Sediment Transport Measurements from the Coastal Ocean Research and Monitoring Program in Onslow Bay, North Carolina

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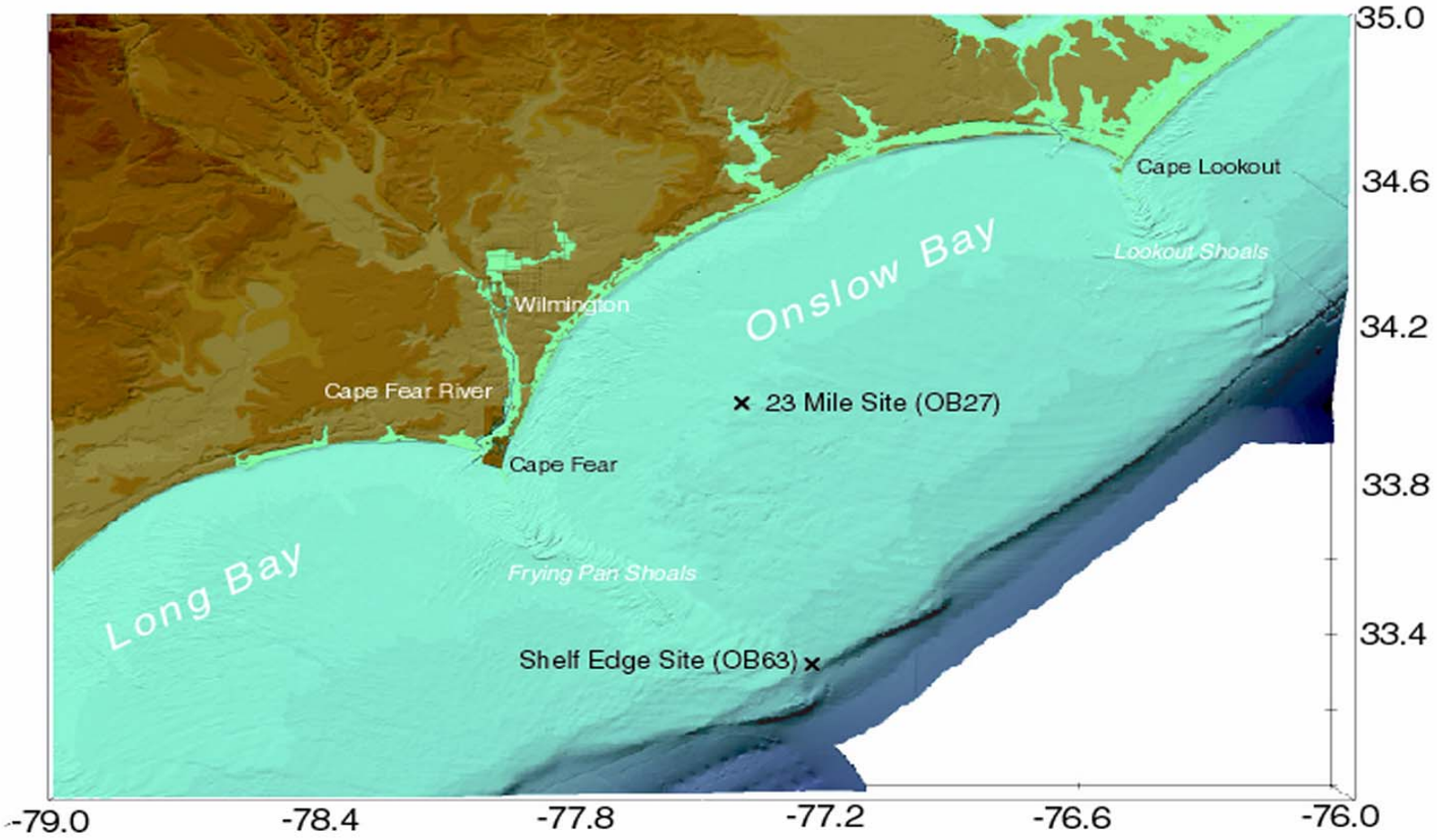
Funded provided by NOAA

