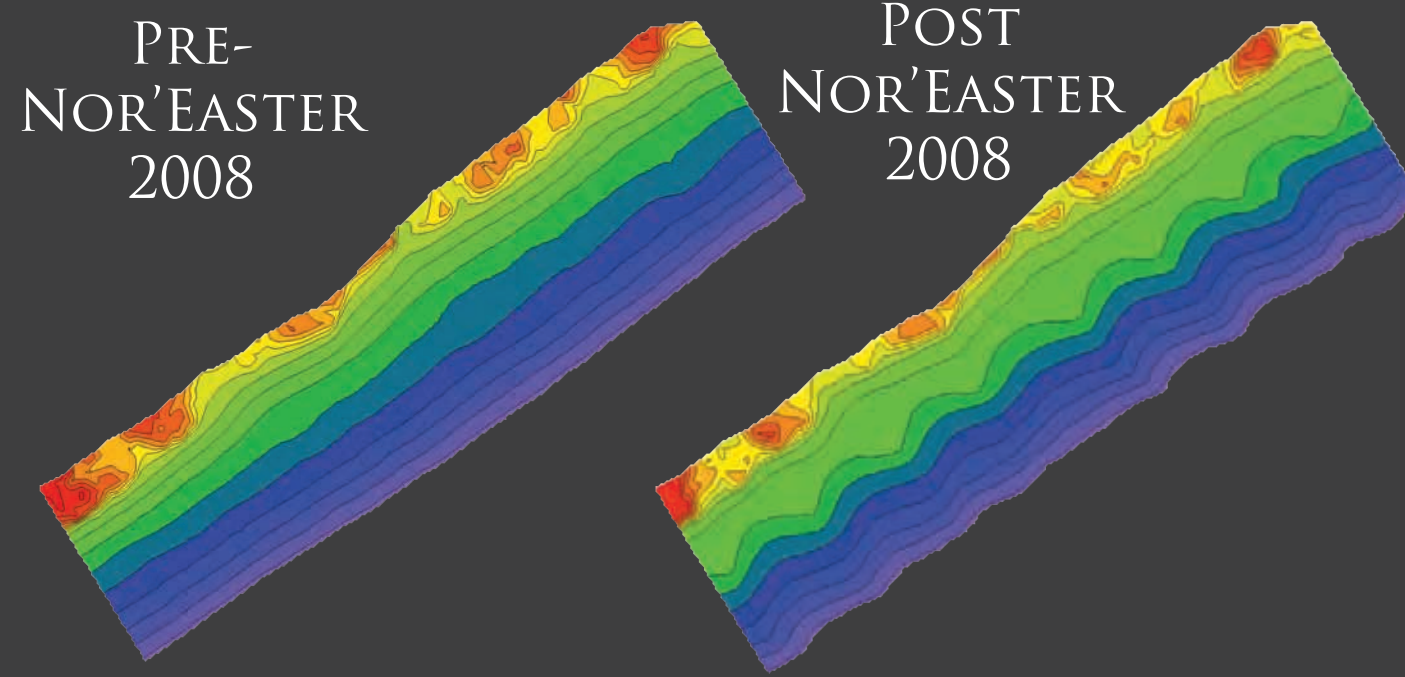
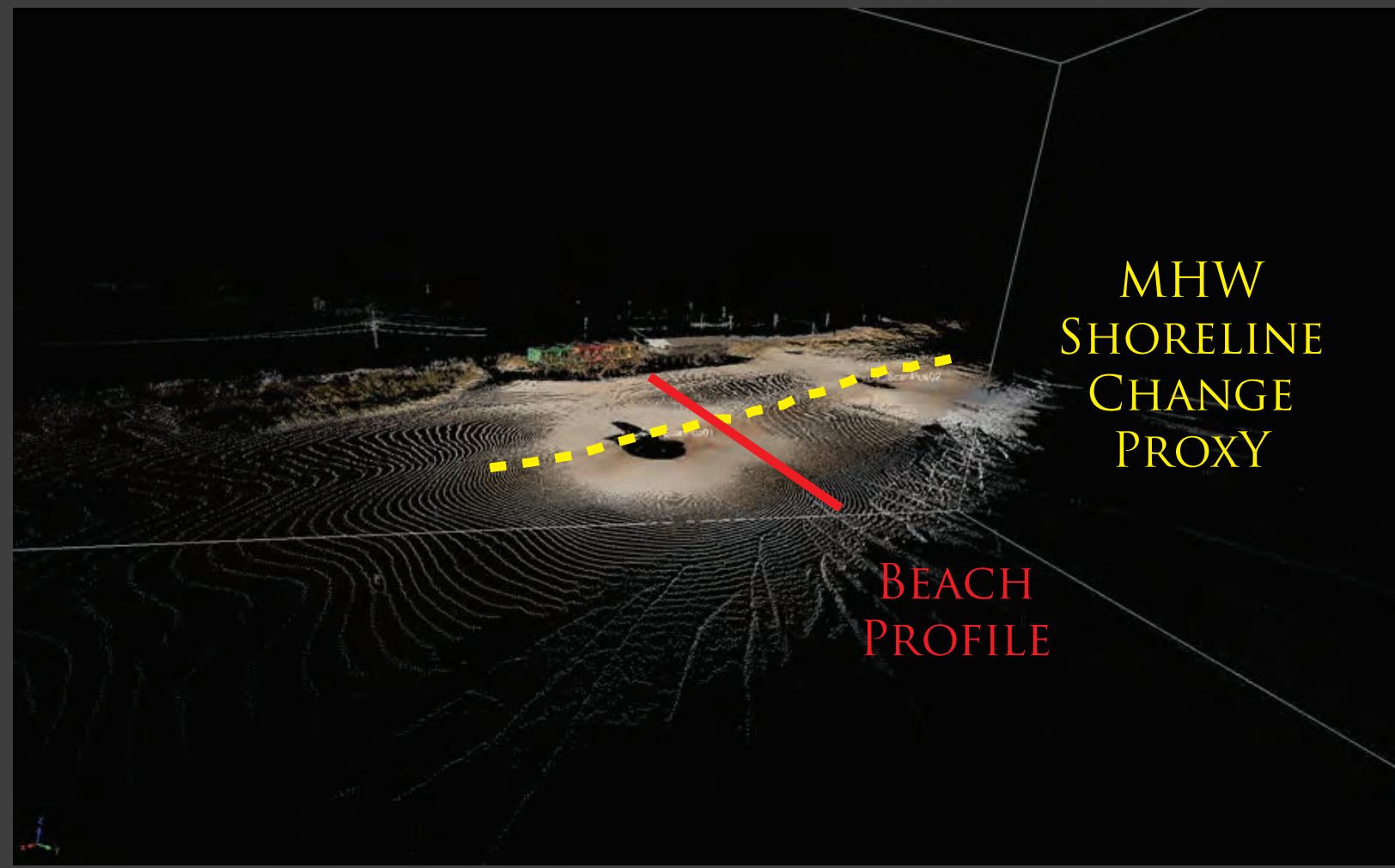


