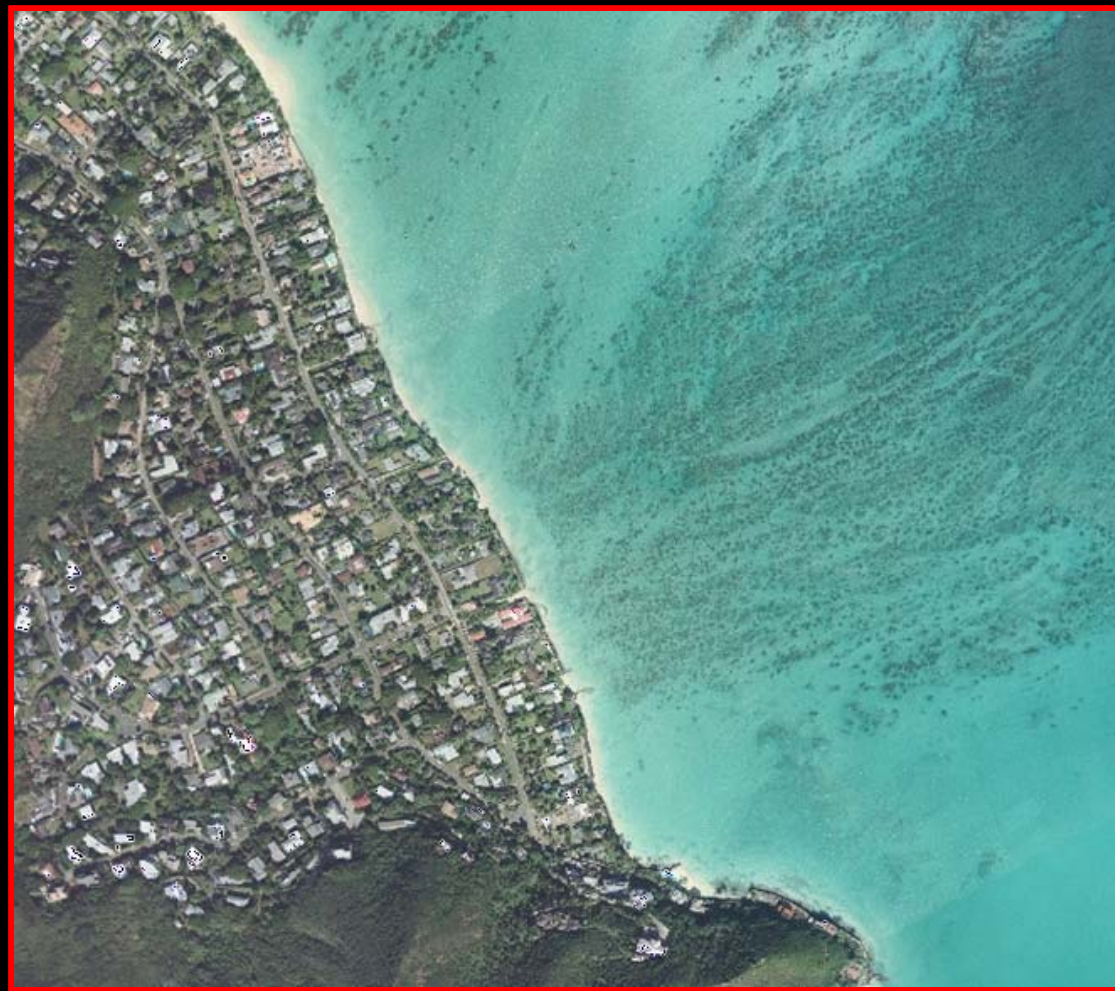


Sediment Transport Study Lanikai Beach

- Embayed headland
- North: Kailua Beach
- South: Bellows Beach
- 50% loss ~30 years