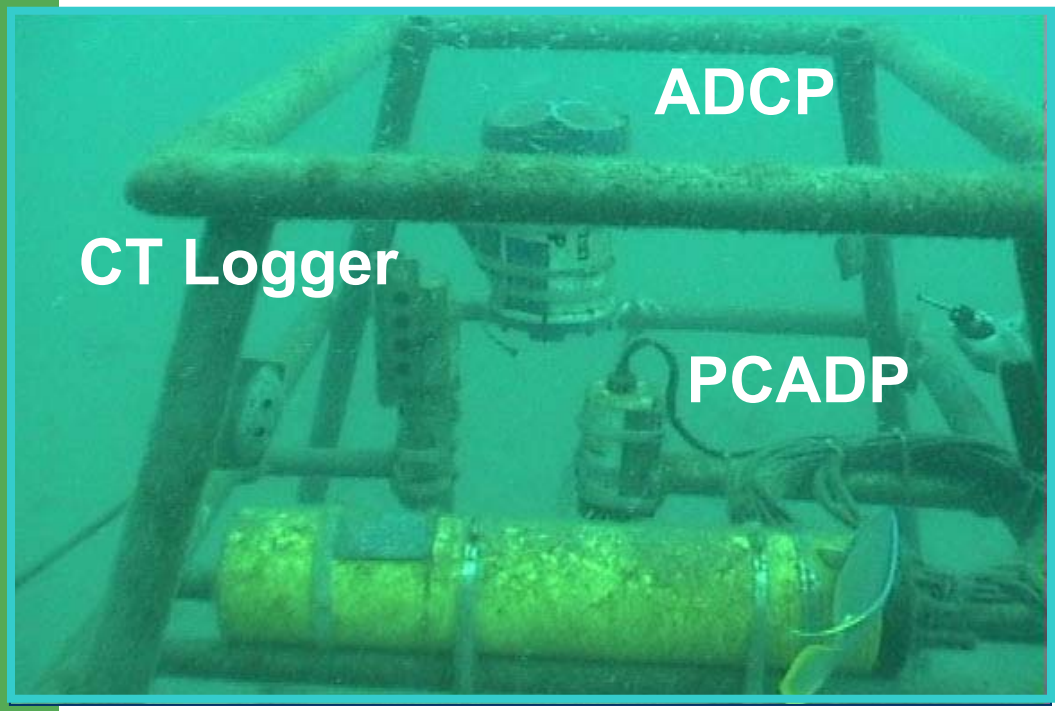
COASTAL RELIEF MODEL:
FRYING PAN SHOALS REGION OF THE SOUTH ATLANTIC BIGHT

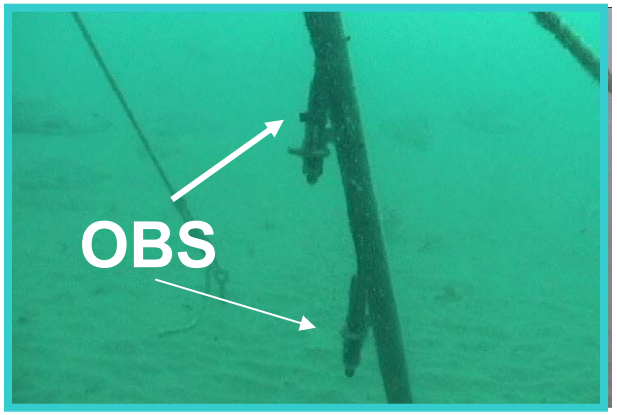


“23 Mile Rock” Side Scan Mosaic

Instrumentation

- ADCP continuous 5 minute averages
- PCADP and OBS: 1 Hz for 17 min every 2 hours
- Retrieved & Redeployed every 4-6 weeks