# EROSION OR ERROR: ARE PROFILES AND THE MEAN HIGH WATER SHORELINE APPROPRIATE PROXIES FOR MEASURING SUBAERIAL BEACH VOLUME CHANGE?

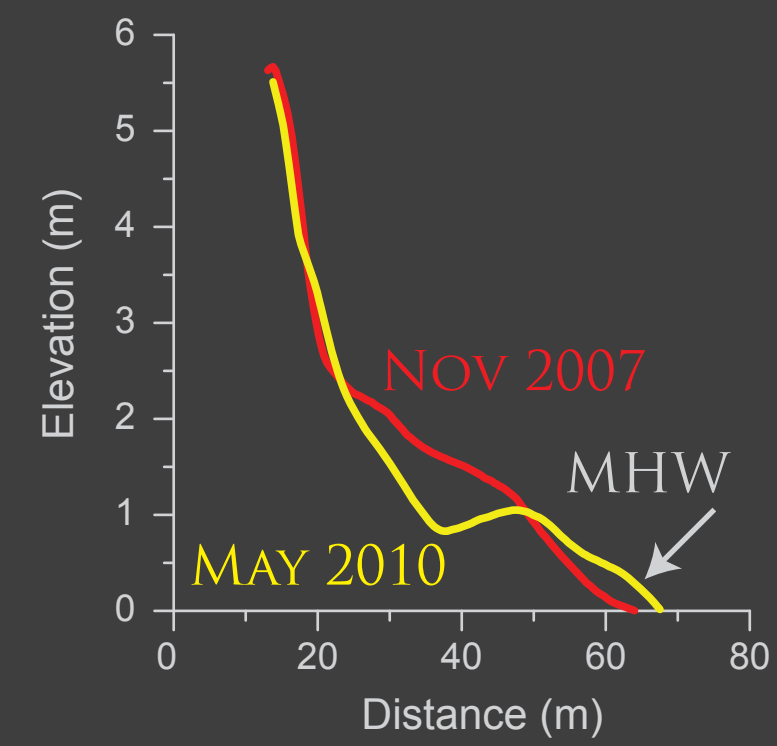
ETHAN J. THEUERKAUF AND ANTONIO B. RODRIGUEZ

INSTITUTE OF MARINE SCIENCES THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

IDEAL METHOD FOR MAPPING BEACH CHANGES SHOULD BE ACCURATE ON BOTH SHORT AND LONG TIME SCALES

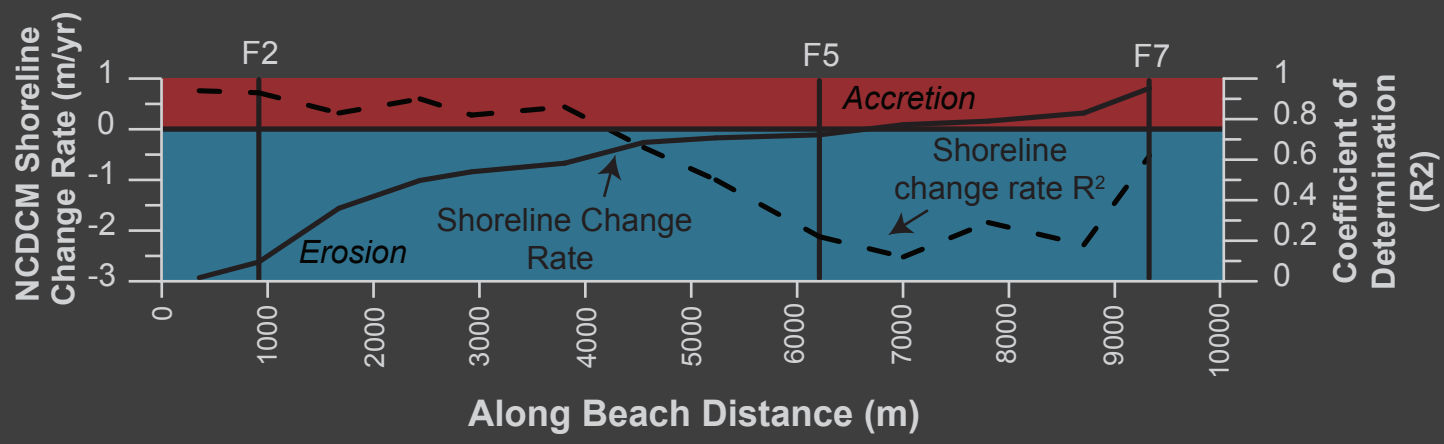
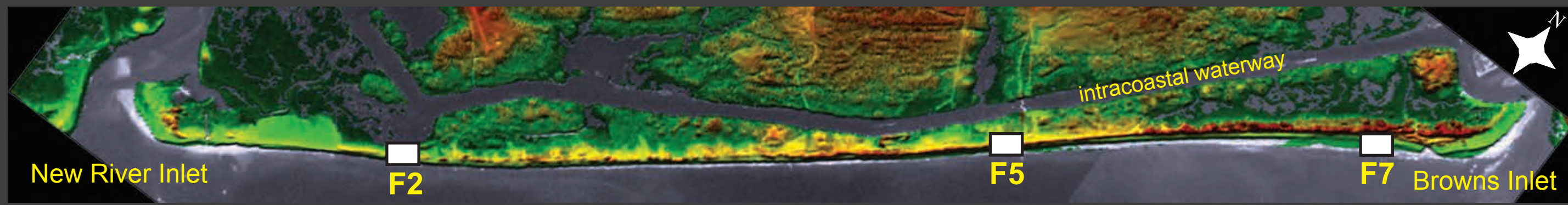
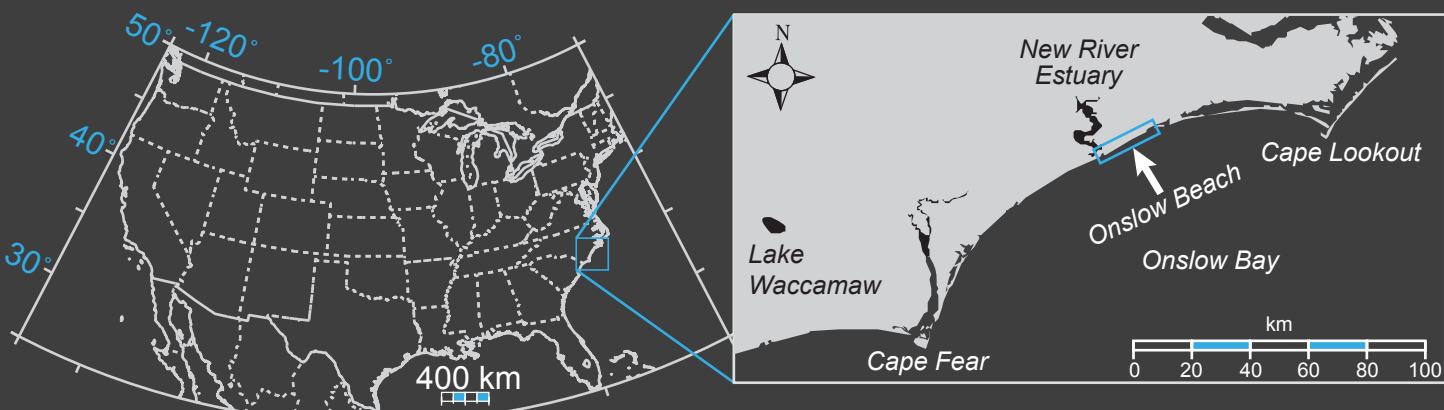