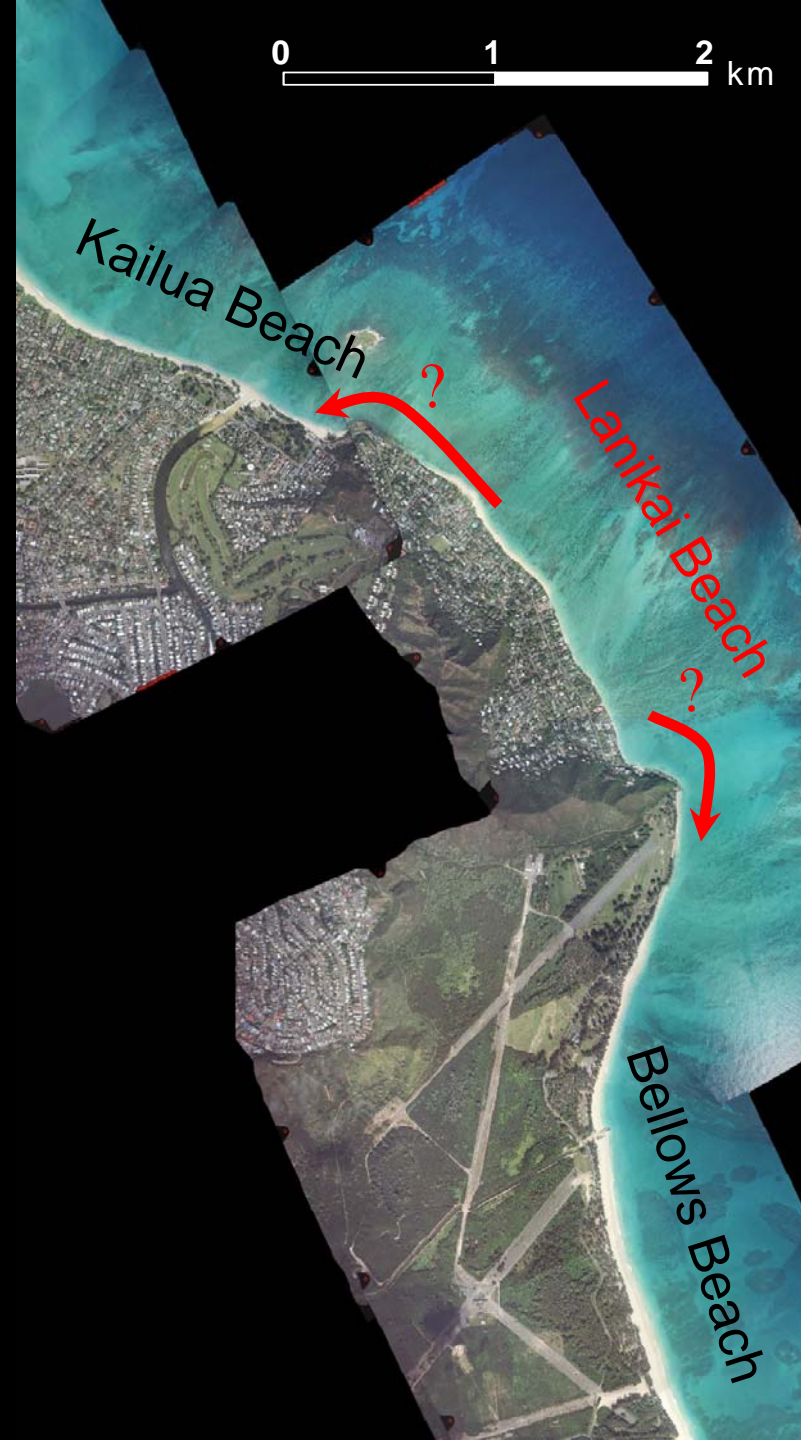




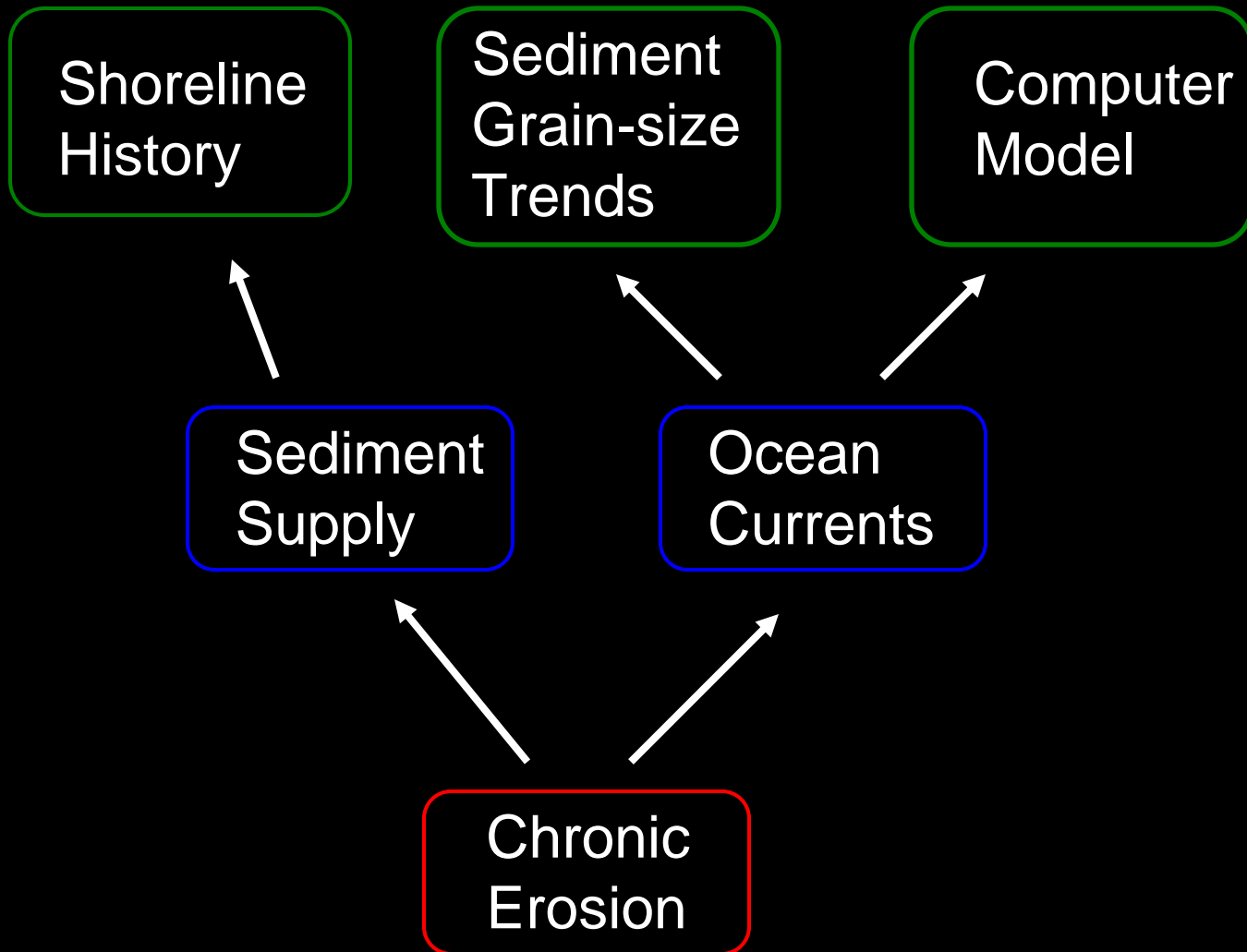
Historical Shoreline Change

On Going Debate: Longshore transport at Lanikai

- Transport direction poorly understood.
 - North to Kailua?
 - Noda (1989): no transport around point, either direction
 - South to Bellows?
 - North Bellows Eroding
 - Offshore Sand Fields
 - Possibly... but usually seasonal
 - Supply Problem?
 - A sand source cut off?
 - Focus on Bellows



Sediment Transport Study: Outline

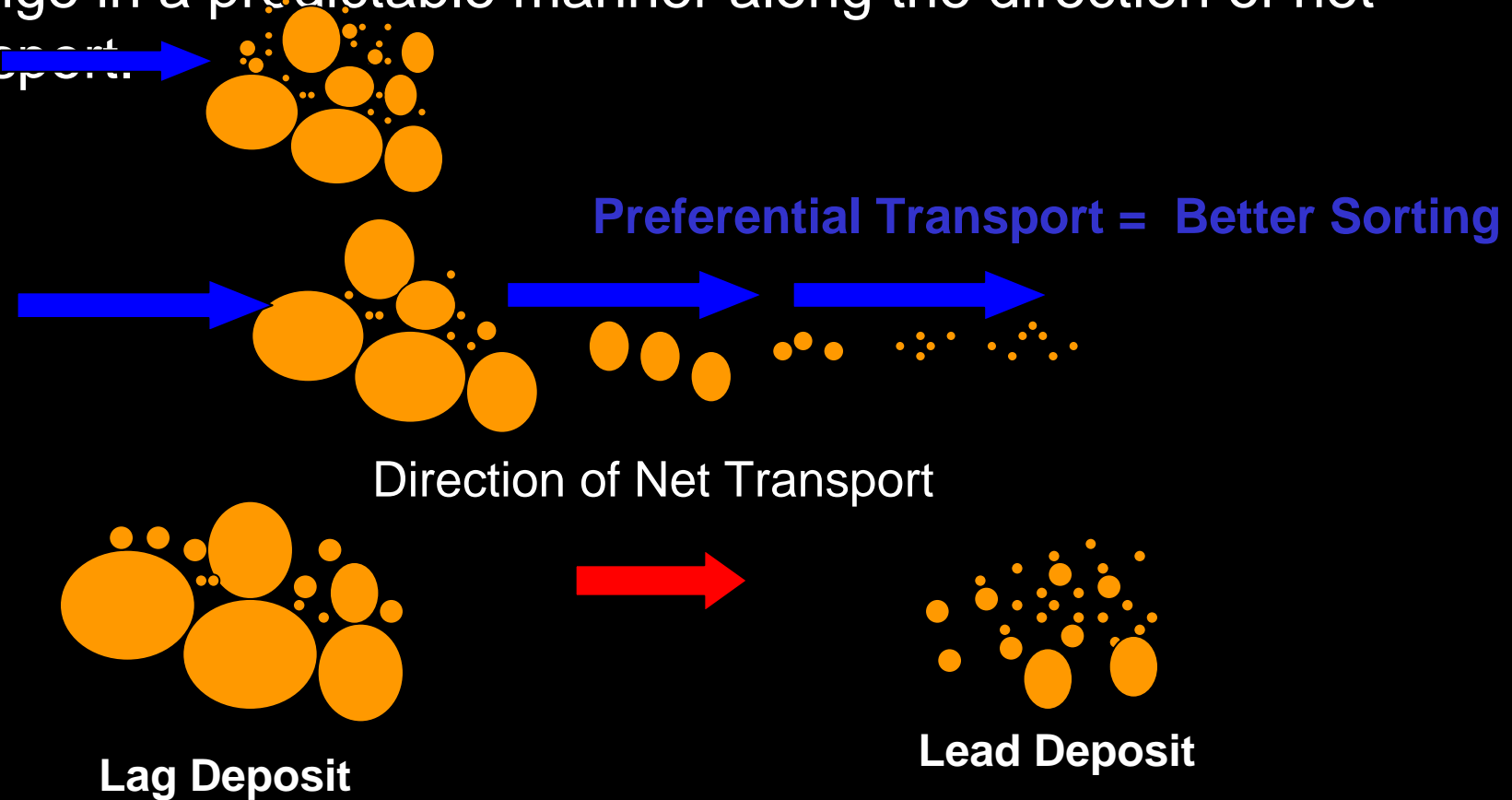


Methodology:

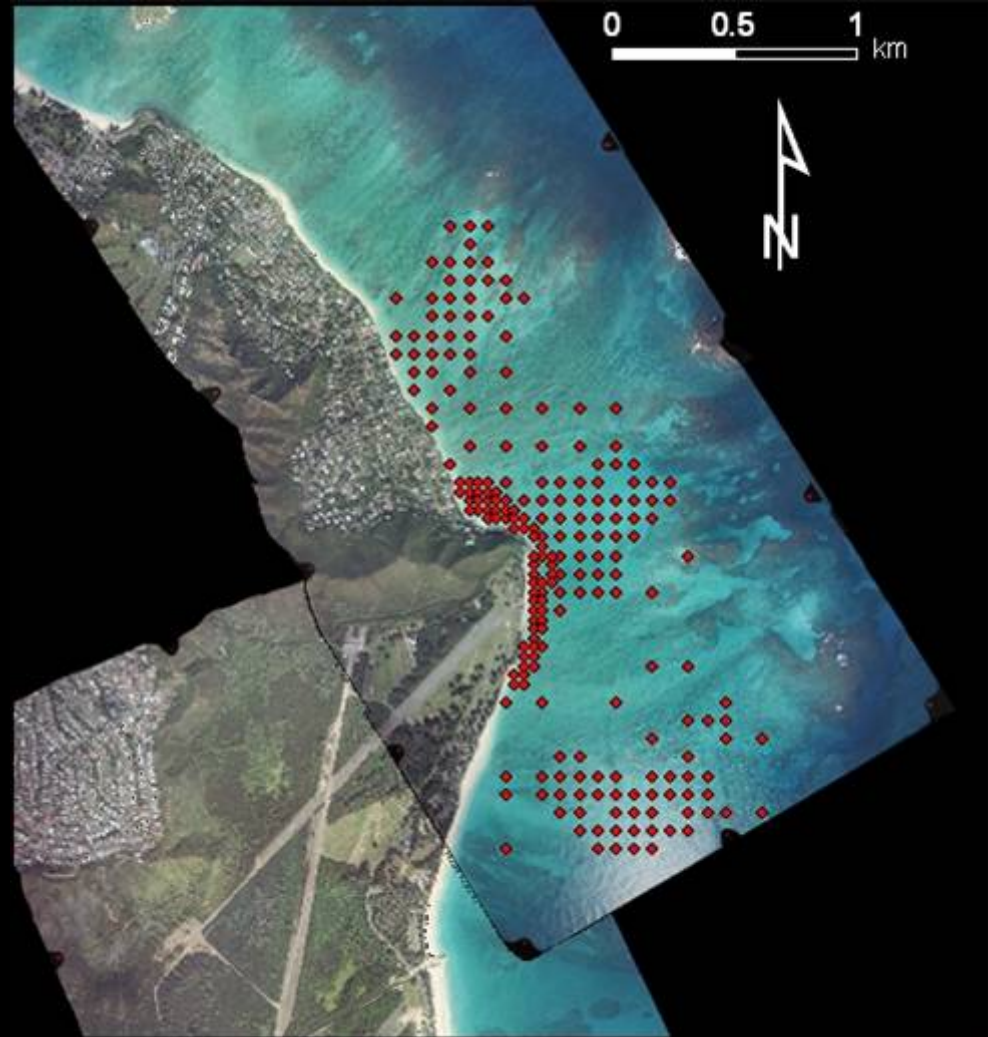
Sediment Grain-size Trend Analysis

Assumption:

Sediment will become better sorted in the direction of transport. Sediment grain size distributions on successive samples will change in a predictable manner along the direction of net transport.