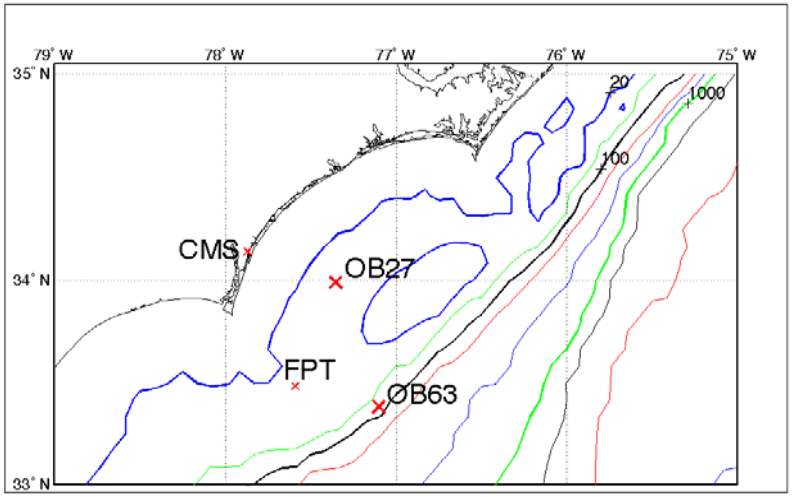


Objectives

- Constrain the key forcing mechanisms for sediment transport at one site on the SEUS mid- continental shelf

- Quantify accretion and erosion patterns adjacent to a marine hard-bottom present at this mid-continental shelf location

Bathymetry for Frying Pan Shoals Region of the SAB



Sediment Mobilization

Four types of "events" have been identified:

- **Spring nor'easter events - Moderate southwesterly waves give way to northeasterly waves.**

SE → N

- **Late summer nor'easter events - Fair weather conditions precede northeasterly waves.**

FW → NE

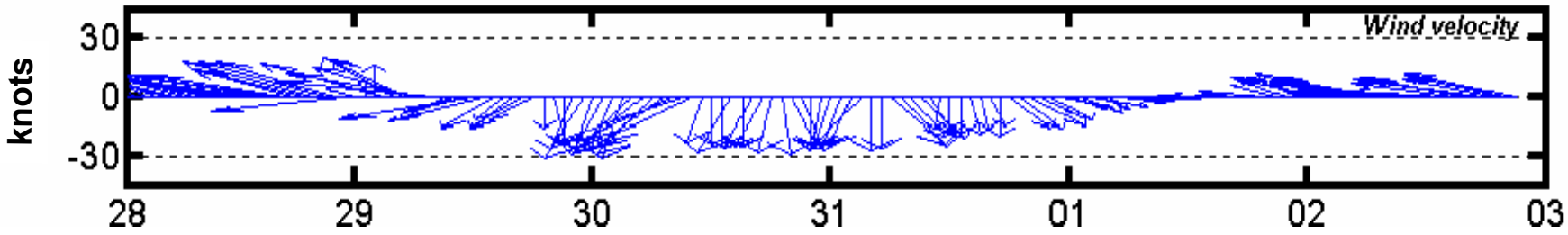
- **Southerly wind events - Northerly winds give way to strong southerly winds.**

