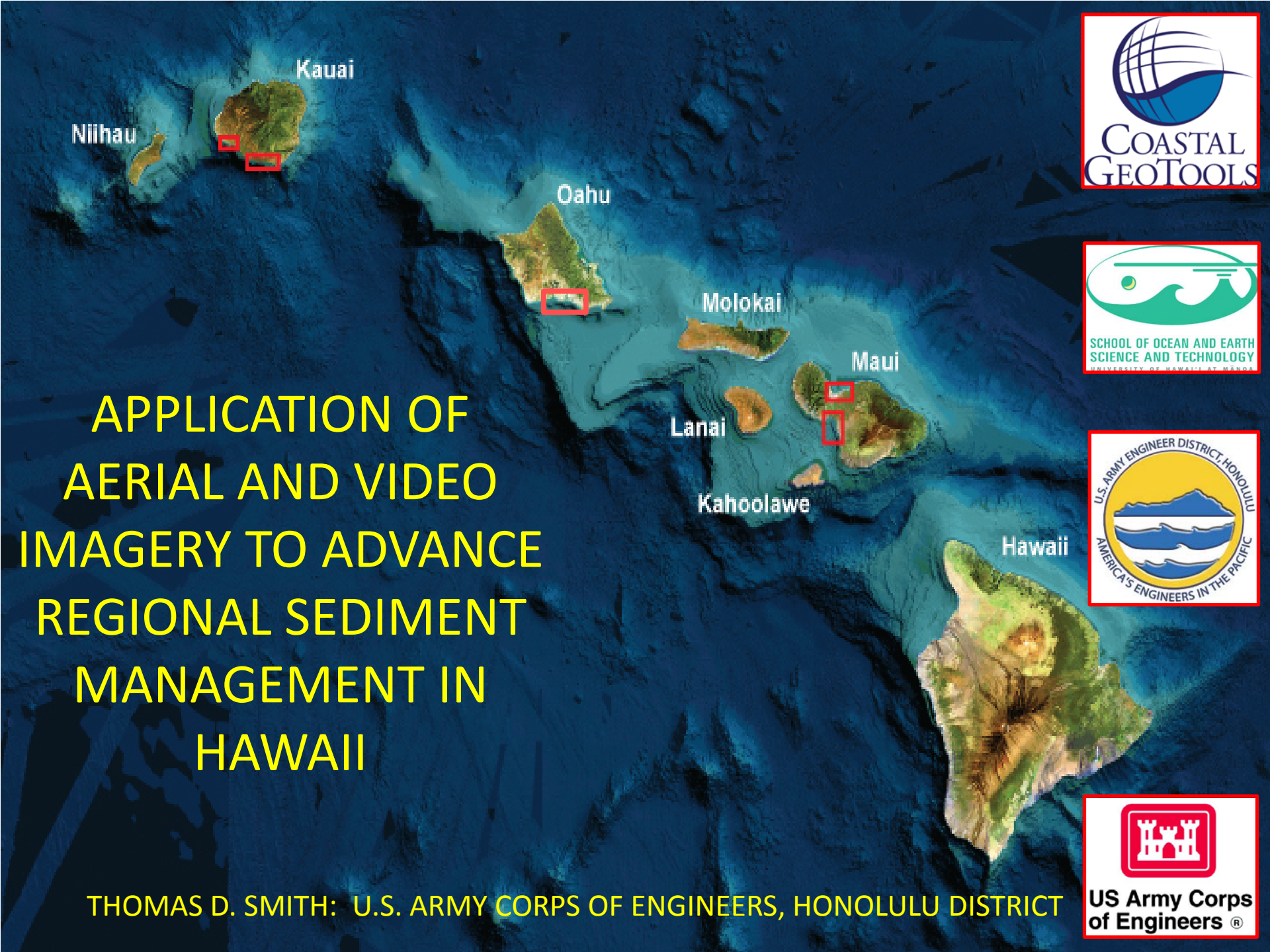


APPLICATION OF AERIAL AND VIDEO IMAGERY TO ADVANCE REGIONAL SEDIMENT MANAGEMENT IN HAWAII

THOMAS D. SMITH: U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT

TOPICS

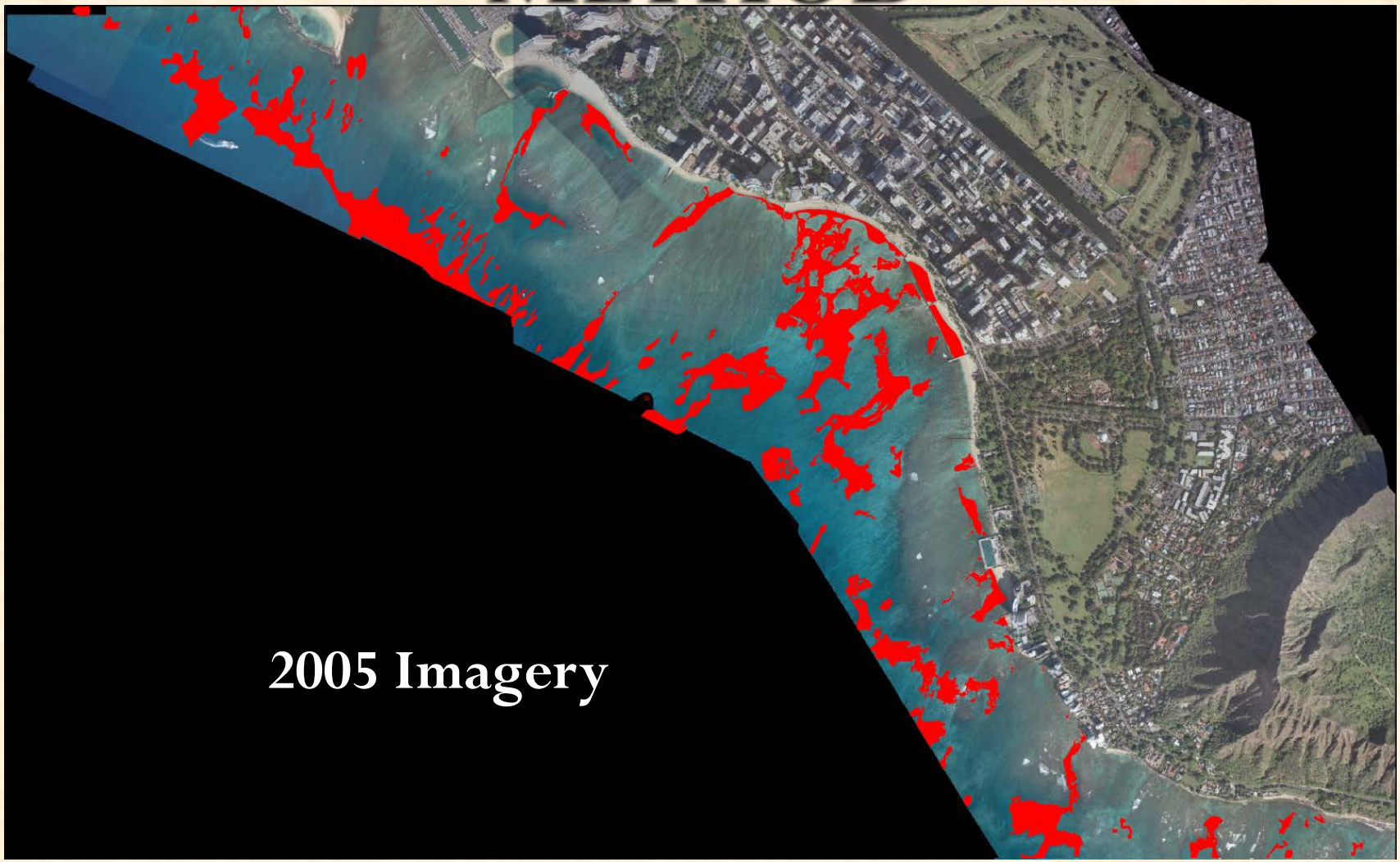
- OFFSHORE SAND SOURCE INVENTORIES
  - MAUI
  - KAUAI
- WAIKIKI BEACH VIDEO CAMERA ANALYSIS

OFFSHORE SAND SOURCE INVENTORY FOR MAUI AND KAUAI

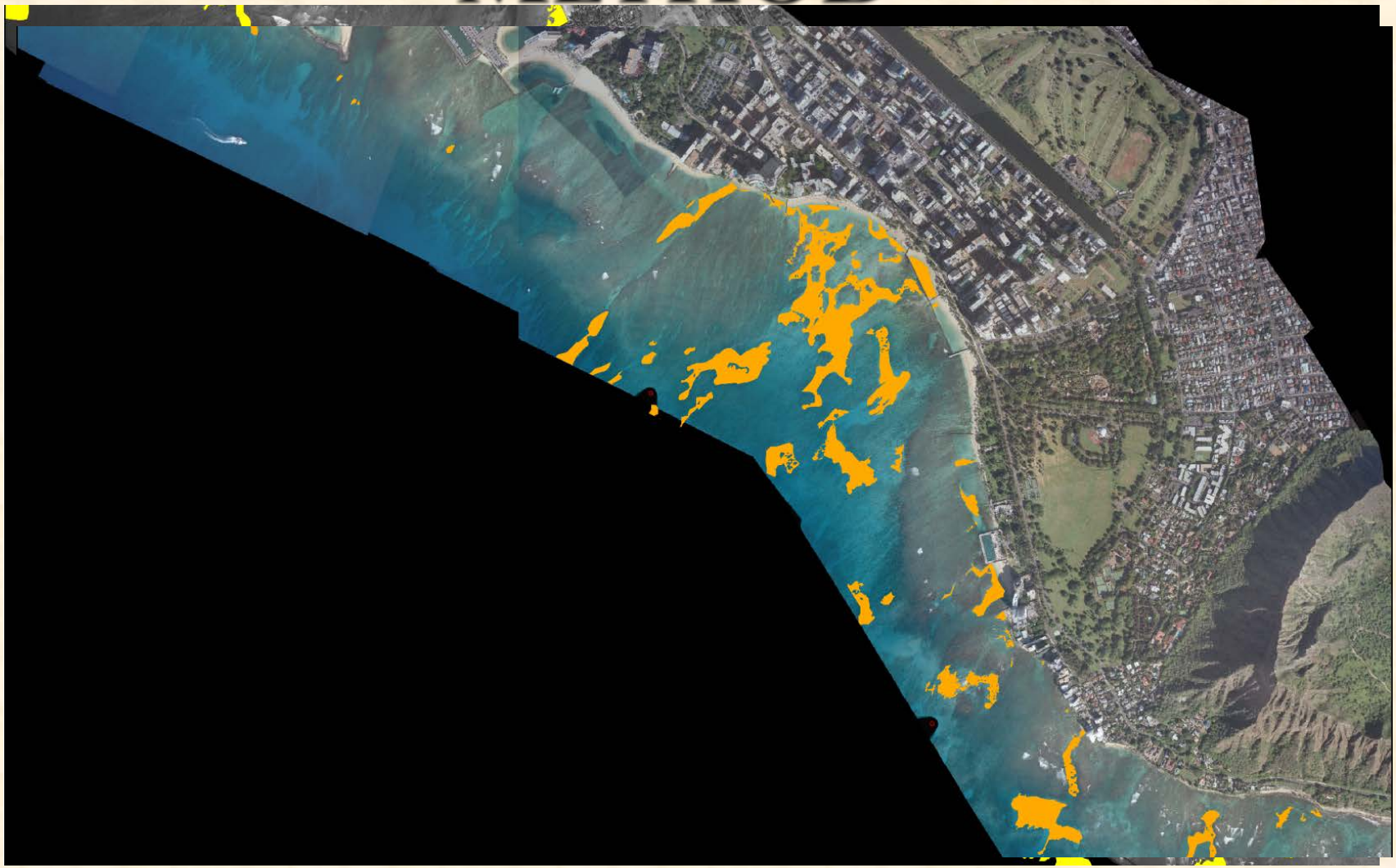
METHOD

- Used high-resolution orthophotomosaics
- Images chosen dependent upon date, area, surface glint, cloud cover and water column clarity.
- TIFF files imported into ArcGIS 9
- To increase contrast, a standard deviation stretch was applied to each image.
- Visible sand fields digitized w/Arc Map.
- ArcToolbox was used for spatial analysis.