PROFILES DO NOT WORK WELL ON SHORT-TIME SCALES AT BEACHES WITH MORPHOLOGIC VARIABILITY, SUCH AS BEACH CUSPS



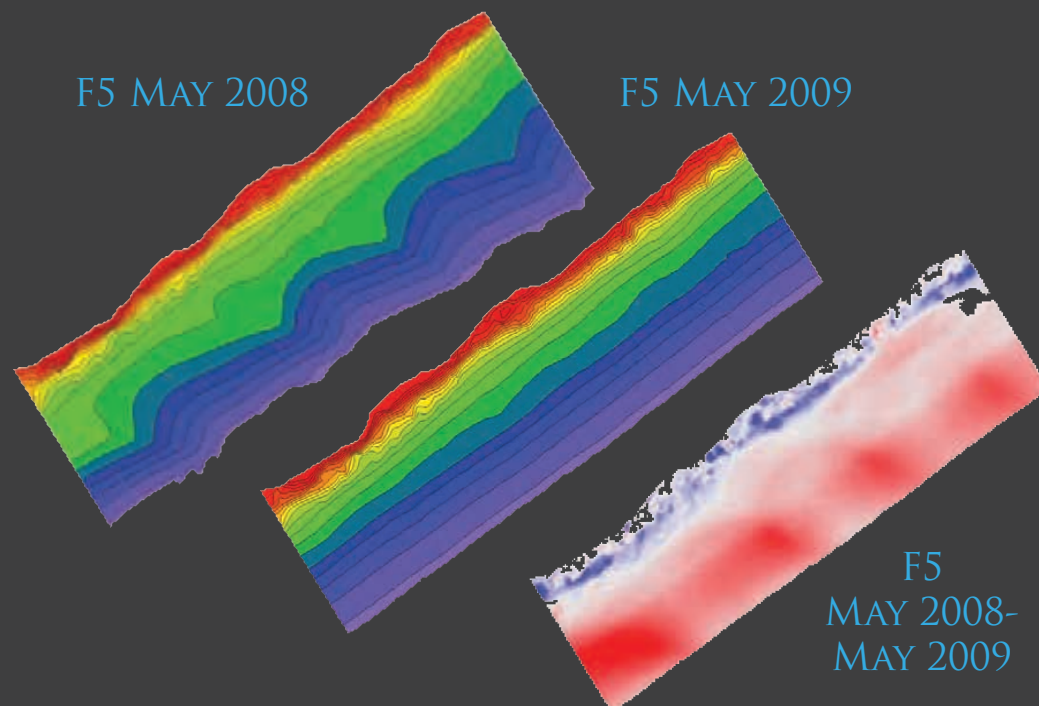
THE SHORELINE-CHANGE PROXY DOES NOT WORK WELL WHEN PROFILE SHAPE IS VARIABLE ON SHORT-TIME SCALES;- IMPROVES WITH TIME BECAUSE MAGNITUDE OF CHANGE EXCEEDS PROFILE VARIABILITY