N → S

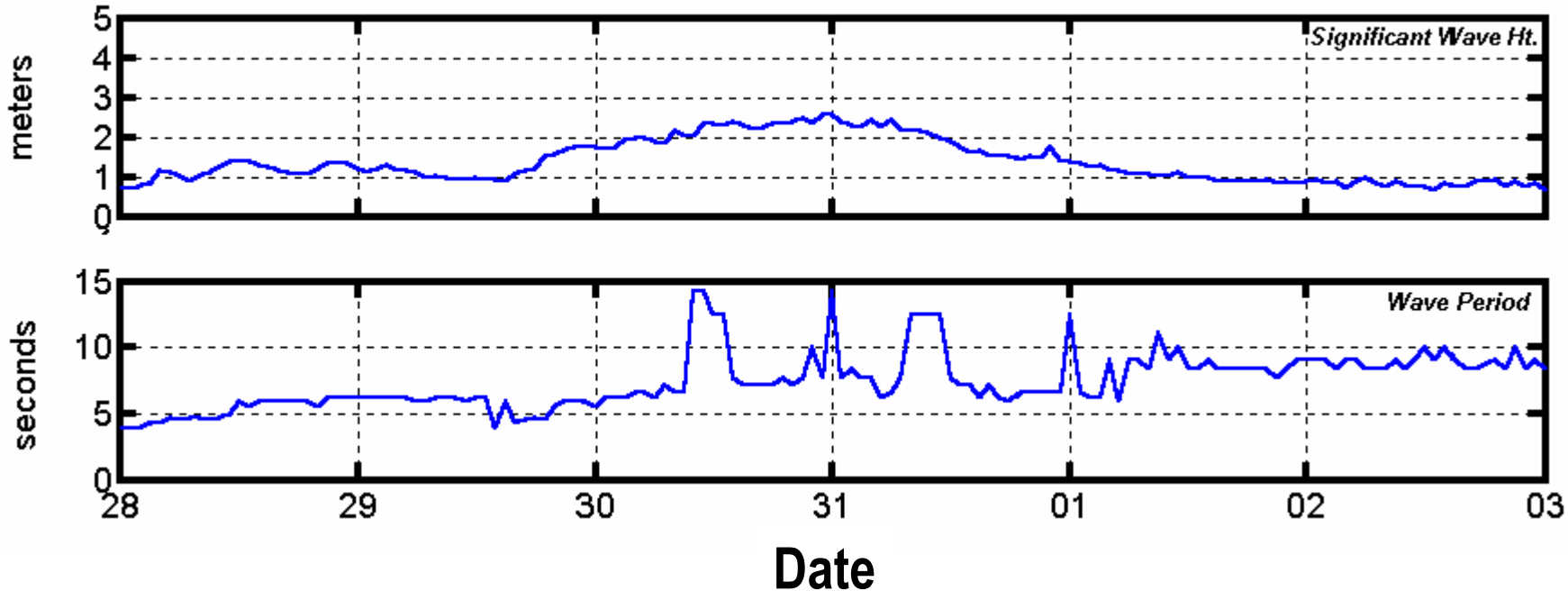
- **Fair weather processes**

May 28 - June 2, 2000

Wind Conditions