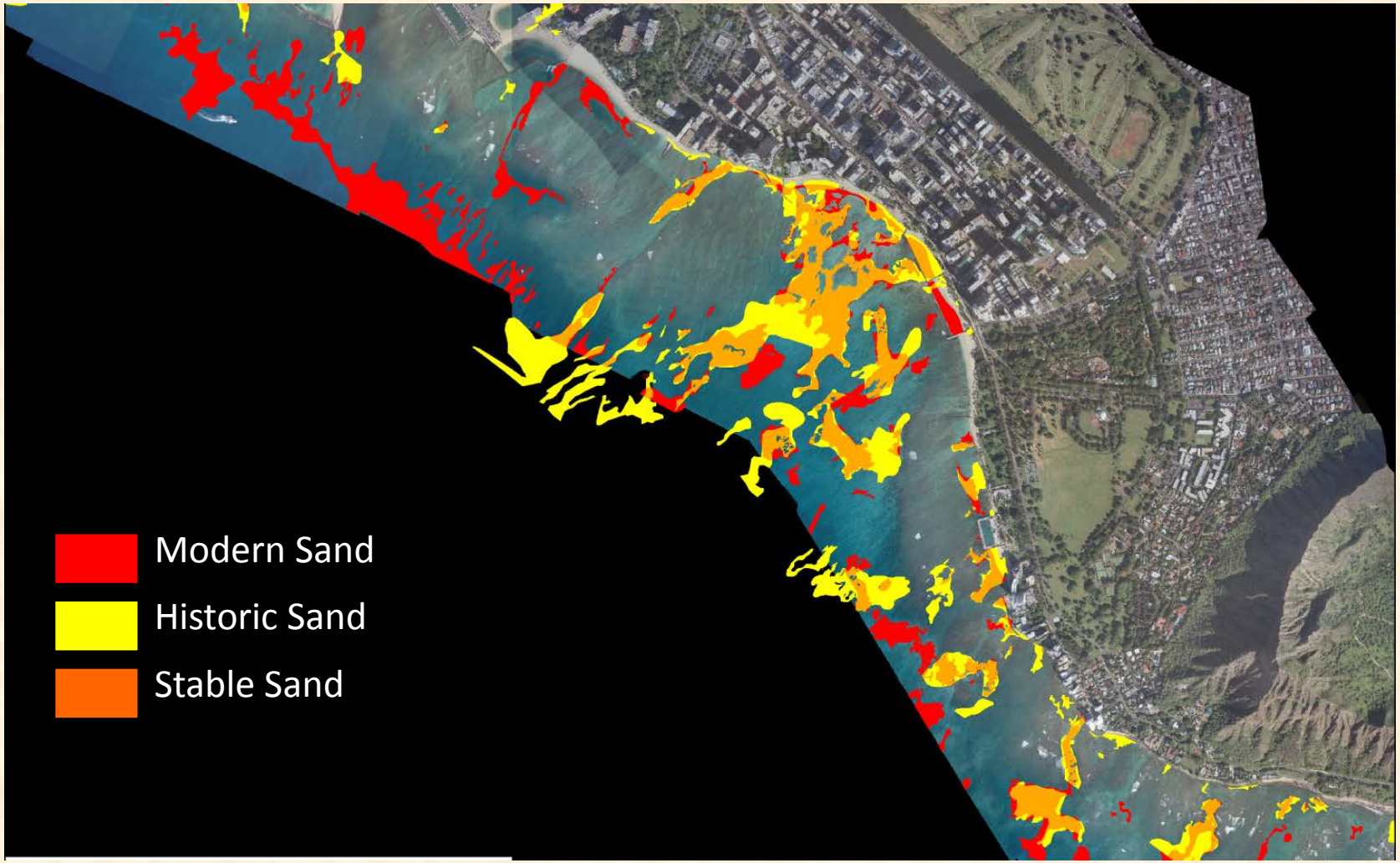
METHOD



METHOD



METHOD

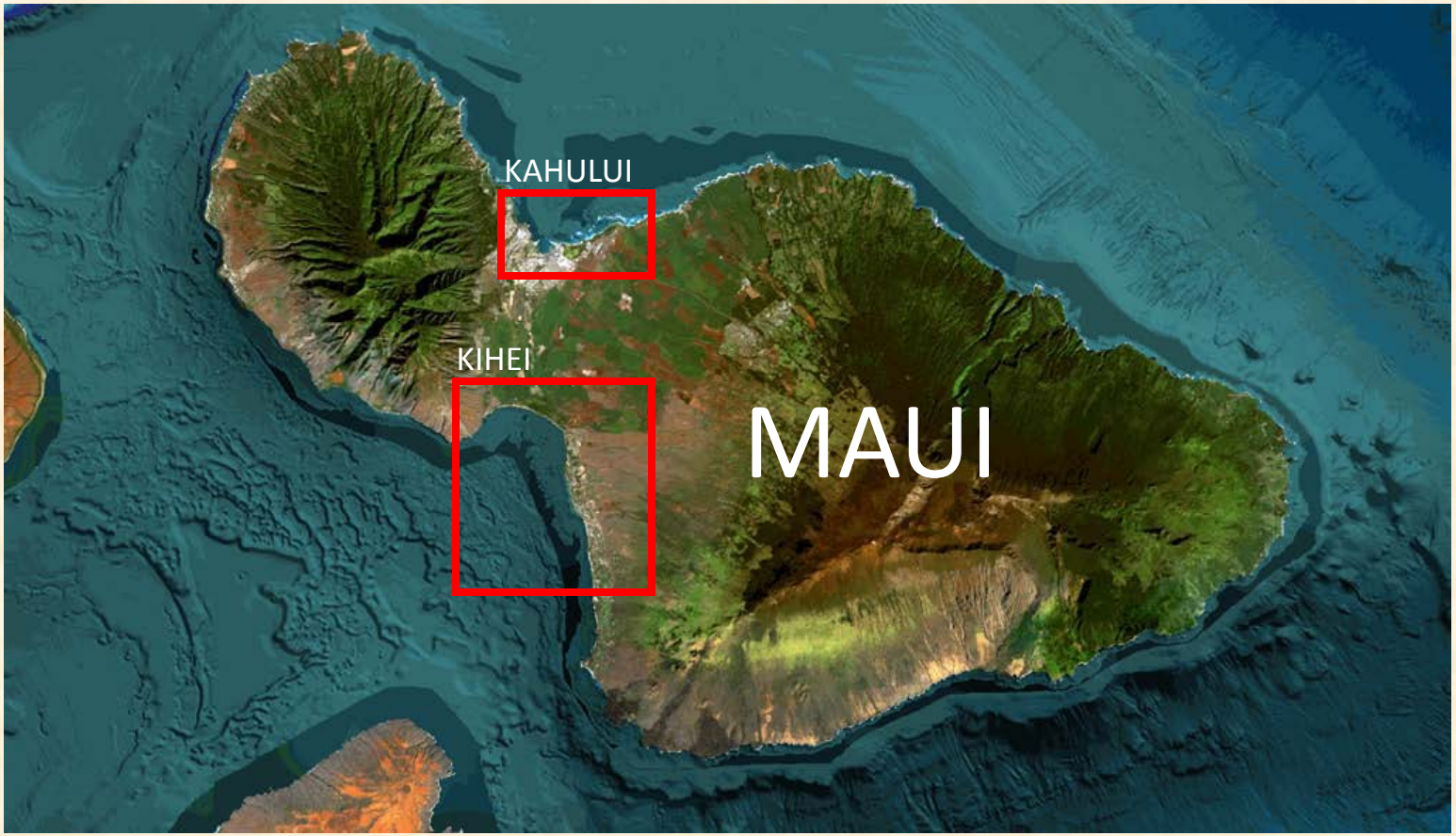


Errors and Uncertainties

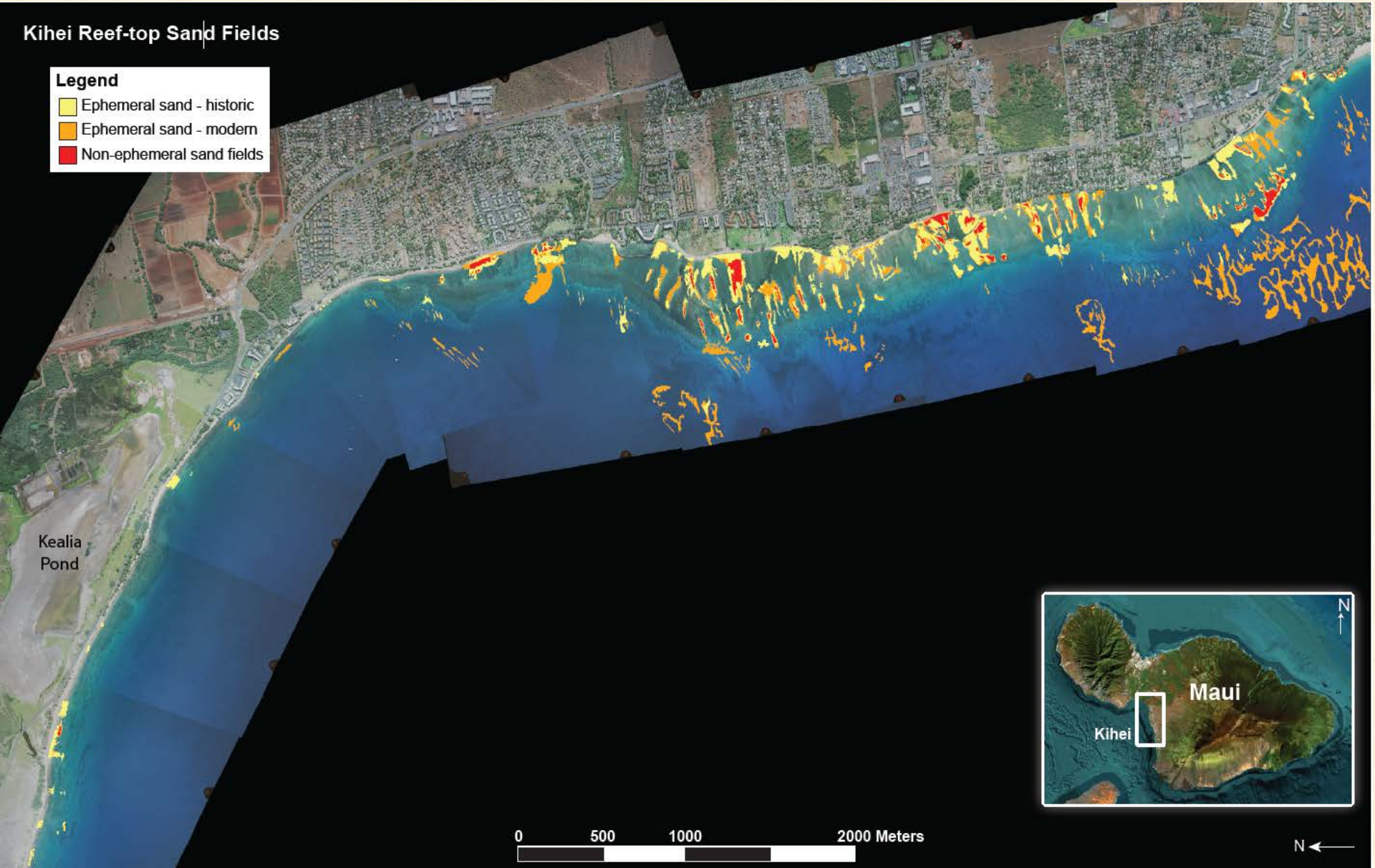
- Orthophotomosaic resolution produced an uncertainty of 0.5m for all images.
- Image quality and spatial accuracy also added to the overall error.
- Uncertainty was quantified by the standard deviation from repeated digitization of a small and a large sand field (30 times each).