## DO ESTIMATES OF VOLUME CHANGE FROM BEACH PROFILES AND THE SHORELINE CHANGE PROXY IMPROVE WITH TIME AT BEACHES WITH VARYING MORPHOLOGIES AND SHORELINE RESPONSE?



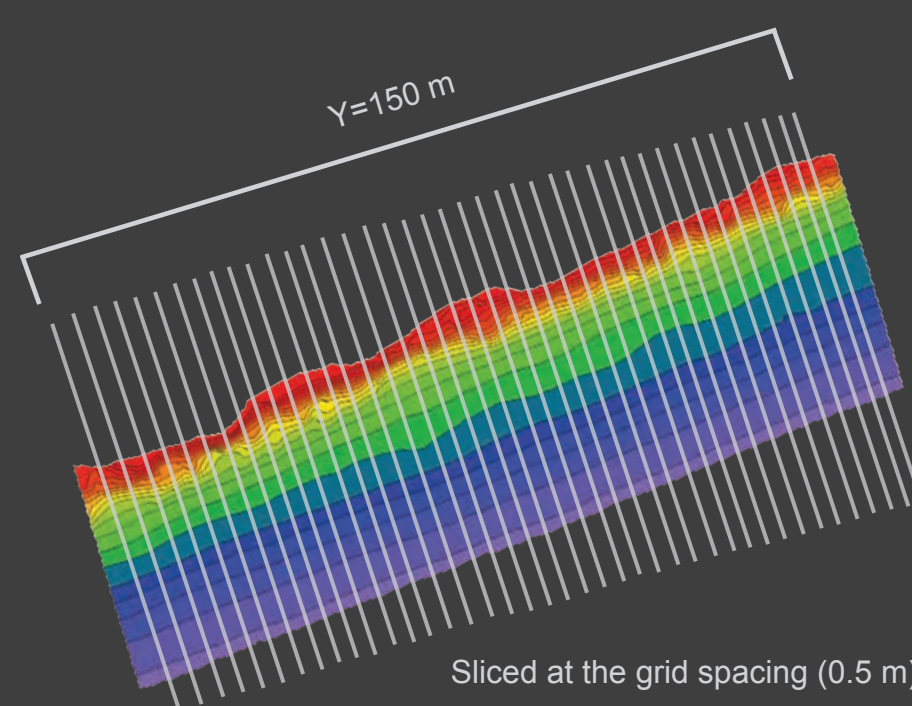
F2- CONSTANTLY ERODING; EPHEMERAL BEACH CUSPS  
F5- NEAR-NEUTRAL EROSION RATE; HIGH DECADAL VARIABILITY IN THE RATE; EPHEMERAL BEACH CUSPS  
F7- NOURISHED BI-ANNUALLY