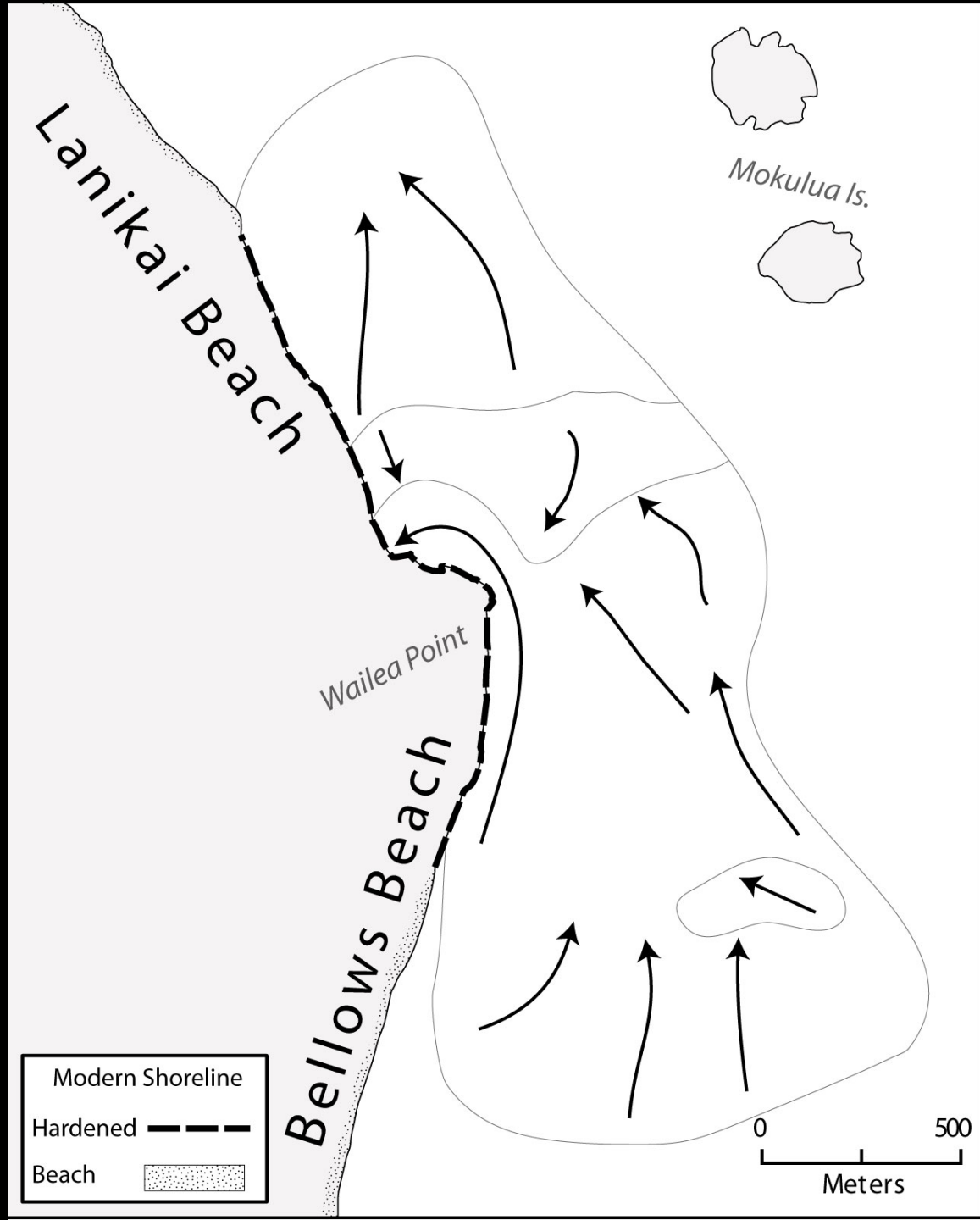
Sample Collection



- 250 collected
- 214 Sieved
- Wet and dry sieving between Phi -2 and 5 (0.5 intervals)

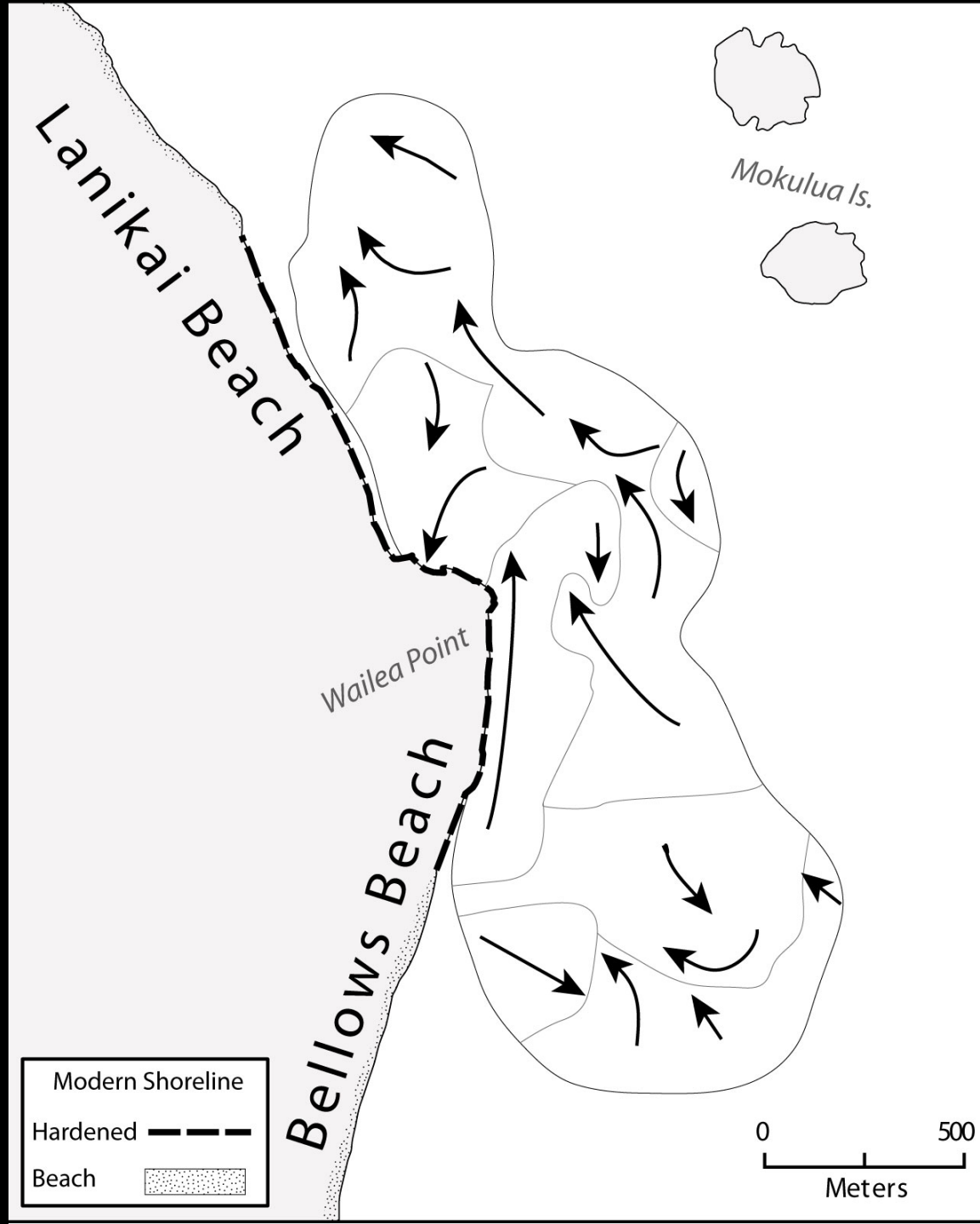
Gao-Collins Method Results

Gao and Collins (1992)