MAUI REEF-TOP SAND FIELD STUDIES

MAUI RSM REGIONS

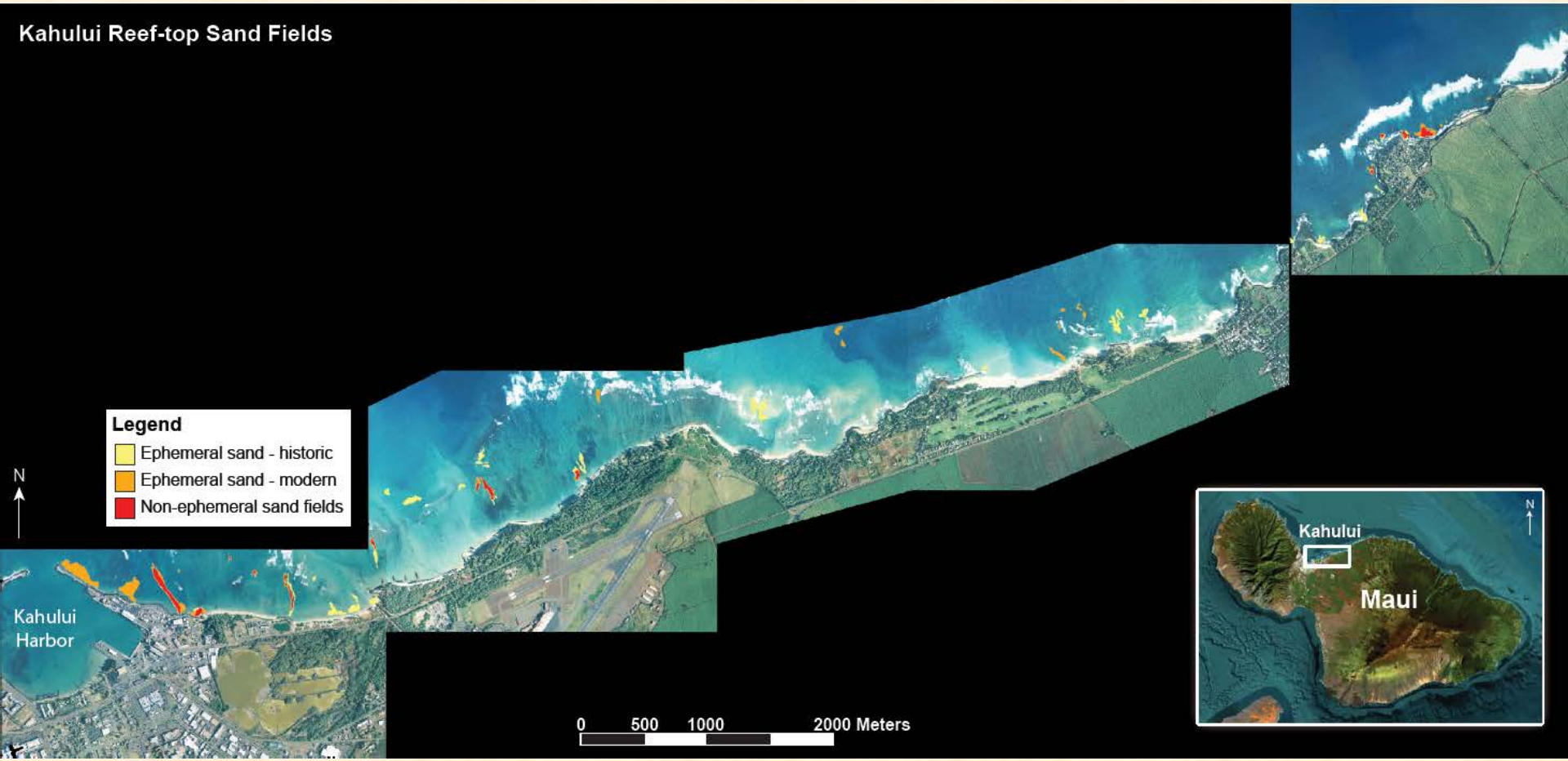


KIHEI REEF-TOP SAND FIELDS

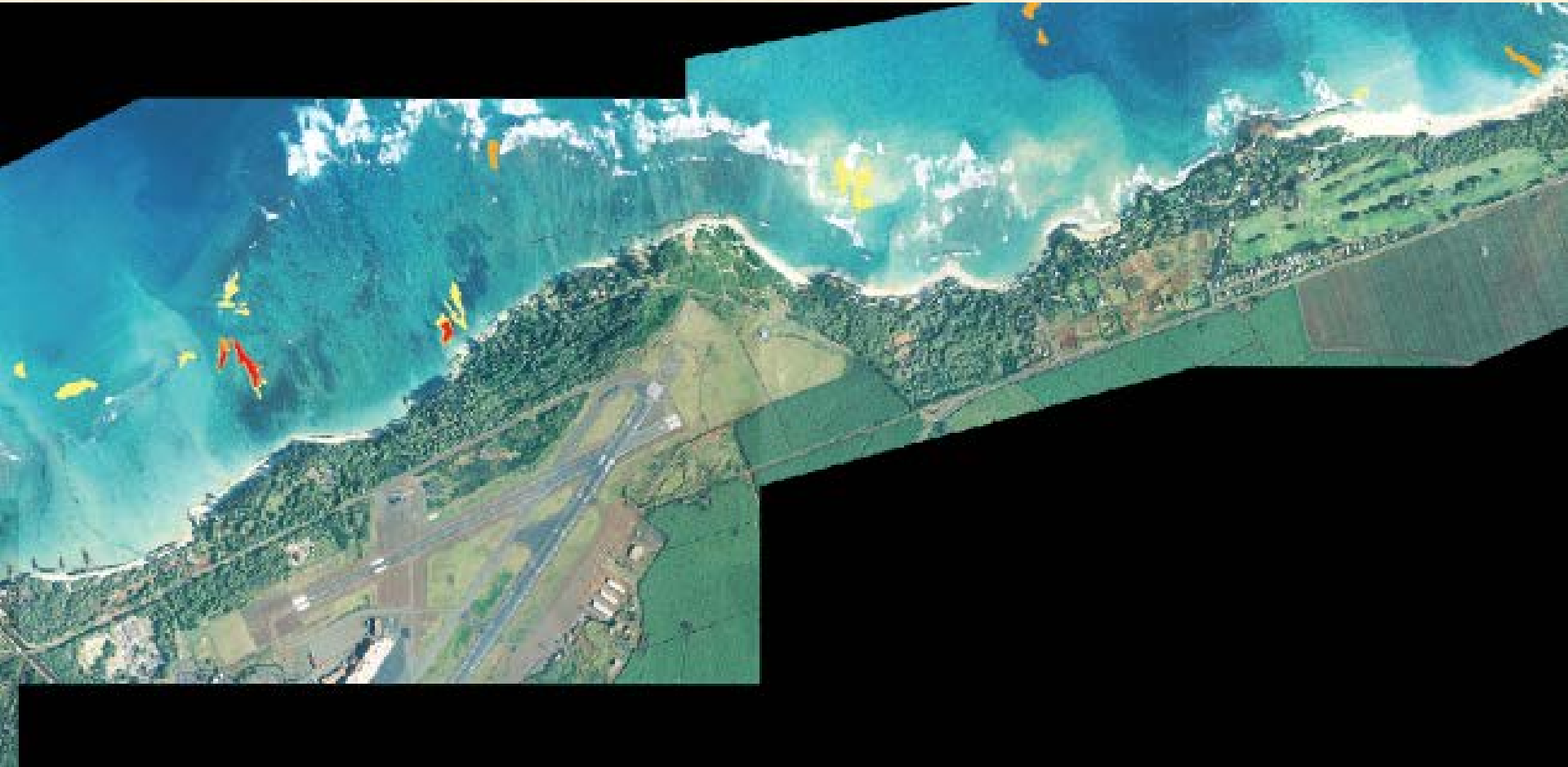


SAND FILLED RELIC STREAM CHANNELS

KAHULUI REEF-TOP SAND FIELDS

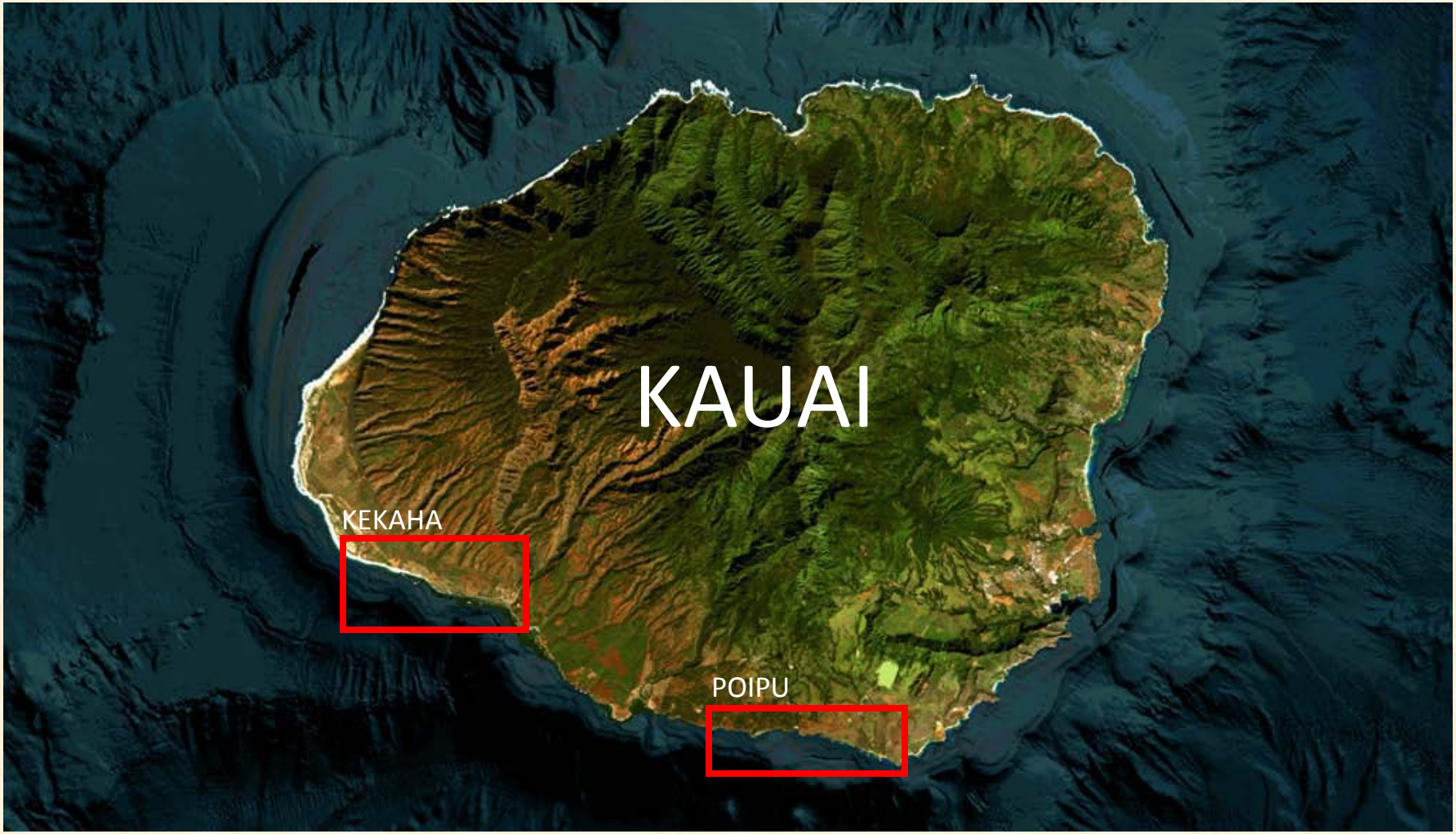


INCONCLUSIVE RESULTS DUE TO POOR WATER CLARITY

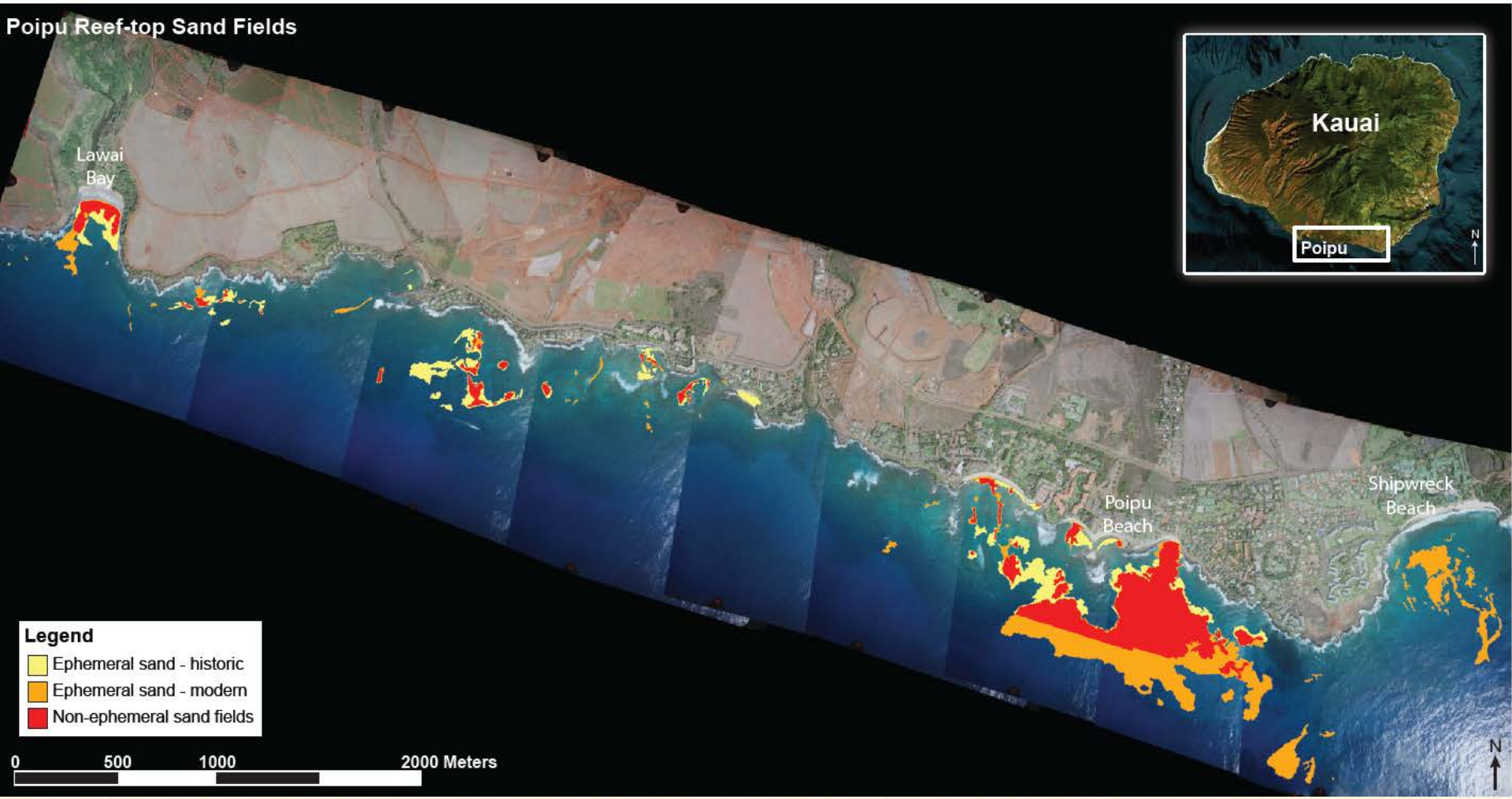