### TERRESTRIAL LASER SCANNING



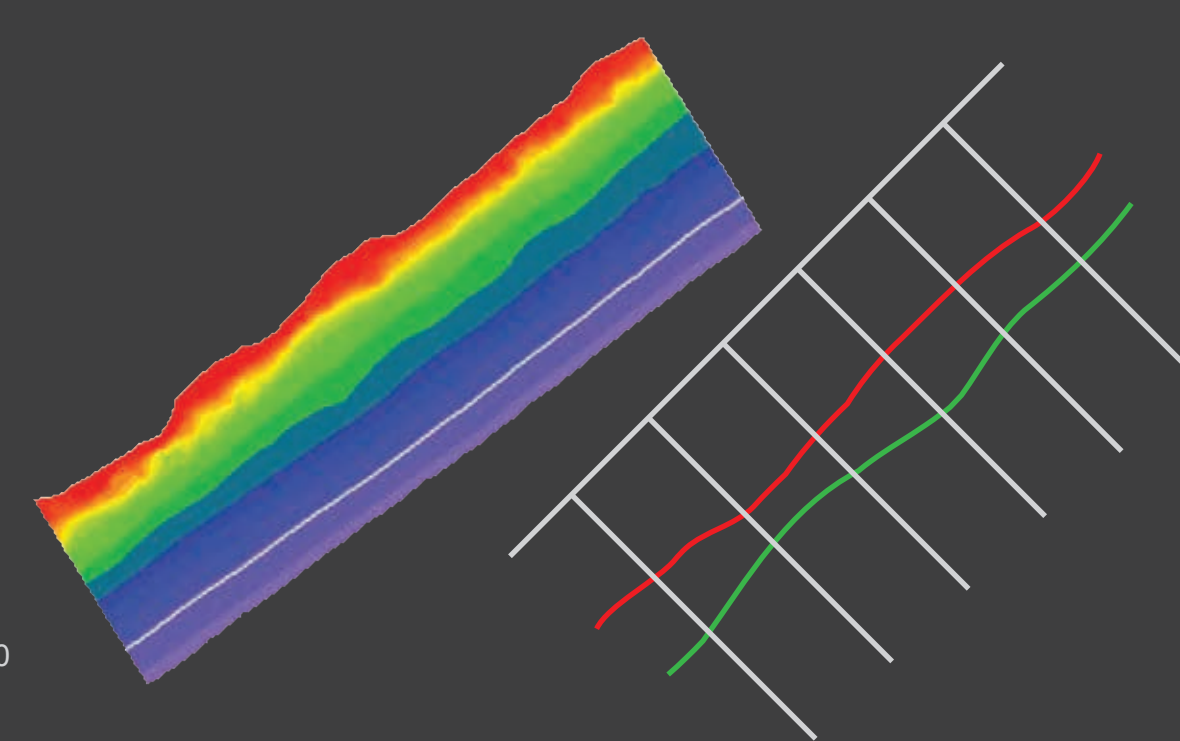
-BIANNUAL SURVEYS (MAY AND SEPT SINCE 2008)  
-TLS DATA USED AS BENCHMARK TO COMPARE AGAINST PROFILE AND SHORELINE CHANGE

### BEACH PROFILES



-SLICED TRANSECTS FOR EACH BIANNUAL SURVEY  
-ASSUMED EACH TRANSECT WAS THE ONLY ONE FOR THAT SITE AND CALCULATED VOLUME CHANGE BETWEEN SURVEYS  
-PERFORMANCE= % OF TRANSECTS WITHIN 10% BENCHMARK