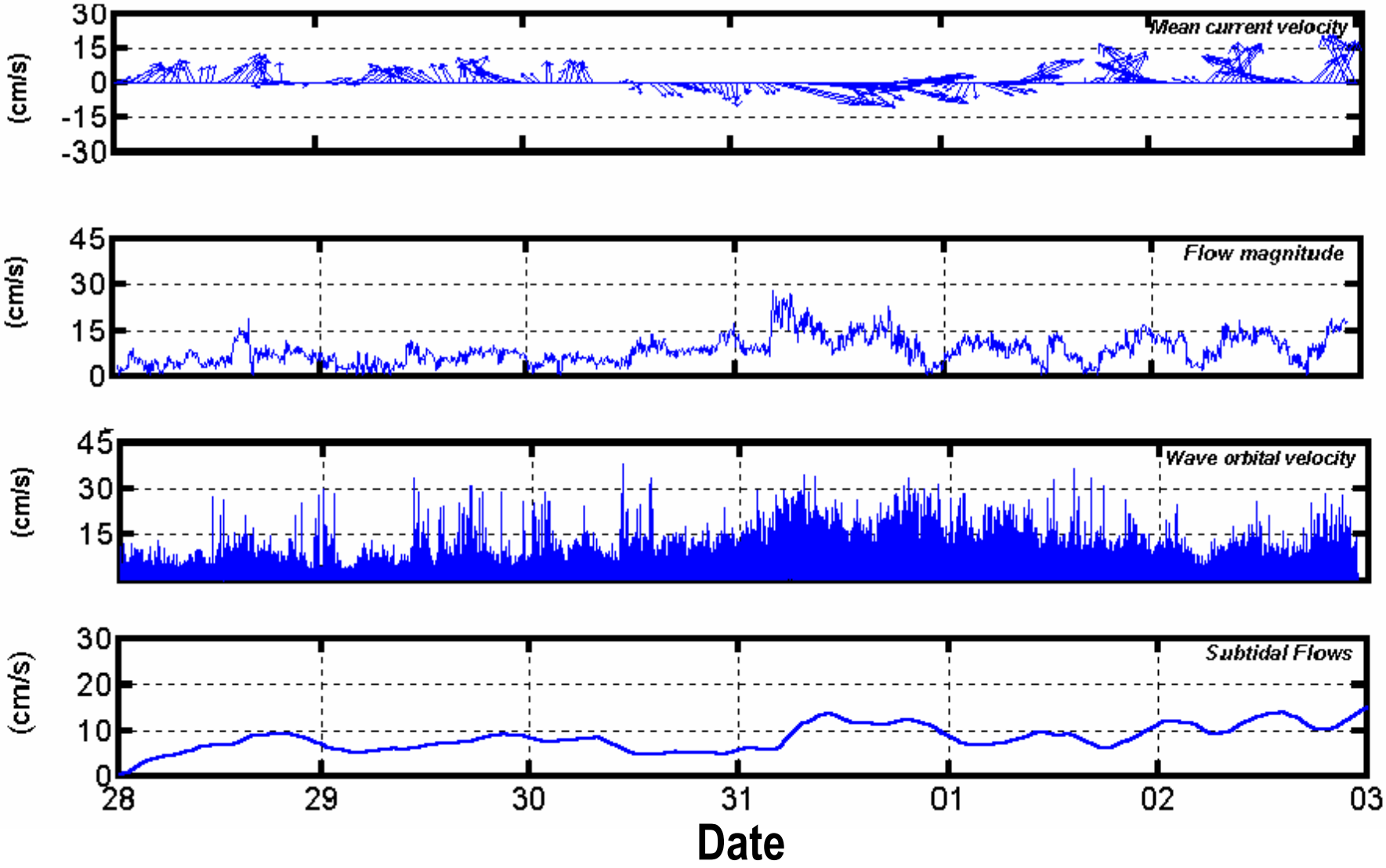


Wave Characteristics

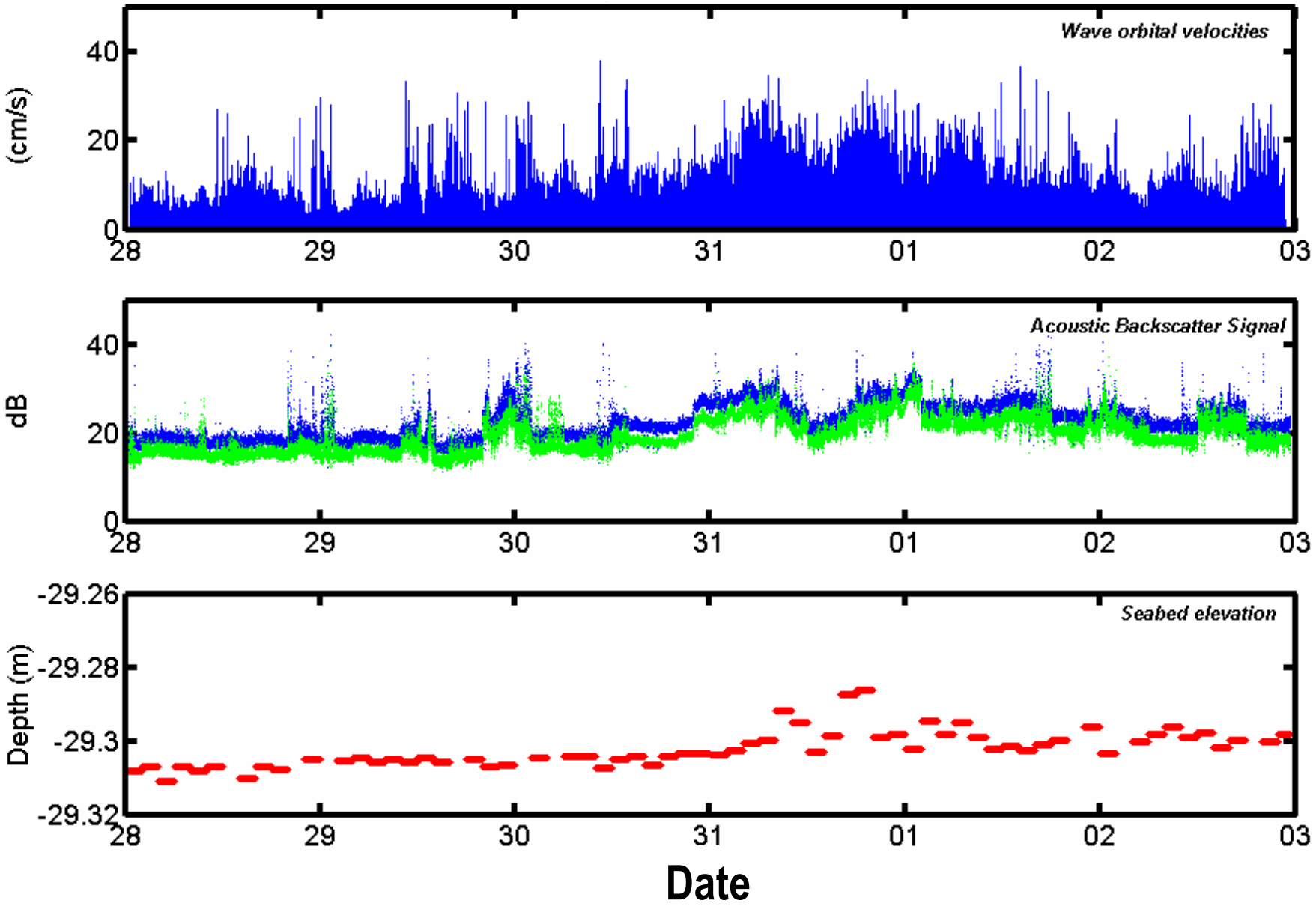


Near-bottom Flows