KAUAI REEF-TOP SAND FIELD STUDIES

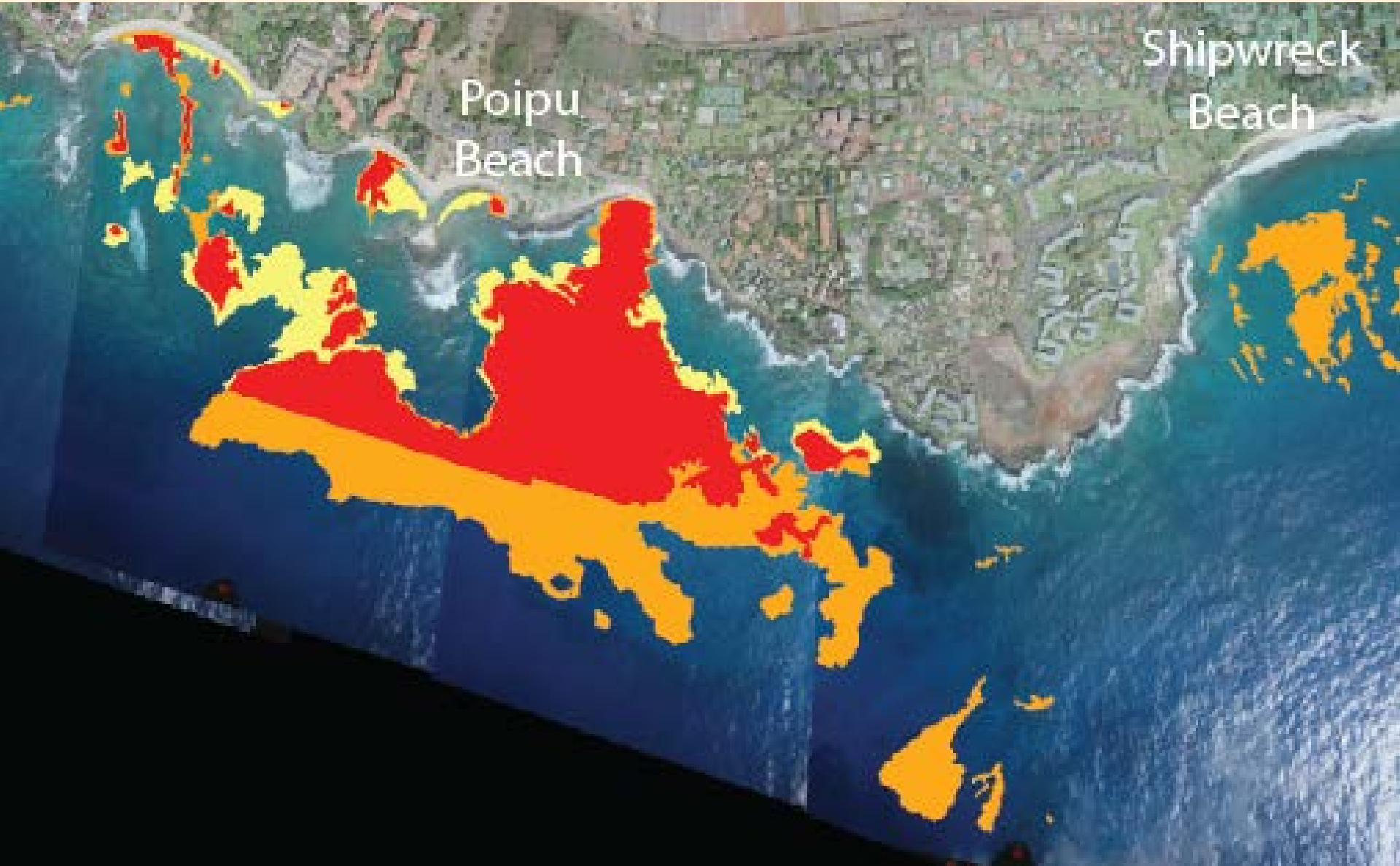
KAUAI RSM REGIONS



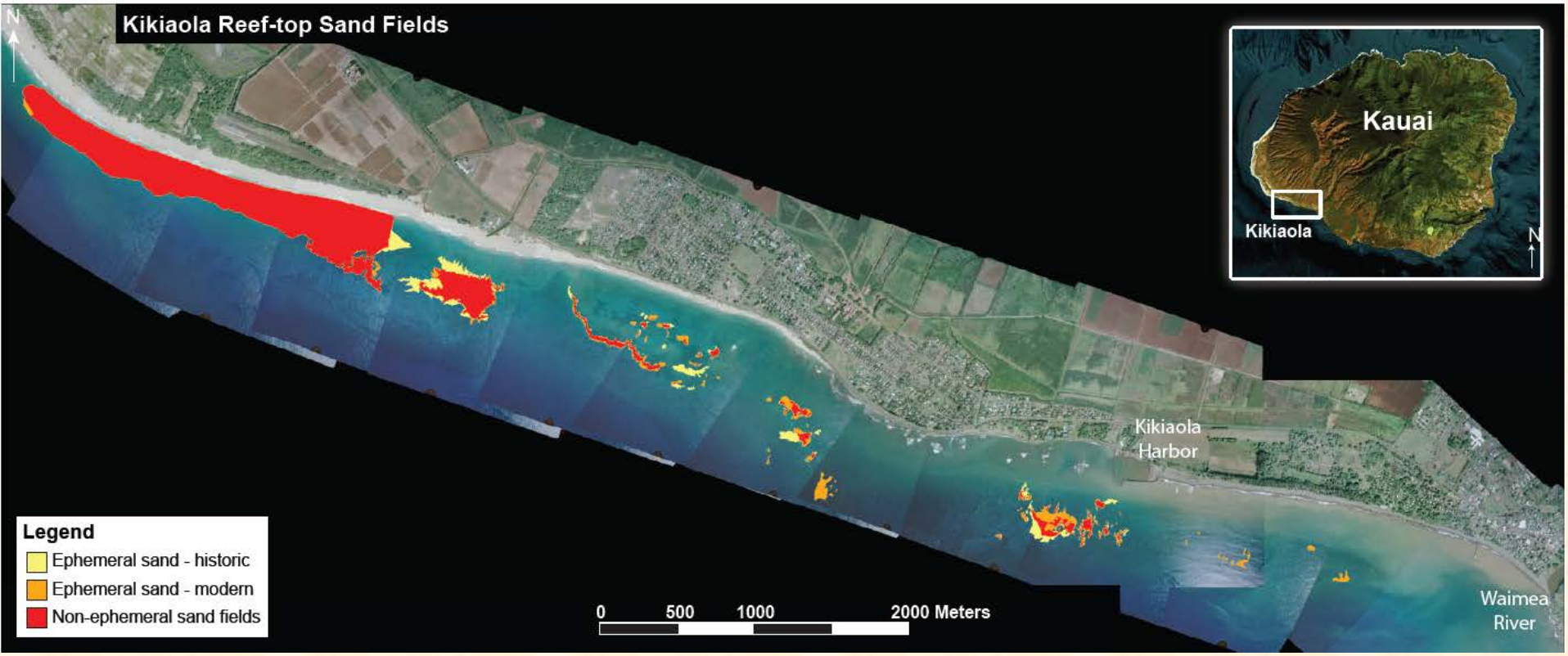
POIPU REEF-TOP SAND FIELDS



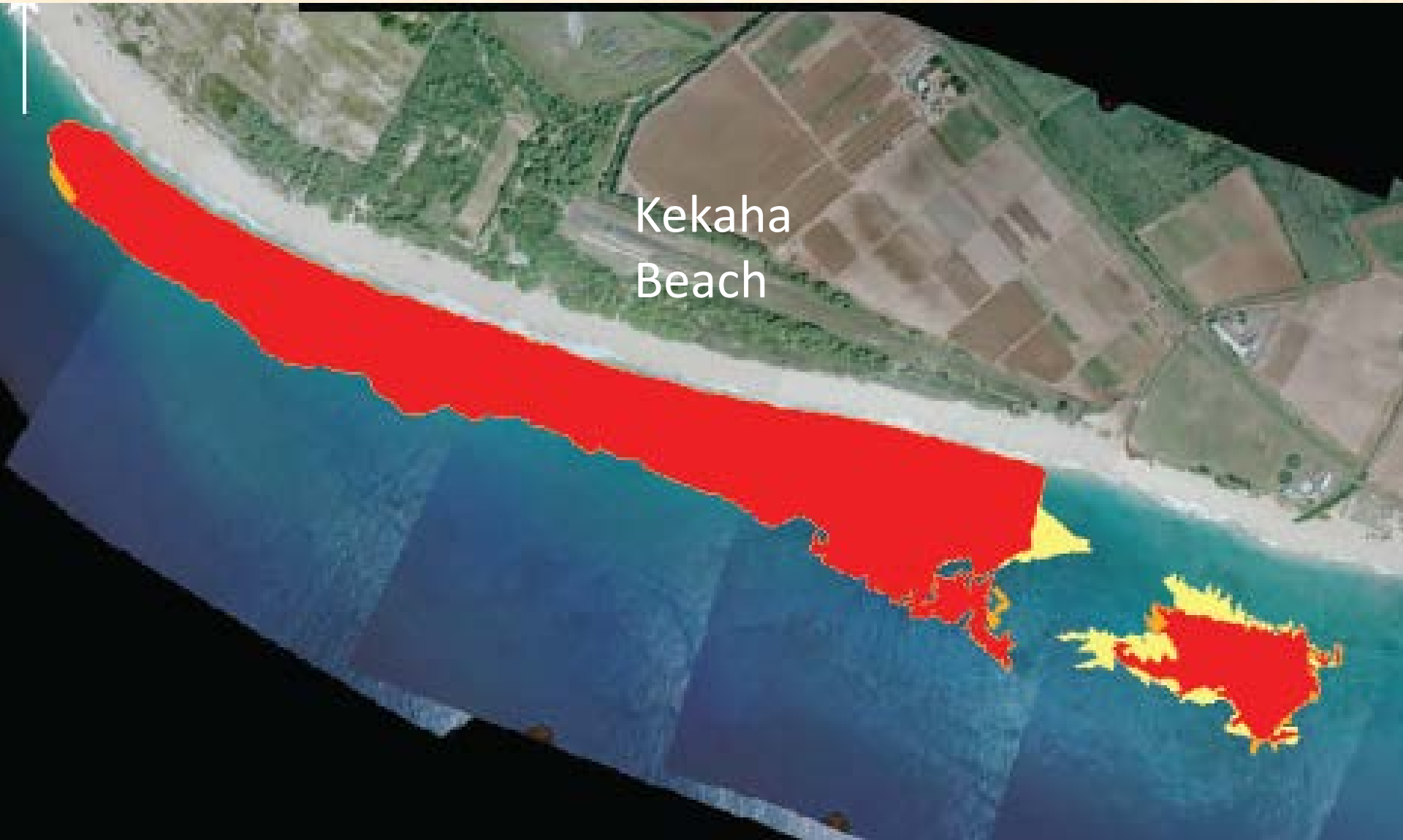
HIGH POTENTIAL SAND FIELD



KEKAHA REEF-TOP SAND FIELDS



LARGE CONTINUOUS SAND FIELD



RESULTS

RSM REGION	AREA (square meters)
•KIHEI, MAUI	56,000