Roux Method Results

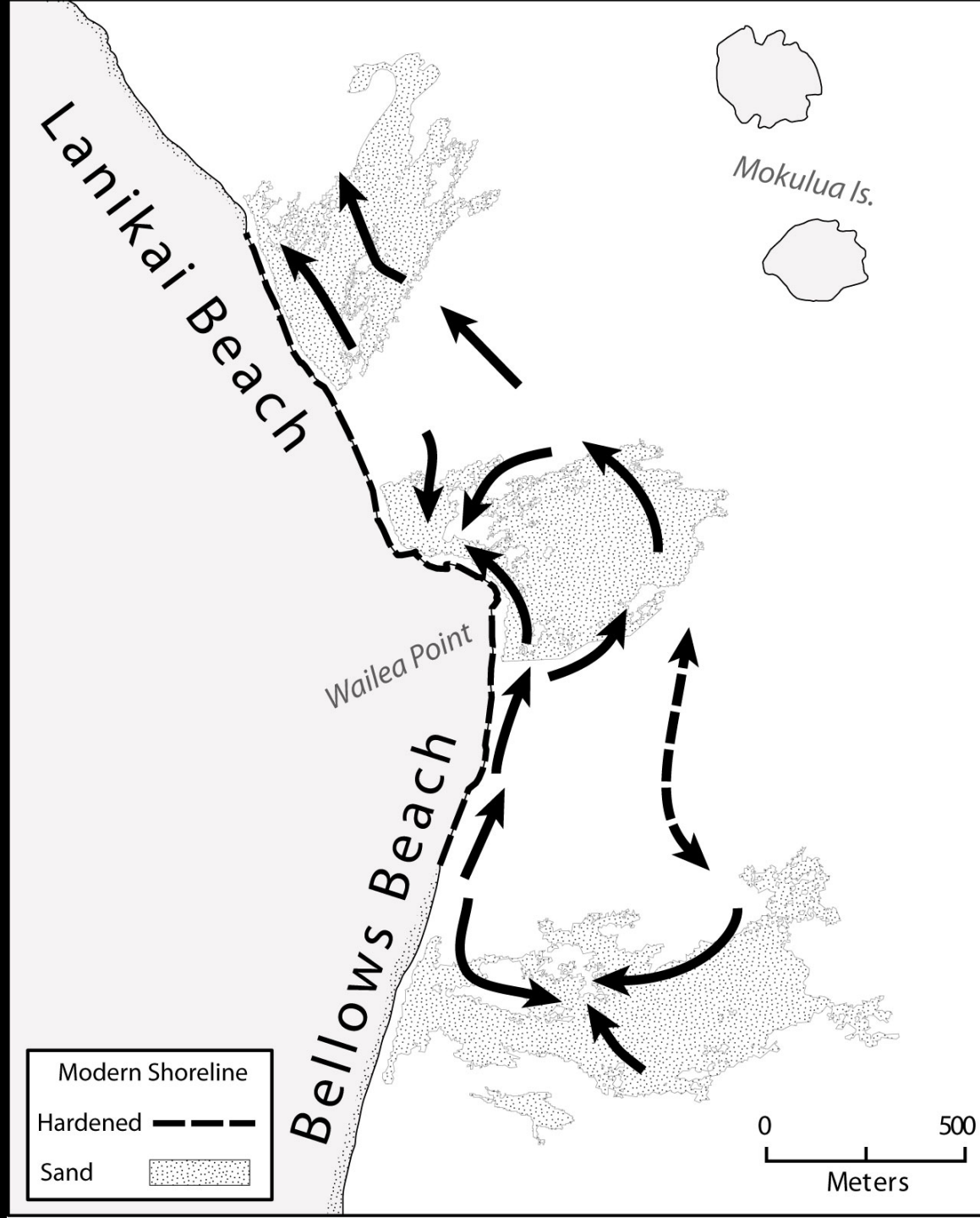
Roux (1994)



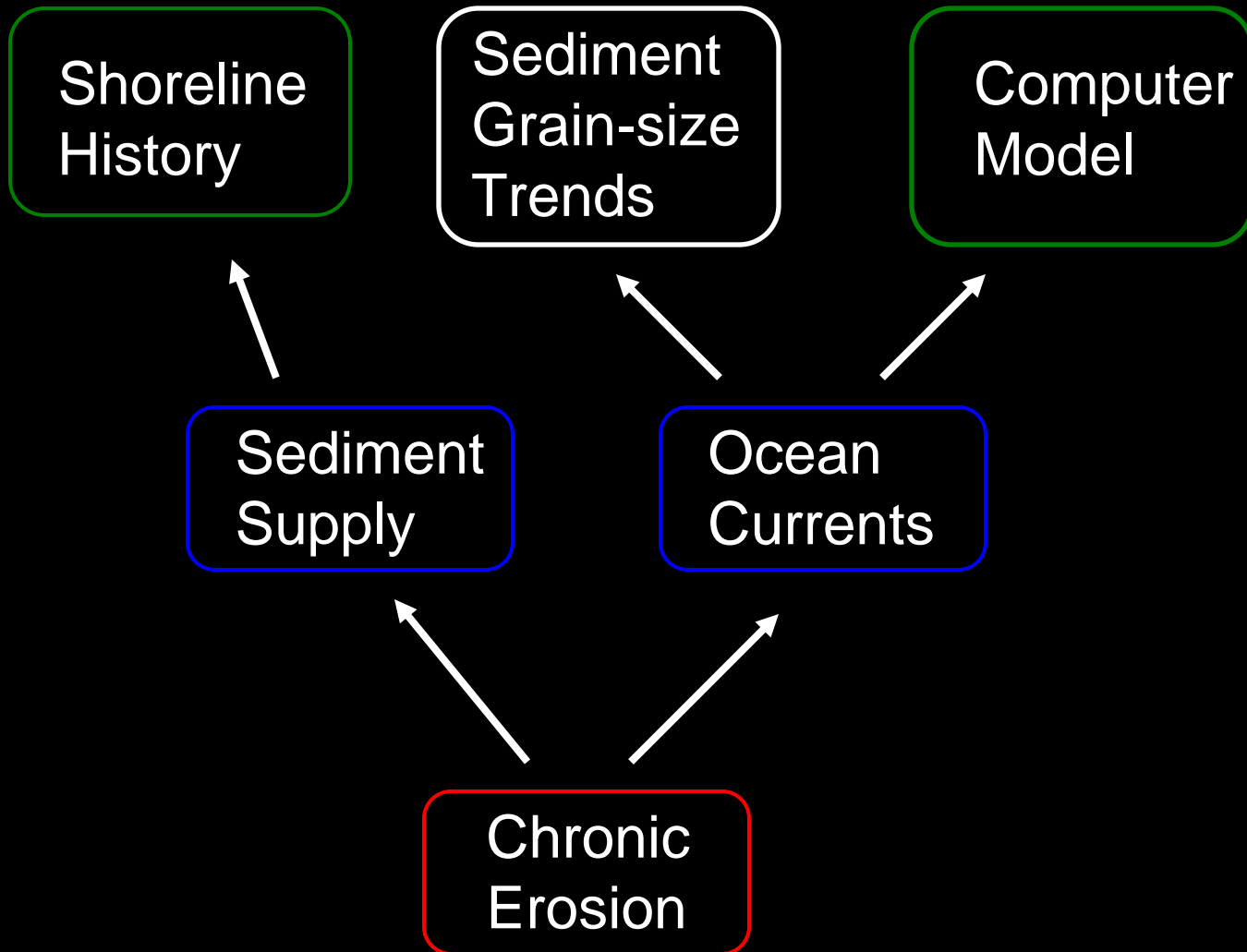
Combine Results

Northward transport

Indicates Lanikai has historical received sand from Bellows Beach.