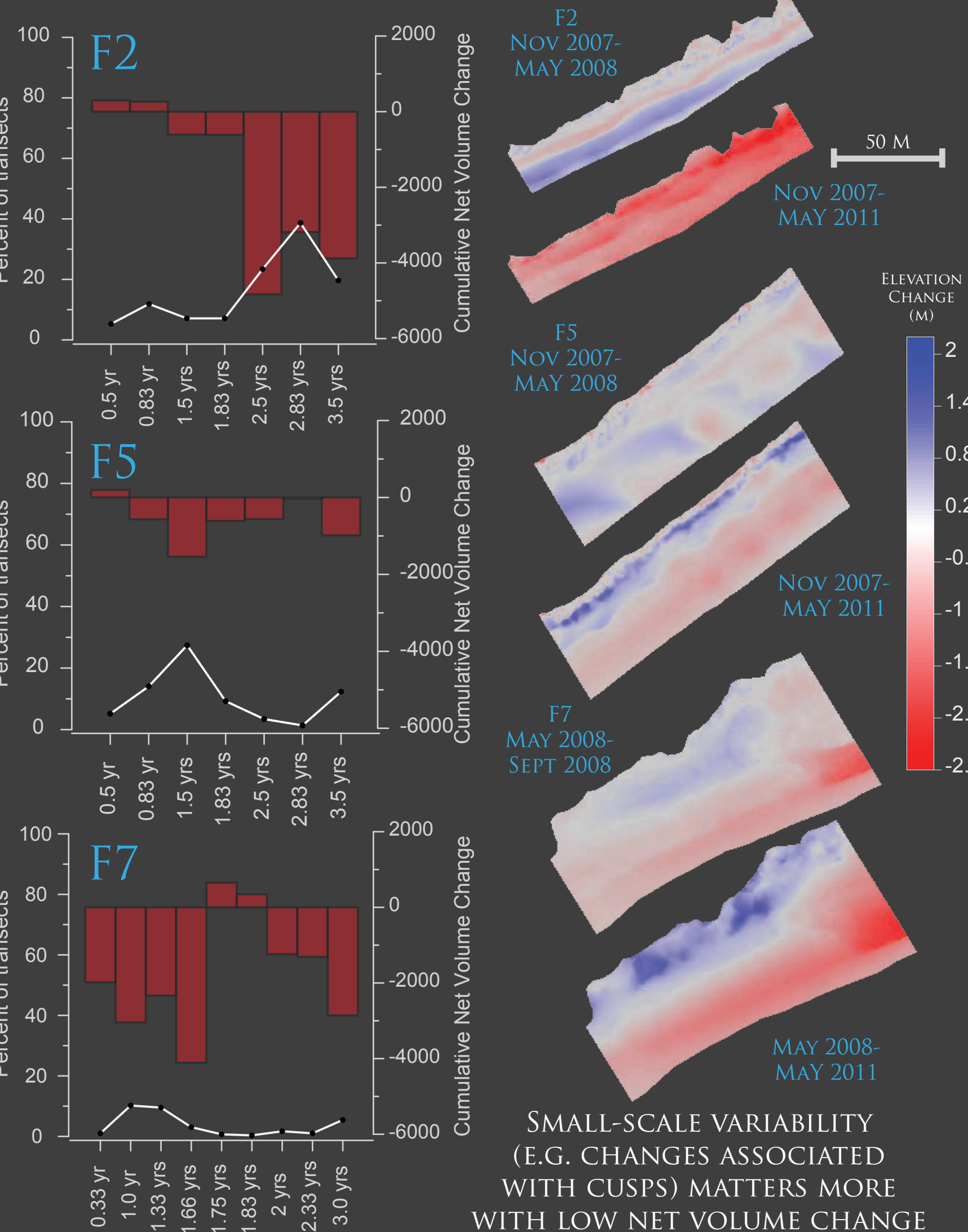
### SHORELINE CHANGE



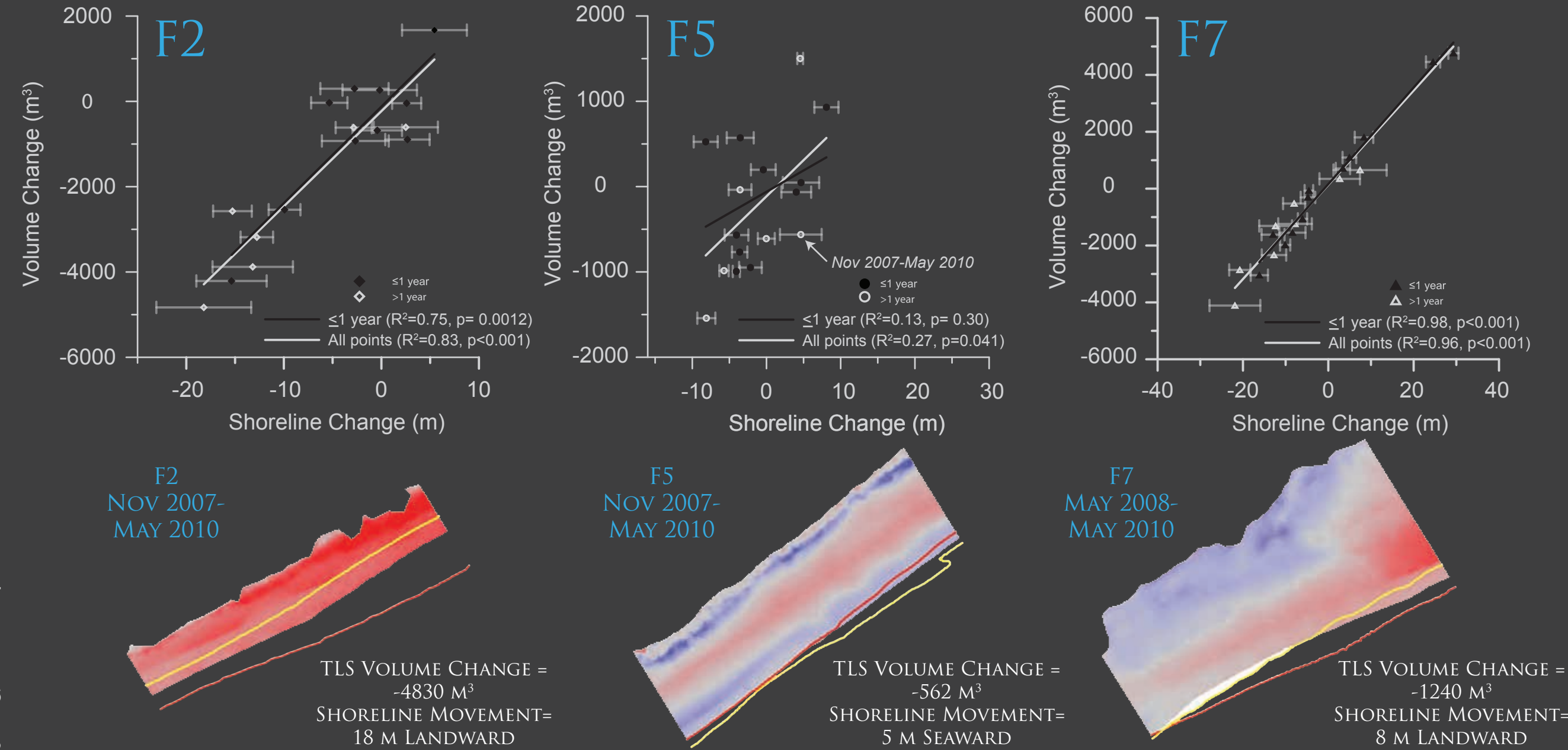
-EXTRACTED MHW SHORELINE (0.36 M)  
-MEASURED SHORELINE CHANGE USING DIGITAL SHORELINE ANALYSIS SYSTEM (THIELER ET AL., 2009- DSAS)

## DOES BEACH PROFILE PERFORMANCE IMPROVE WITH TIME?

## DOES PERFORMANCE OF THE SHORELINE-CHANGE PROXY VARY WITH MORPHOLOGIC CHANGE?



SMALL-SCALE VARIABILITY (E.G. CHANGES ASSOCIATED WITH CUSPS) MATTERS MORE WITH LOW NET VOLUME CHANGE



### BEACH SURVEY METHOD RECOMMENDATIONS

#### BEACH PROFILES

SEASONAL/ANNUAL: BEACHES WITH LOW ALONG-BEACH VARIABILITY  
MULTI-YEAR: BEACHES THAT ARE CONSISTENTLY ERODING OR ACCRETING- AS TIME INCREASES MAGNITUDE OF ANY VARIABILITY EXCEEDED

#### SHORELINE CHANGE PROXY

SEASONAL TO MULTI-YEAR: BEACHES WITH CONSISTENT EROSION OR ACCRETION; FORESHORE AND BACKSHORE RESPONSES SIMILAR; NOURISHMENT THAT IS GRADED TO A RAMP-LIKE MORPHOLOGY

#### LIDAR

SEASONAL/ANNUAL: BEACHES WITH HIGH ALONG-BEACH MORPHOLOGIC VARIABILITY  
MULTI-YEAR: BEACHES THAT OSCILLATE BETWEEN EROSION AND ACCRETION ON DECADAL SCALES- SHORT-TERM VARIABILITY INFLUENCES PROXY METHODS ON LONGER TIME SCALES AT BEACHES WITH HIGH INTERANNUAL VARIABILITY IN SHORELINE CHANGE RATES