•KAHULUI, MAUI	32,000
•POIPU, KAUAI	292,000
•KEKAHA, KAUAI	766,000

WAIKIKI BEACH
VIDEO CAMERA ANALYSIS

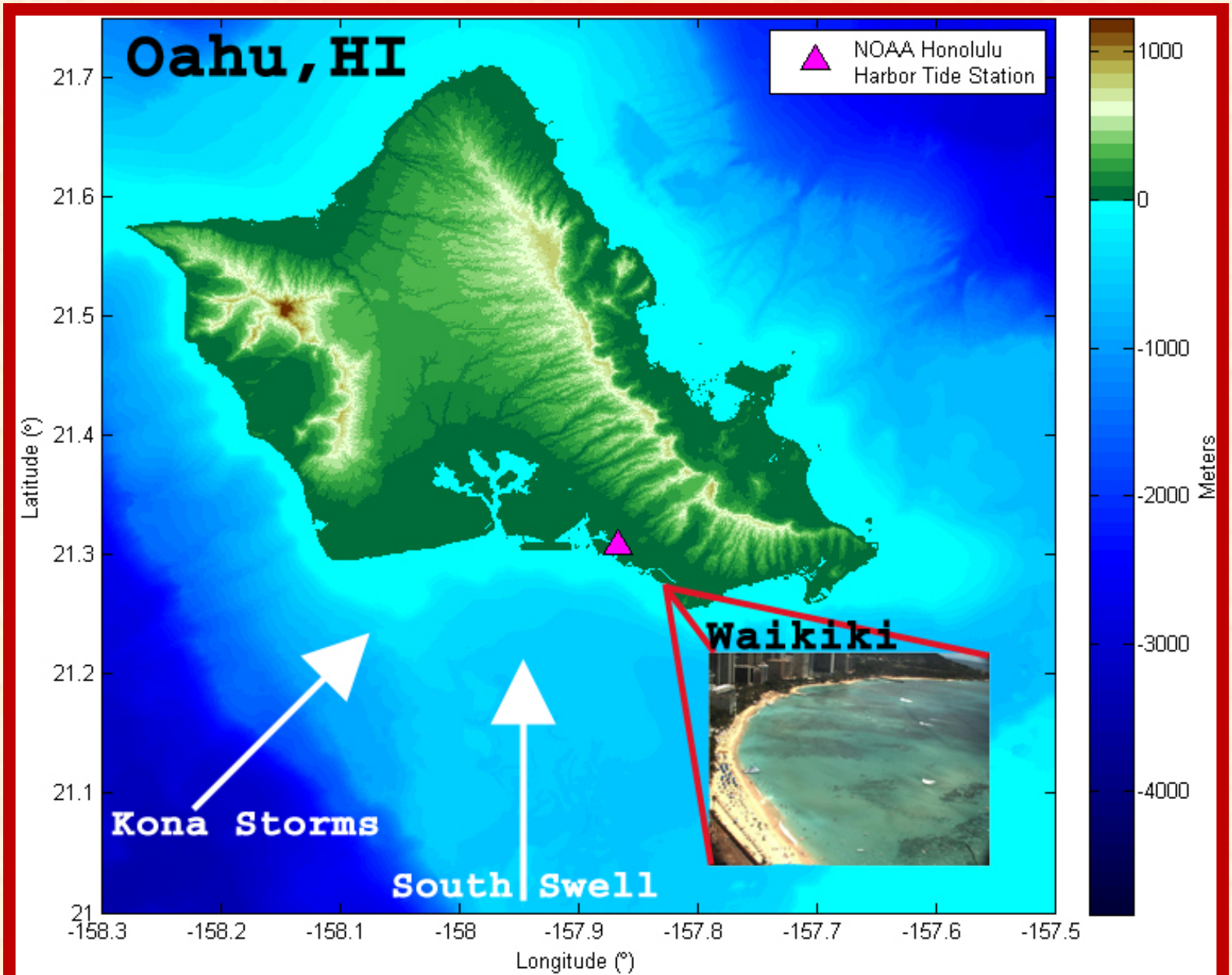
WAIKIKI CAMERA ANALYSIS

US Army Corps of Engineers ®

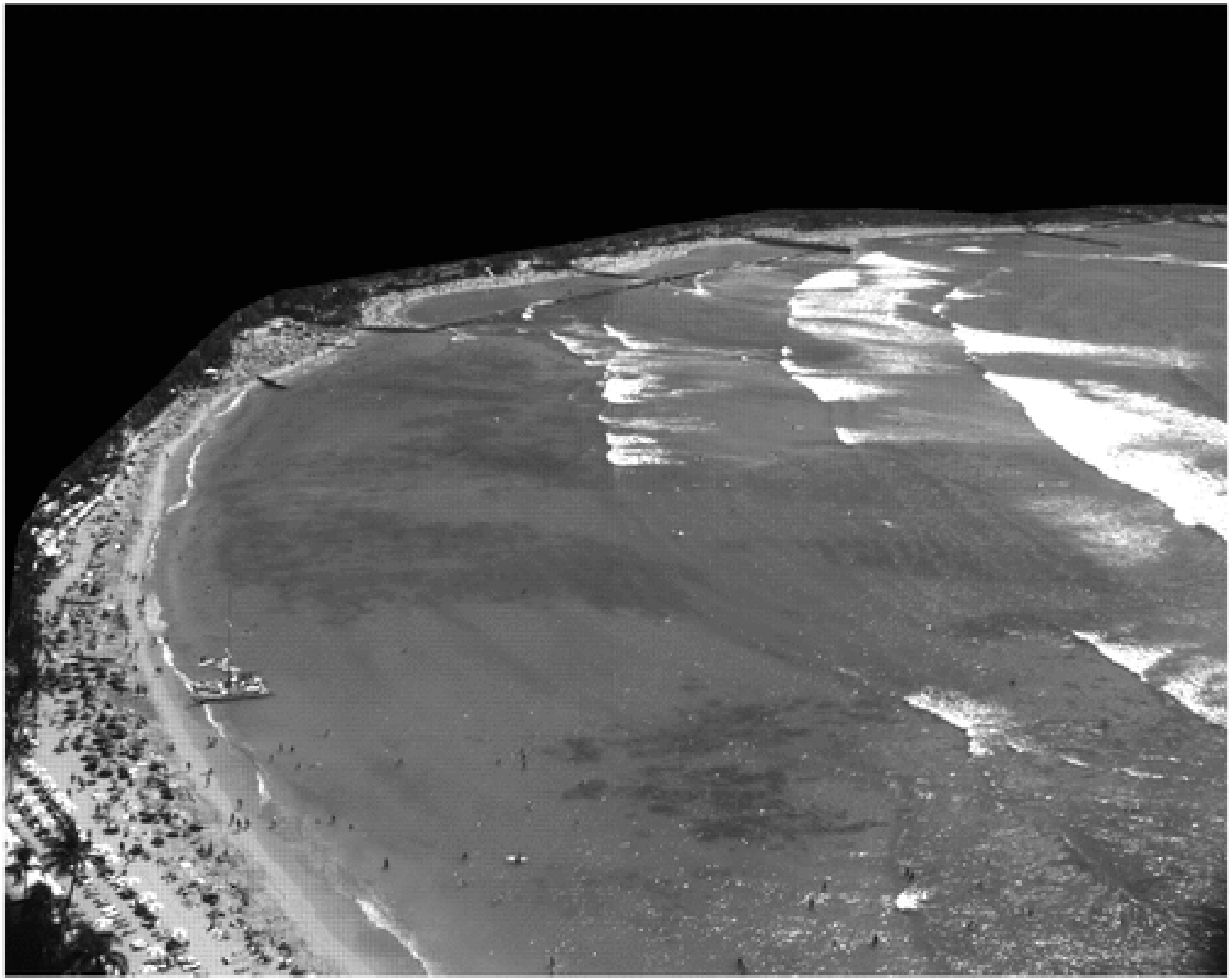
EA/HHF Joint Venture

SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY
UNIVERSITY OF HAWAII AT MĀNOA