May 28 – June 2, 2000

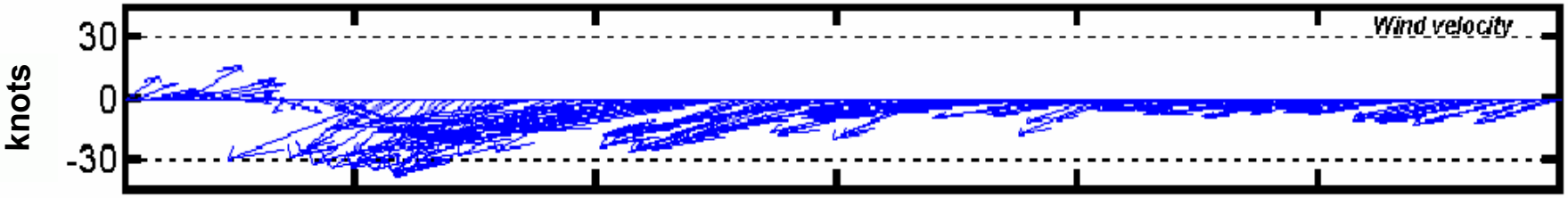


Sediment Mobility
May 28 – June 2, 2000

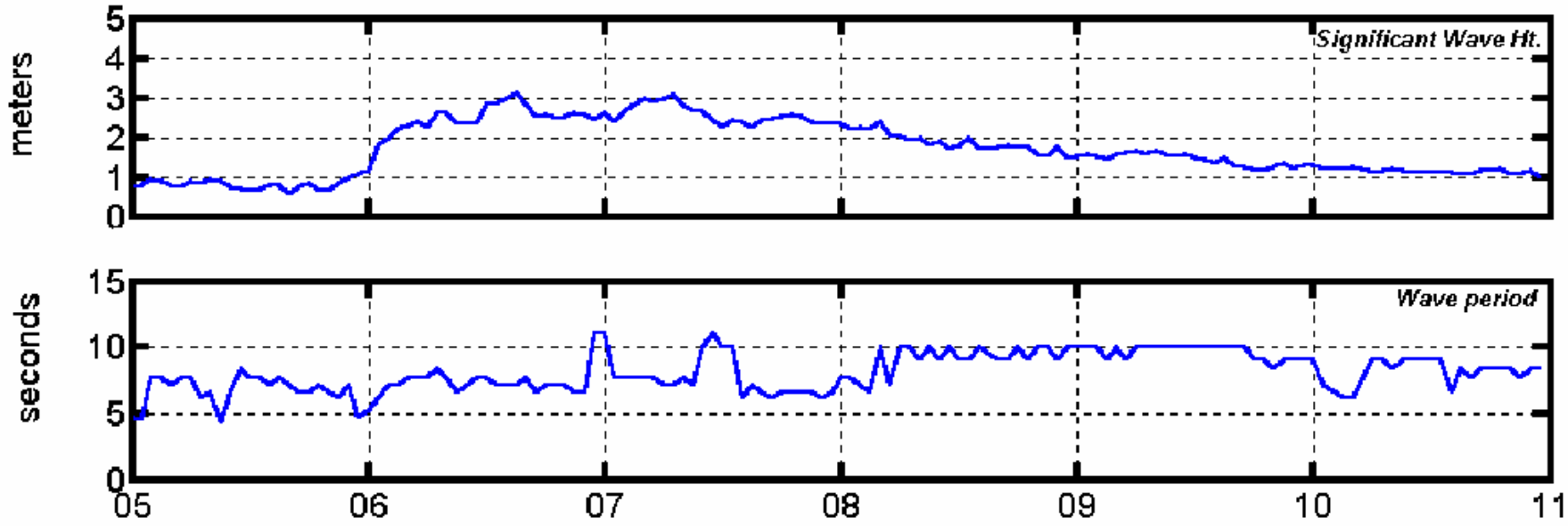