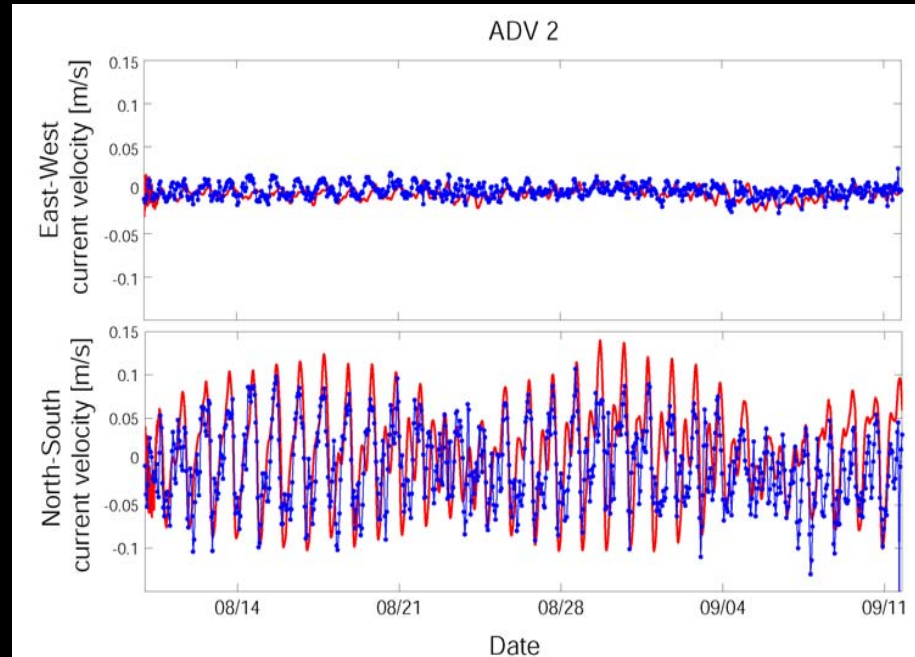
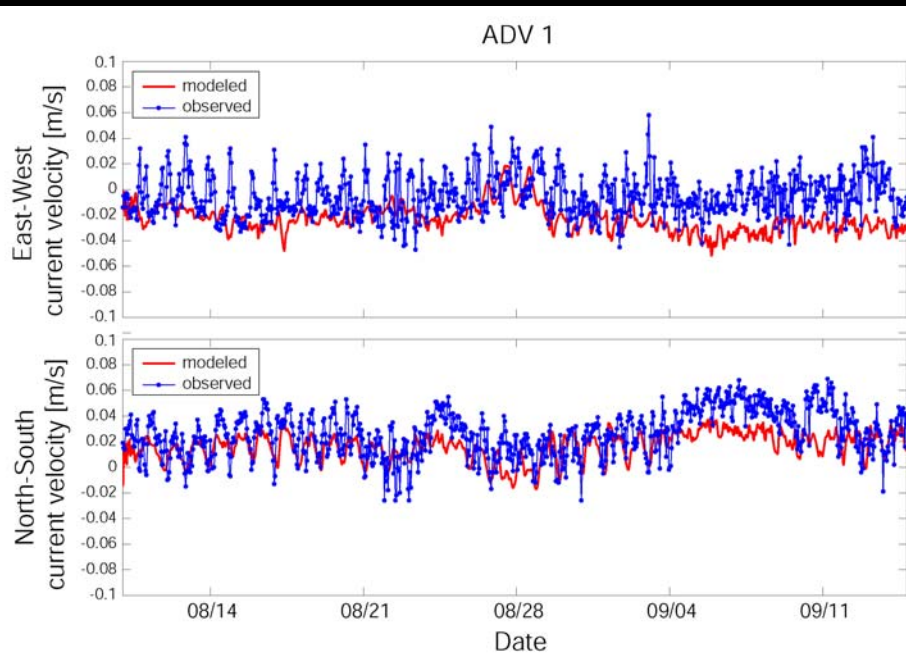
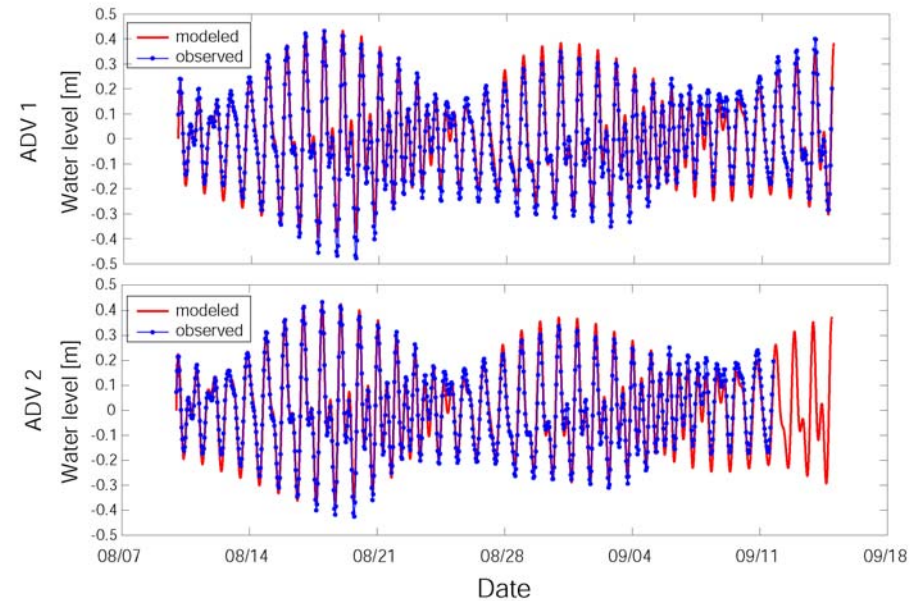
Sediment Transport Study: Outline