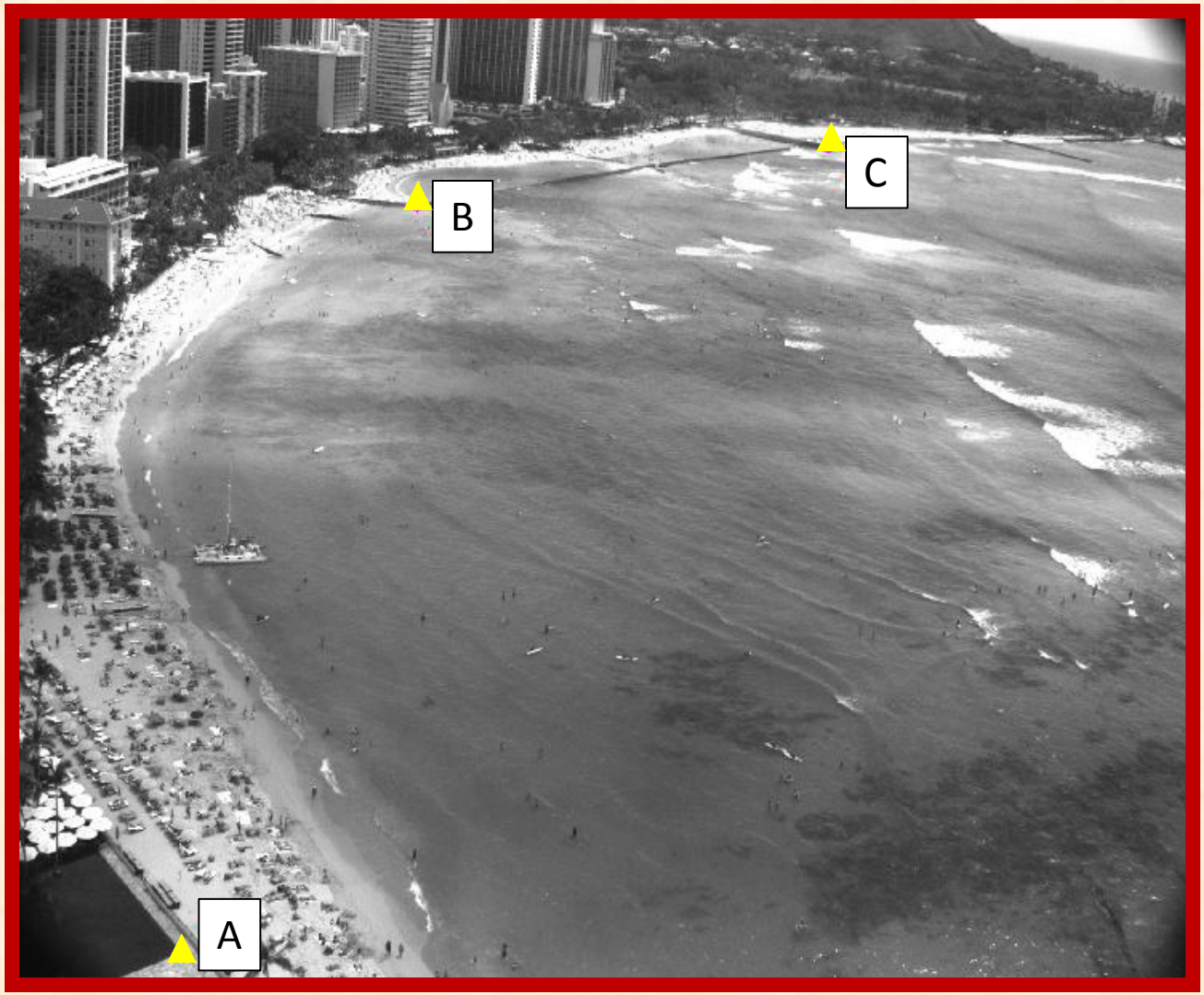
STUDY LOCATION



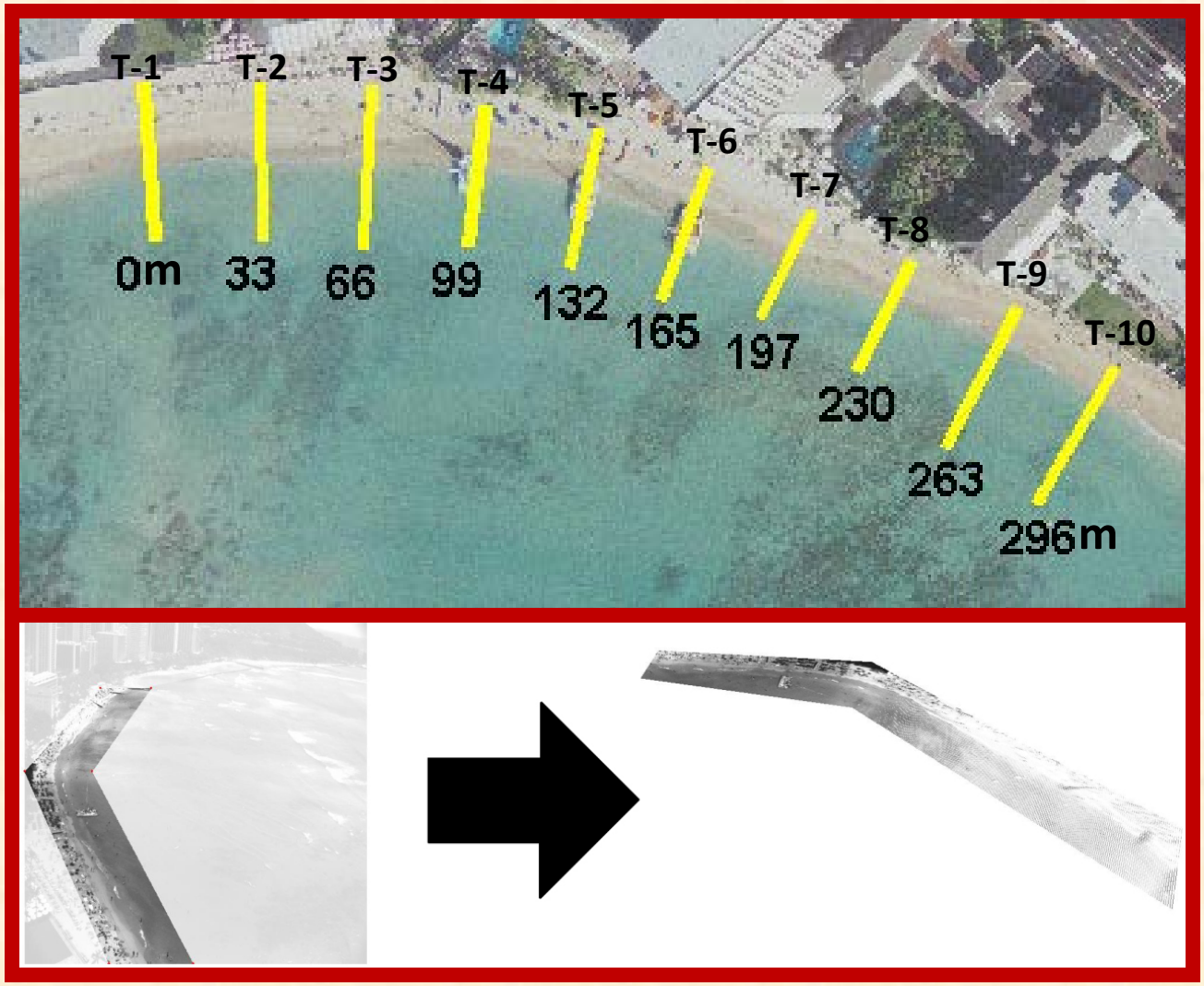
Date 2/26/2008 Time 12 hr



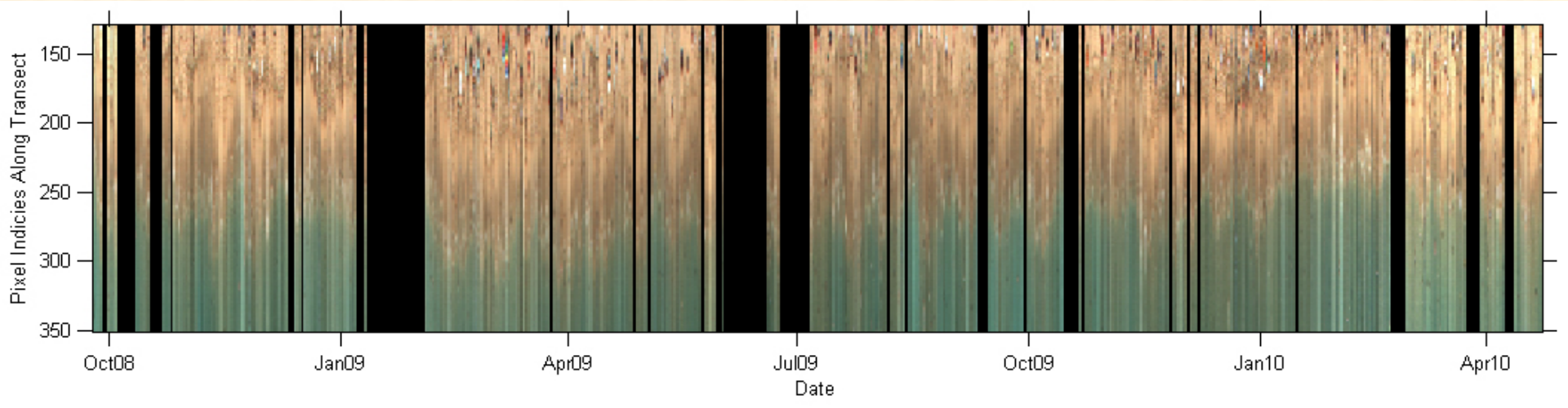
GROUND CONTROL POINTS



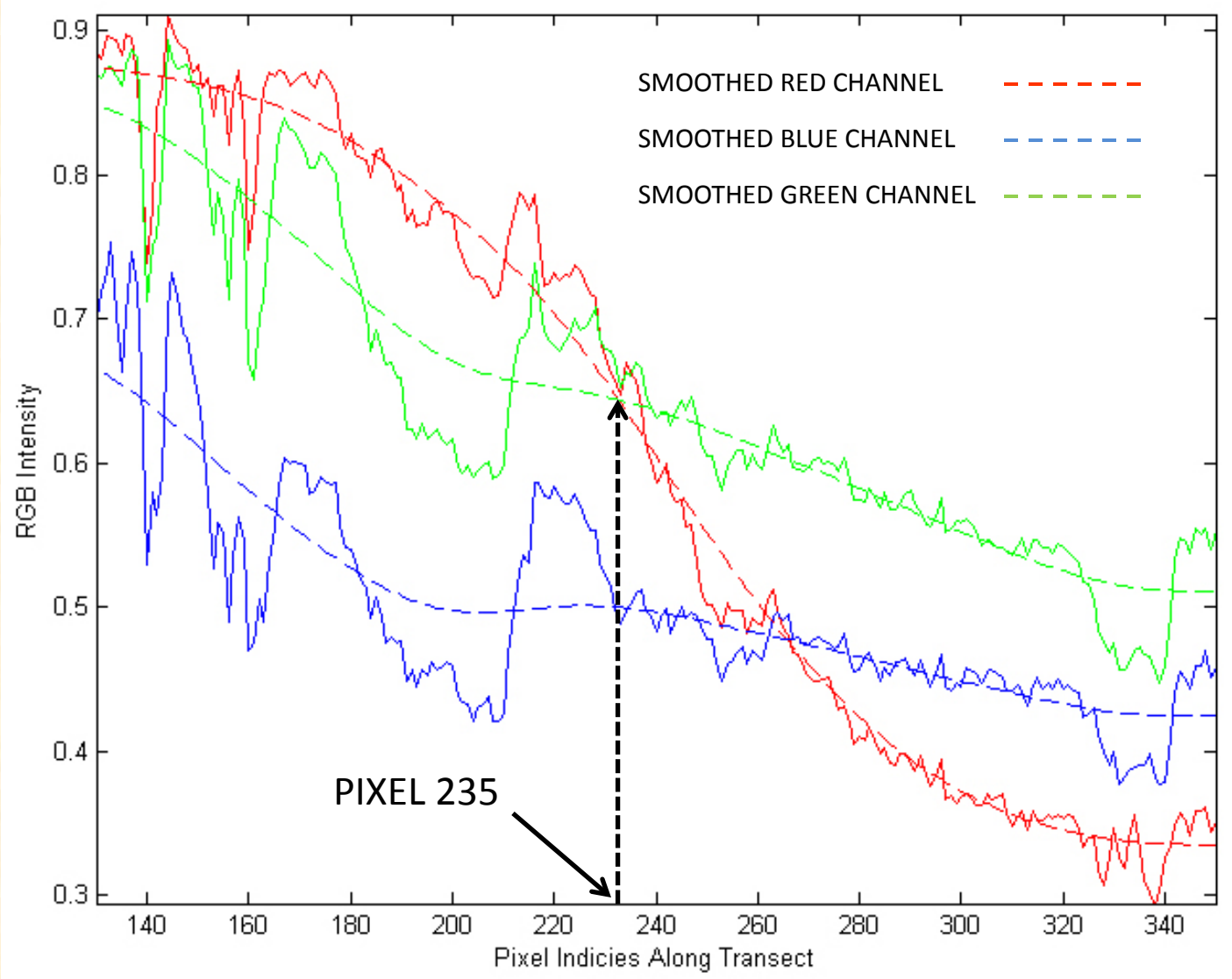
TRANSFORMATION FROM CAMERA TO GEOGRAPHIC SPACE



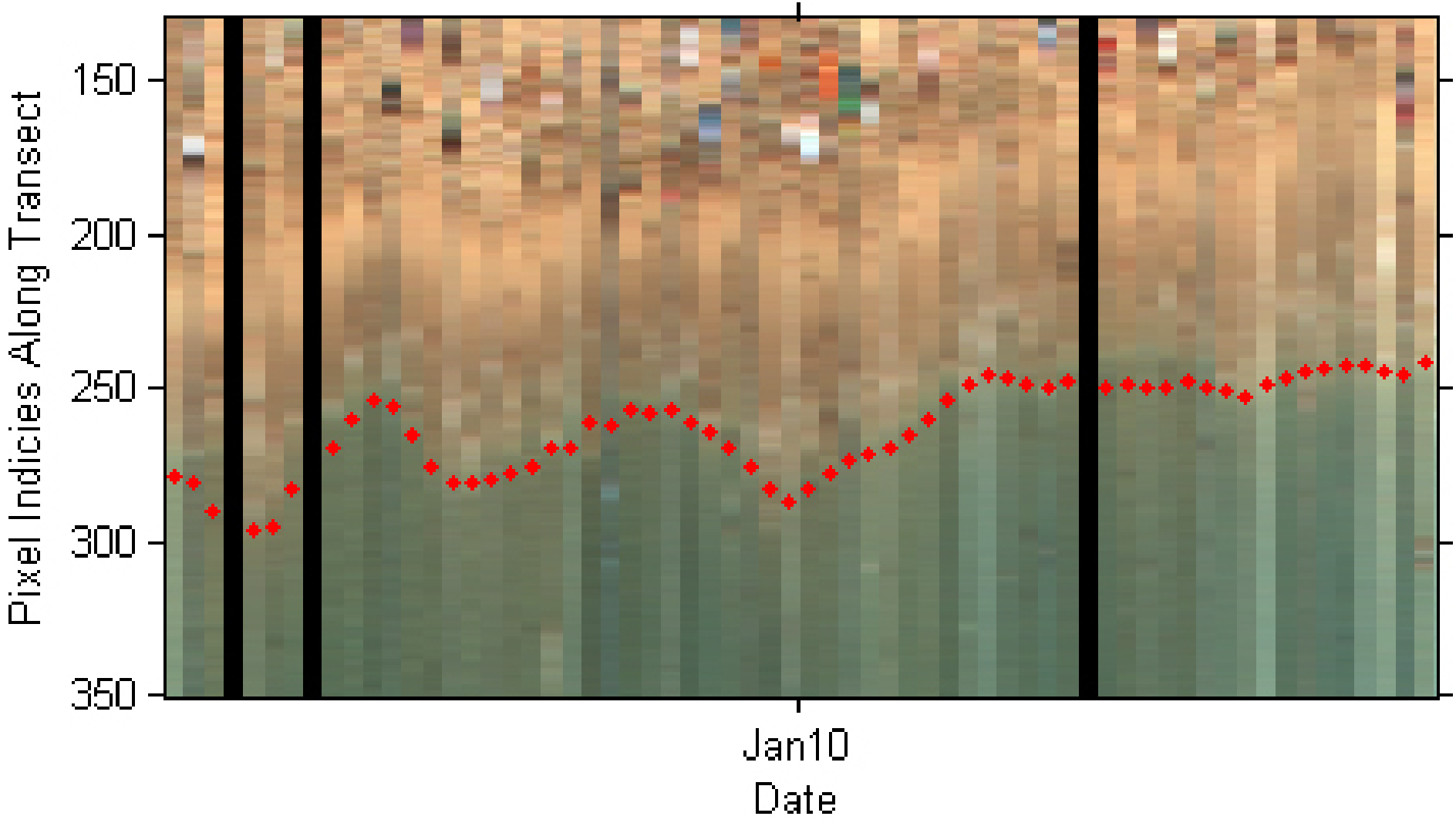
TRANSECT 1


Pixel Indicies Along Transect
150
200
250
300
350
Oct08
Jan09
Apr09
Jul09
Oct09
Jan10
Apr10
Date