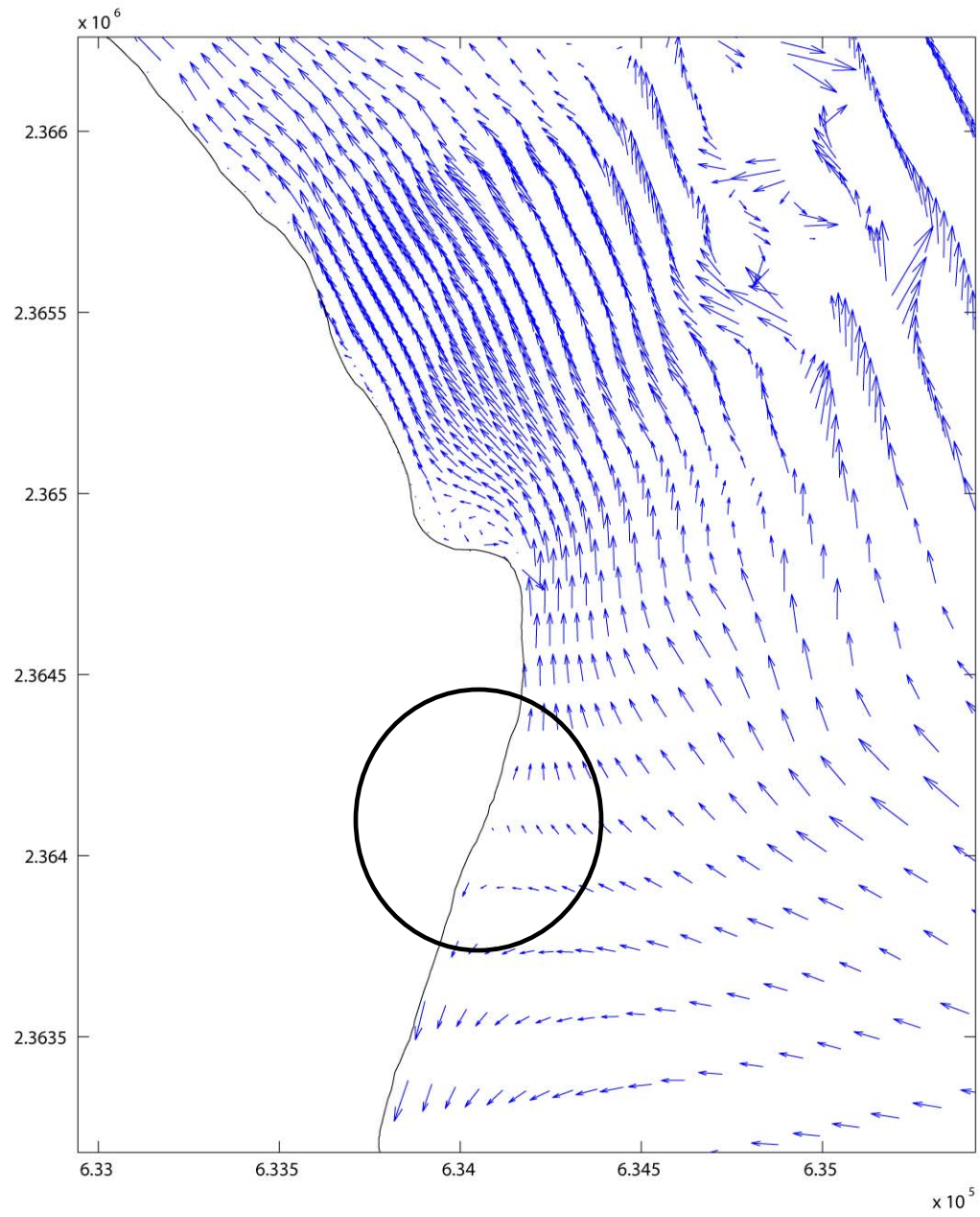


DELPH3D Model

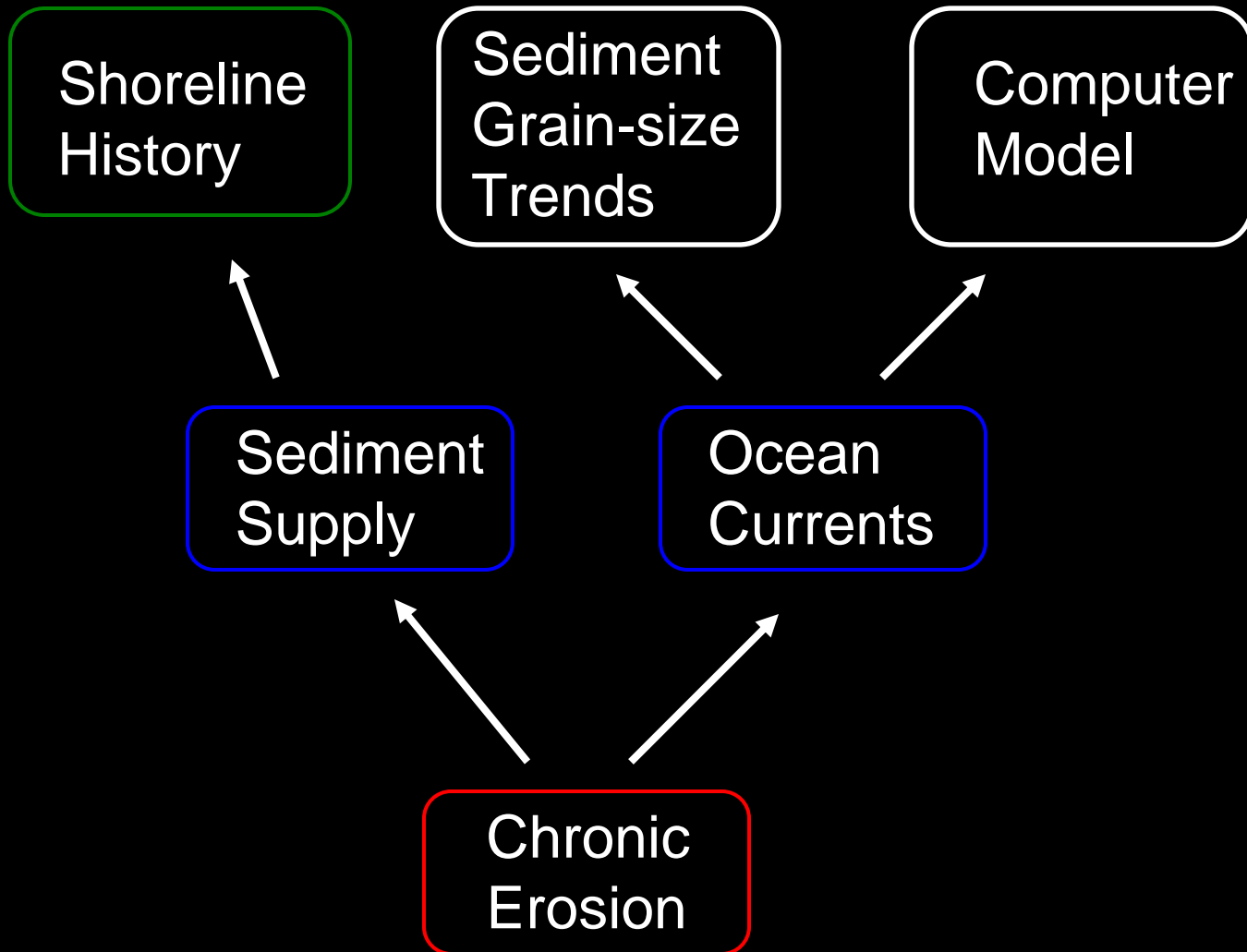
- Tides
- Wind driven currents
- Waves insignificant in shallow depths

Modeled Observed



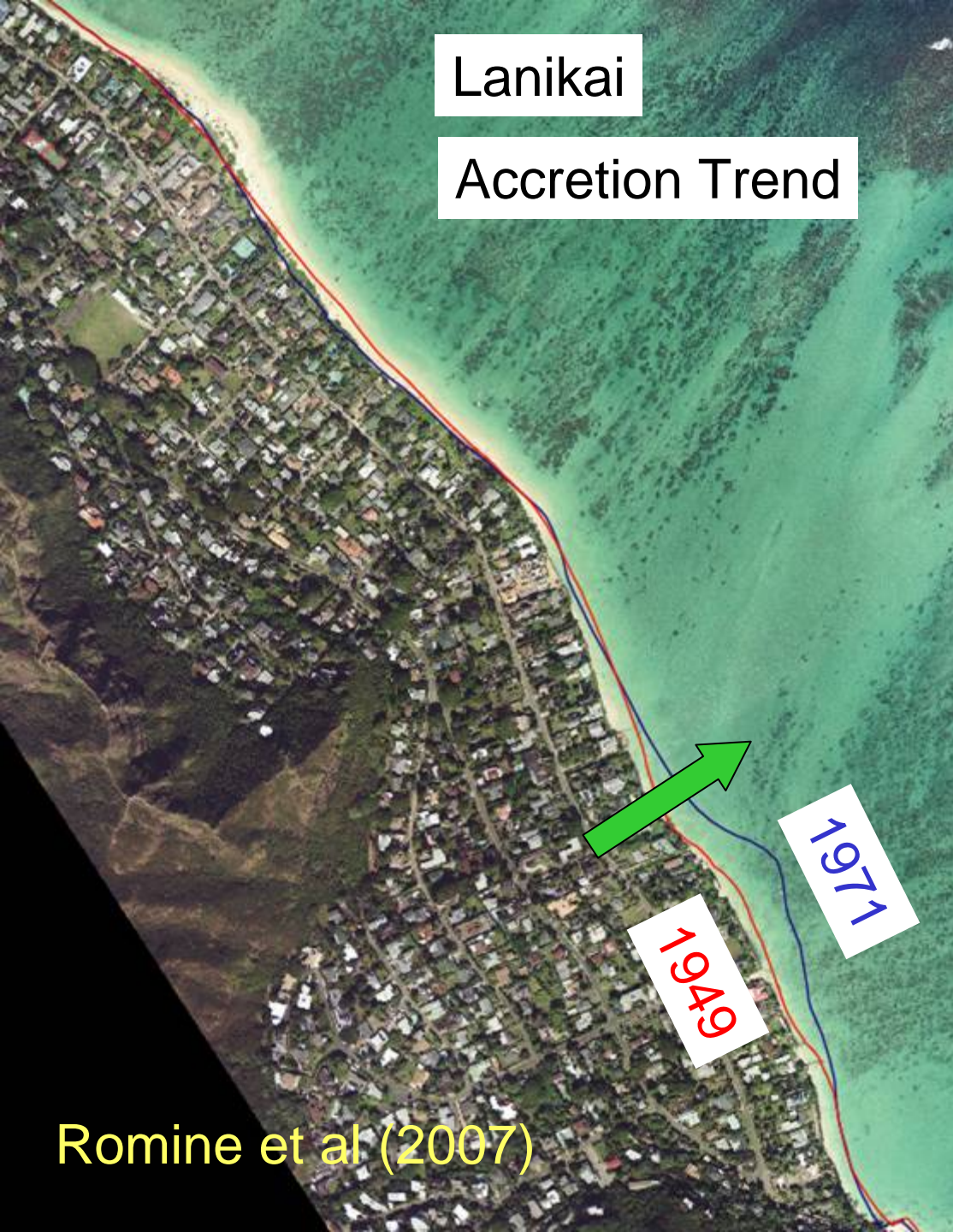


Sediment Transport Study: Outline



Lanikai

Accretion Trend



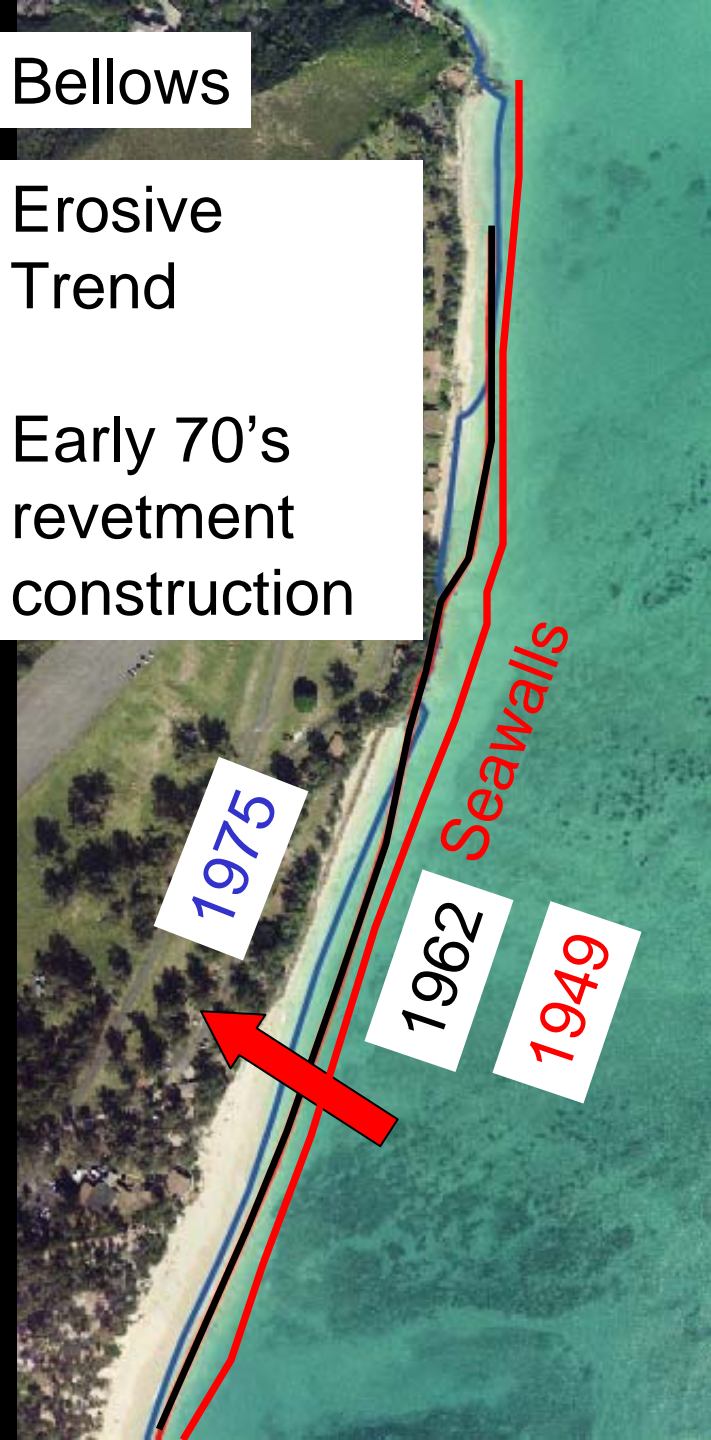
1949

1971

Romine et al (2007)

Bellows

Erosive Trend
Early 70's
revetment
construction



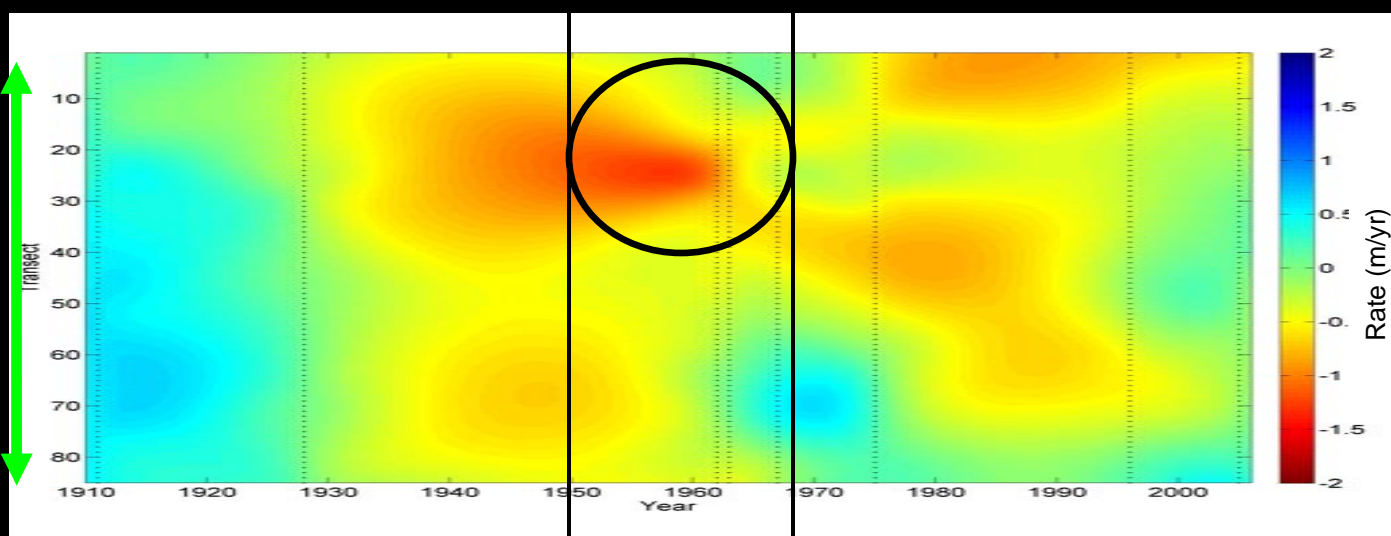
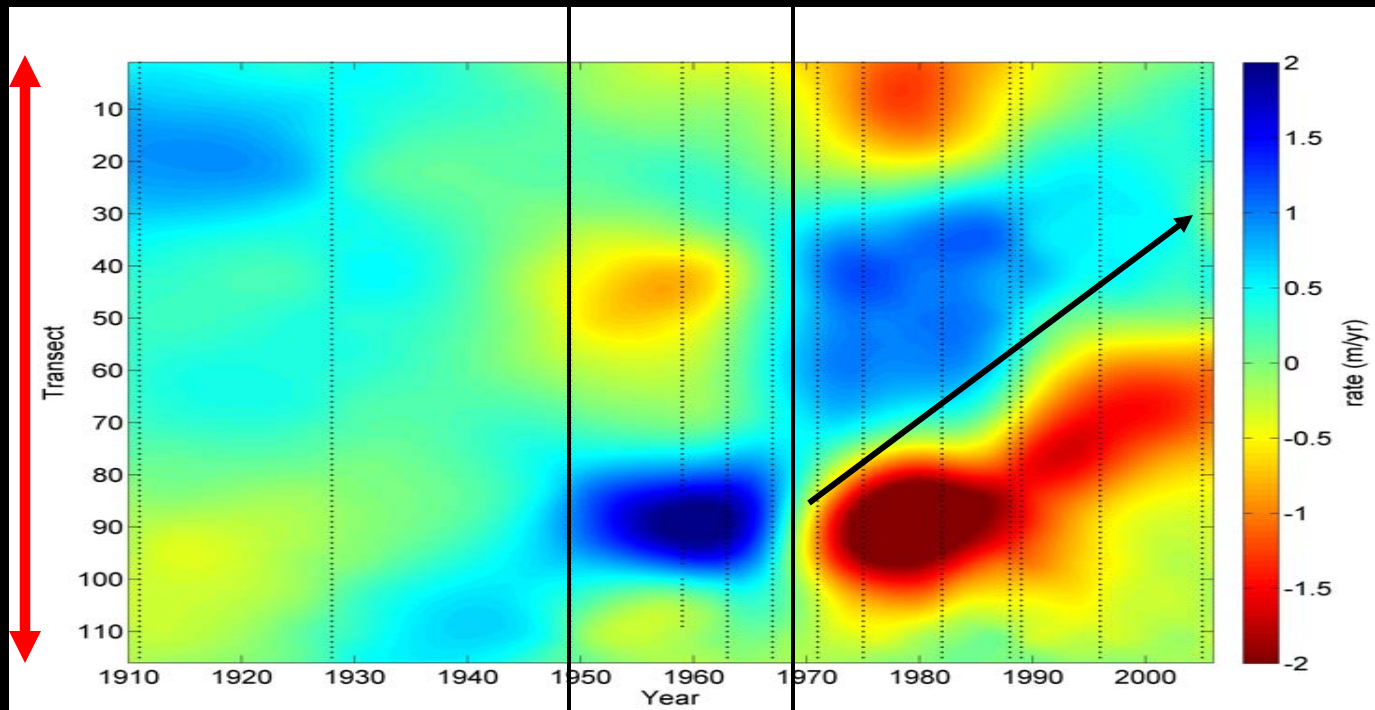
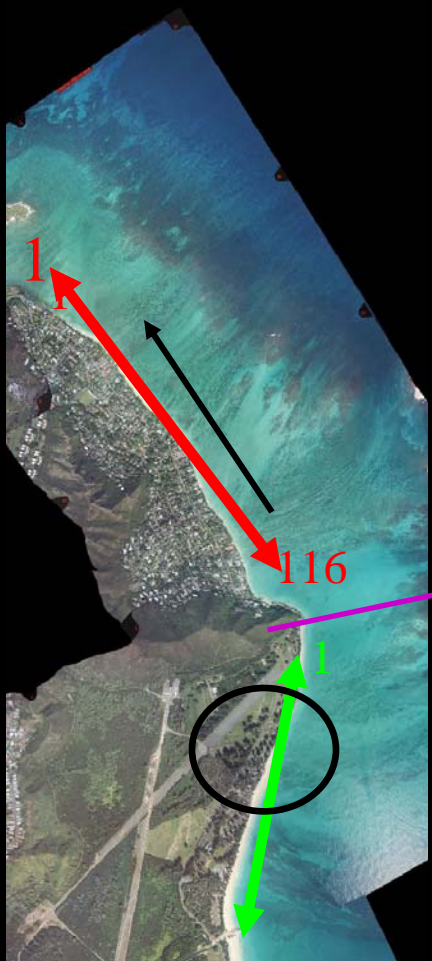
1975