TRANSECT 1 - DAY 1
CCD METHOD SHORELINE POSITION

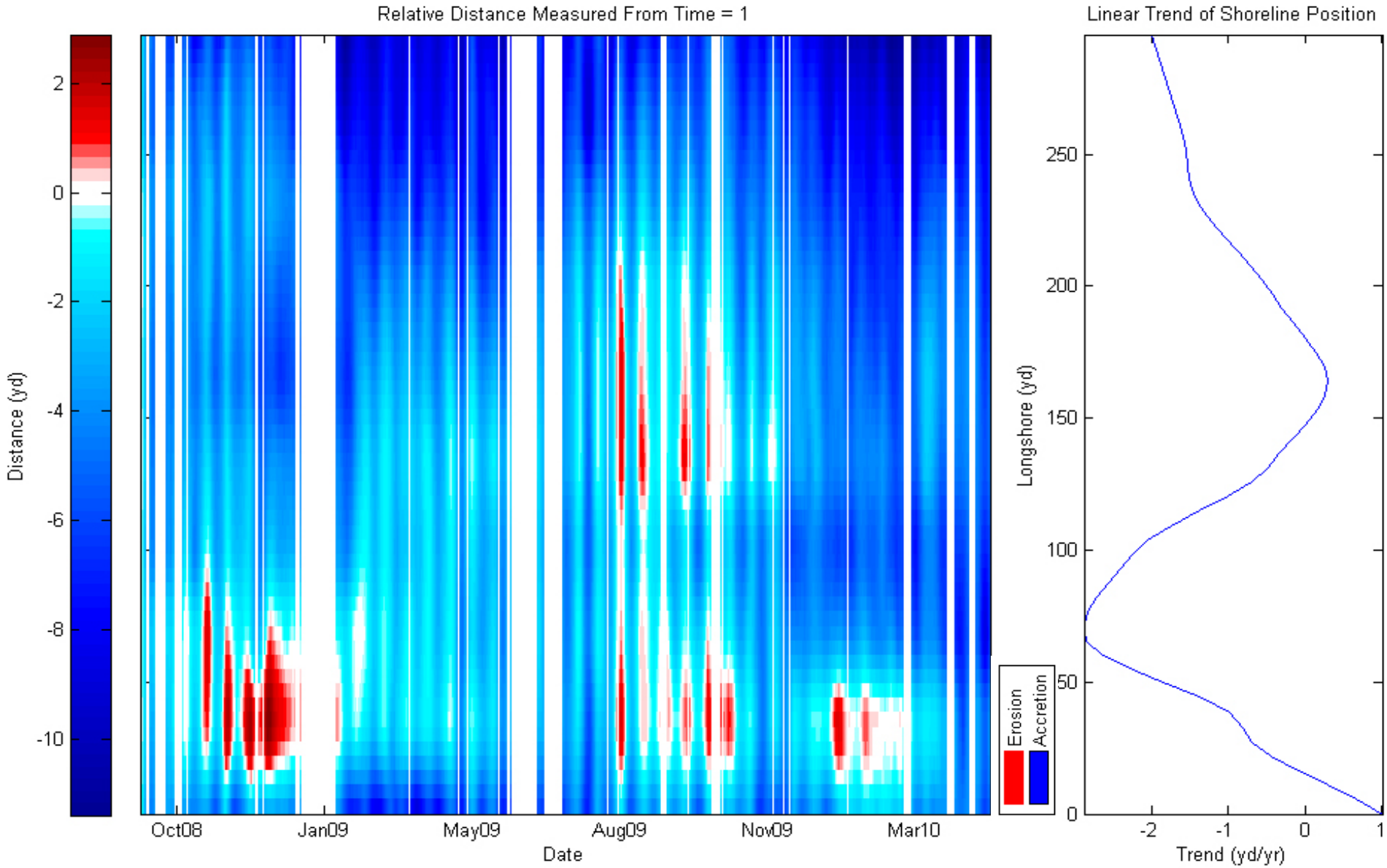


TRANSECT 1

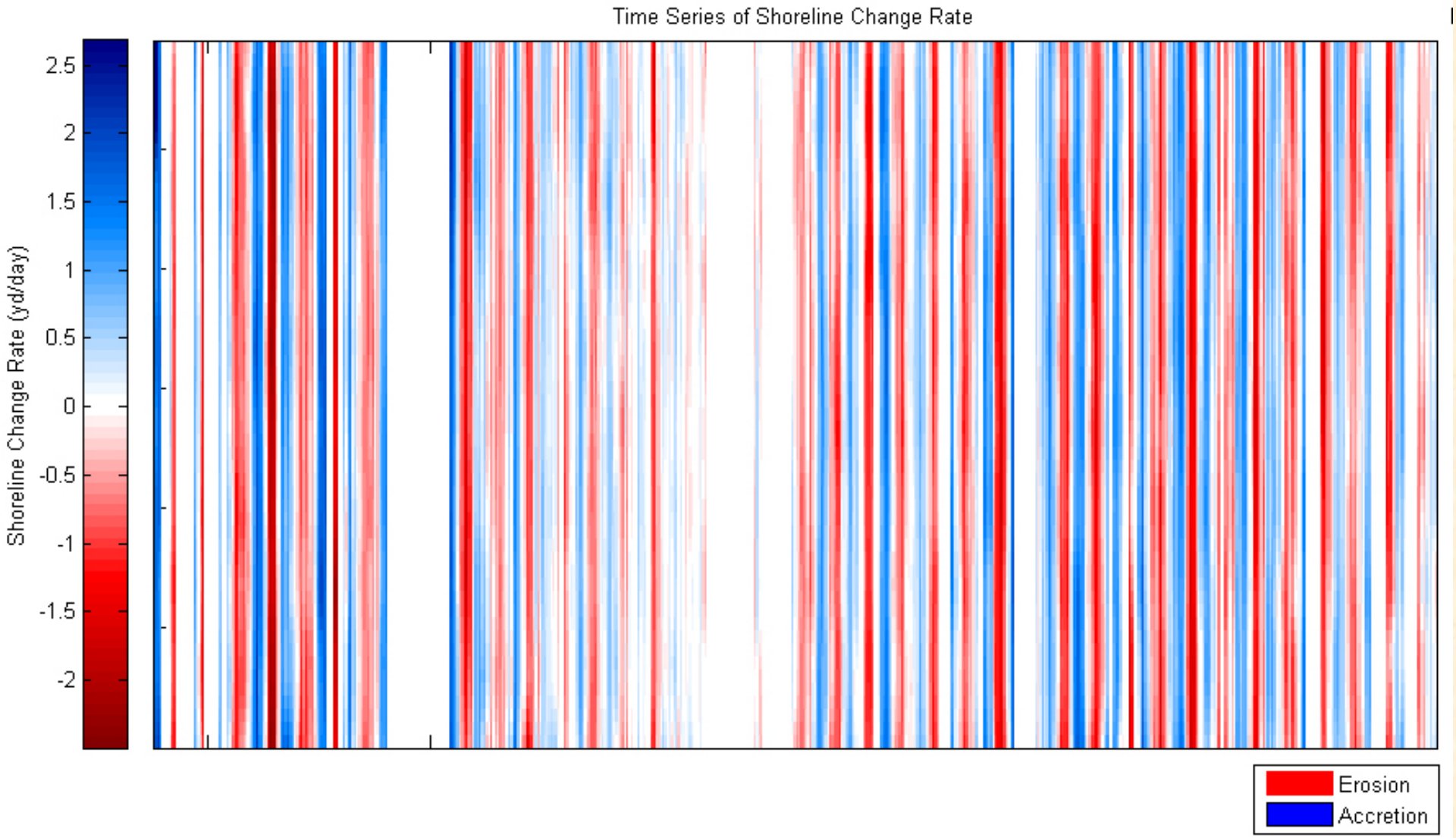


ZOOM OF FILTERED SHORELINE POSITION TIME SERIES

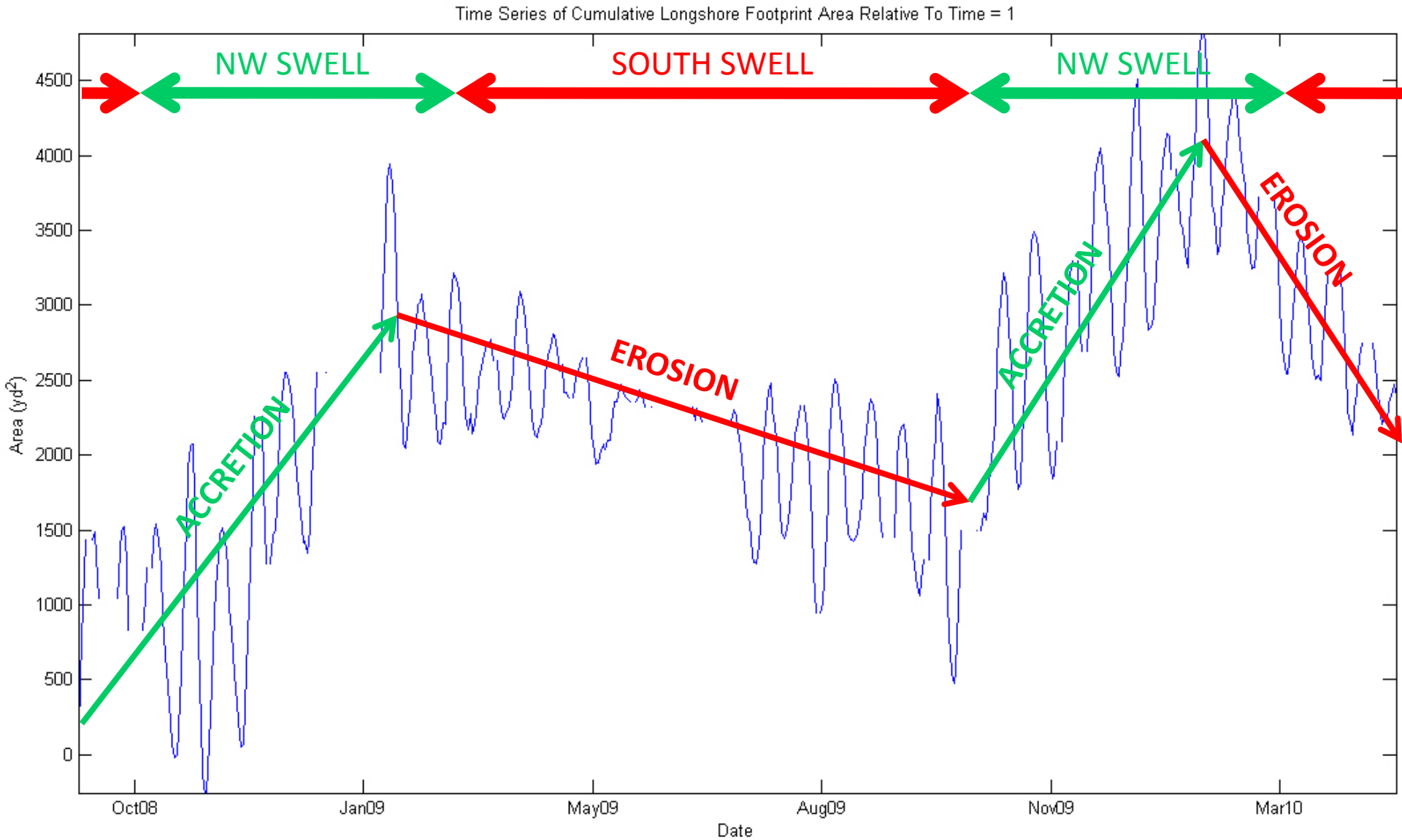
RELATIVE 2-D TEMPORAL SHORELINE CHANGE



DAILY SHORELINE CHANGE



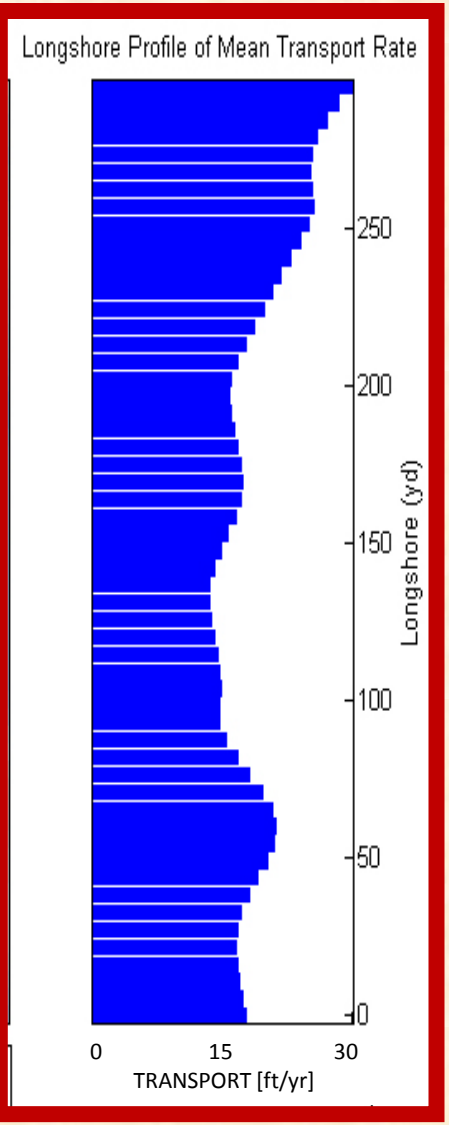
CUMULATIVE BEACH AREA



RESULTS

Rates of Net Shoreline Change September 2008 to April 2010

TRANSECT	RATE OF CHANGE (ft/yr)
1	17.7
2	17.1
3	20.7
4	14.7
5	13.5
6	17.1
7	15.6
8	20.7
9	25.2
10	30.0



CONCLUSIONS

OFFSHORE SAND SOURCE INVENTORY	WAIKIKI BEACH VIDEO CAMERA ANALYSIS
• Limited Sandy Resources in Kihei and Kahului • Poipu Sand Source is Extremely Promising • Kekaha Sand Source Likely Linked to Beach • Technique Reduces Field Investigation Costs • Jet Probing Within High Probability Areas is Likely Next Step	• Video Imagery Provides Unprecedented Temporal and Spatial Resolution • Strong Seasonality of Erosion and Accretion Trends at Waikiki Beach • Data Must be Corrected for Various Water Level Contributors • Able to Identify "Hot Spots" Within a Project

THANK YOU