1962

1949

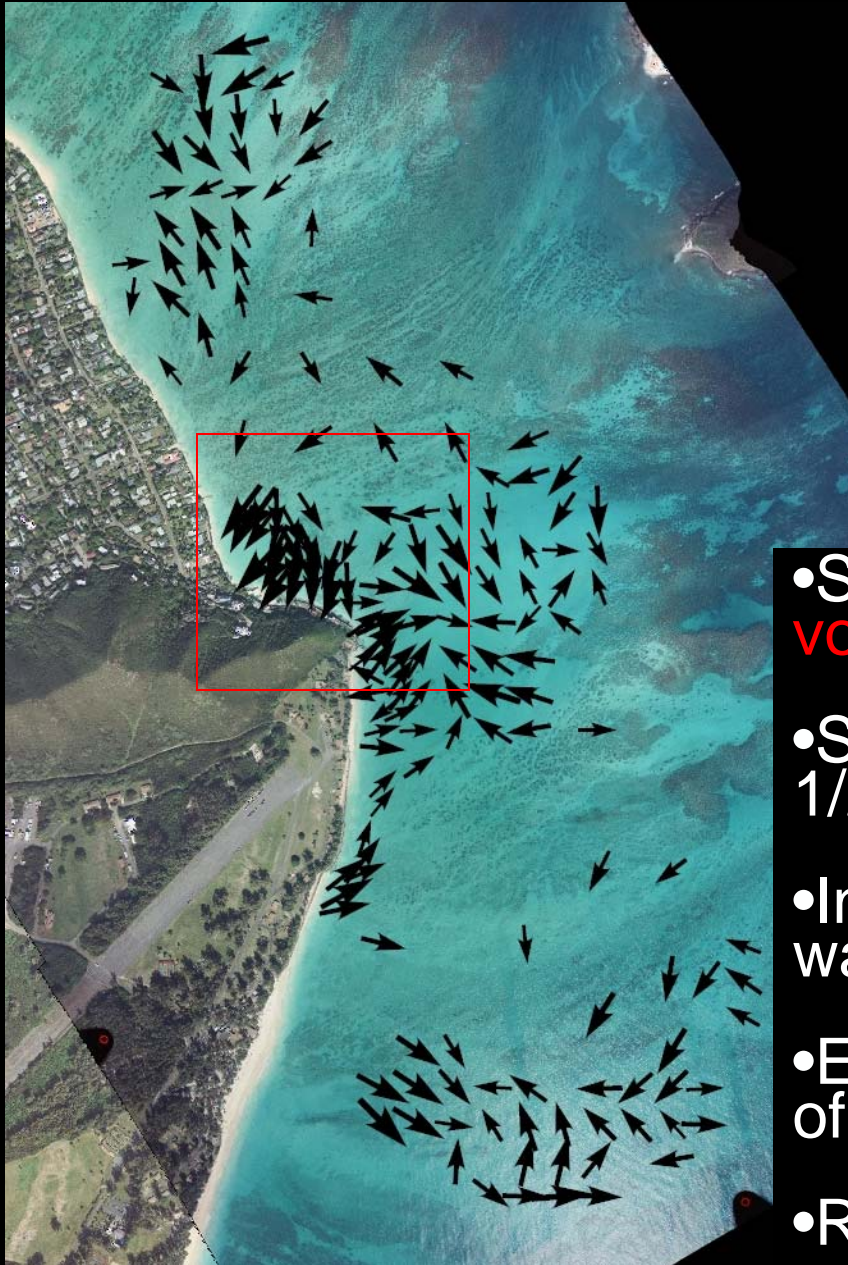
Seawalls



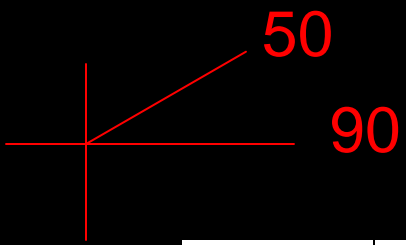


Stronger Seawall Reflection

Thesis: Lipp (1995)

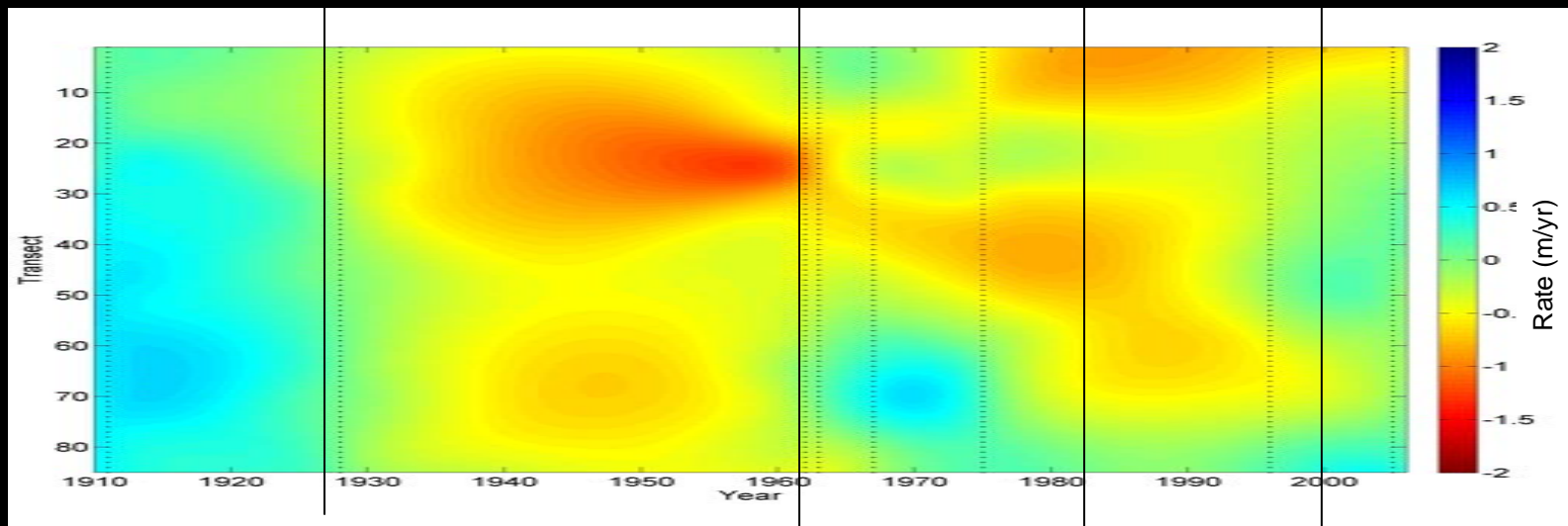
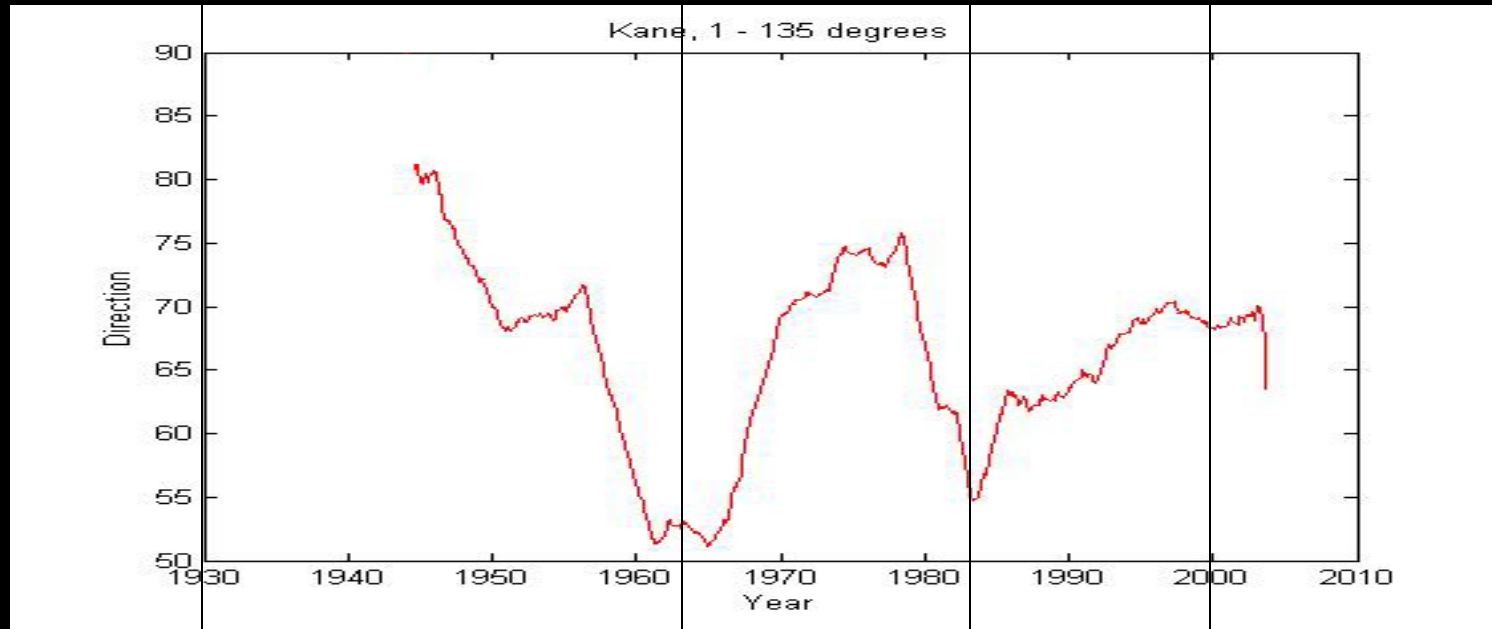


- Sand bar has formed off Lanikai:
volume = 5000 m^3
- Sand bar distance from shore = $1/2 * \text{mean annual wave length}$
- Incoming wave cancels reflected wave
- Enhanced seawall reflection & lack of sediment = sediment deficit
- Relict sedimentology of transport



Shifting Winds?

Kaneohe MCB wind direction



Conclusions

- Sediment Trends
- DELPH3D model
- Historical Analysis

1950s: Bellows acts as a source for accretion in Lanikai

1970s: Revetments stabilize Bellows → S. Lanikai erodes

1970-2008: Lanikai sand drifts to the north without replenishment

Questions?



THANK YOU