September 5 - 10, 2000

Wind Conditions

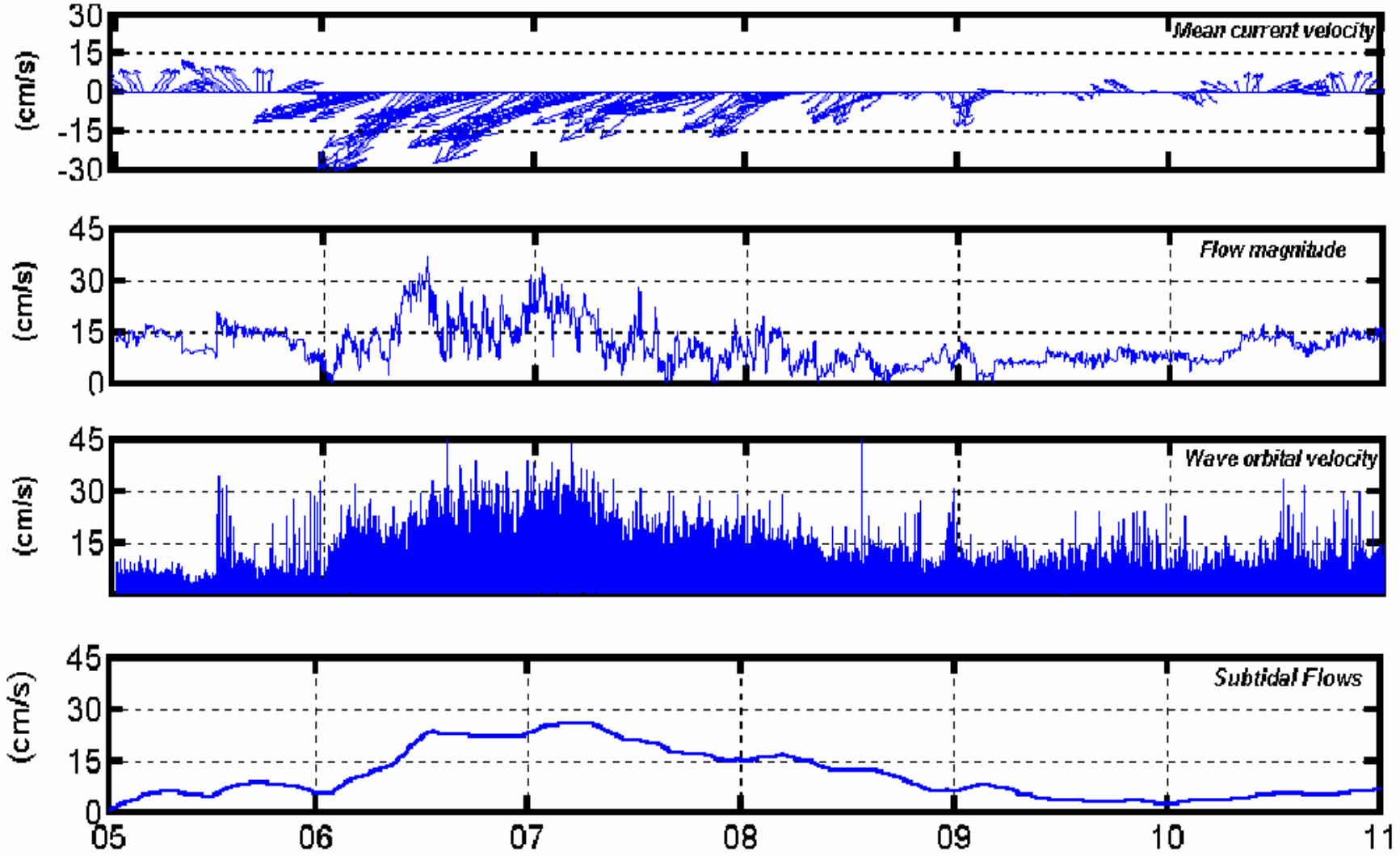


Wave Characteristics

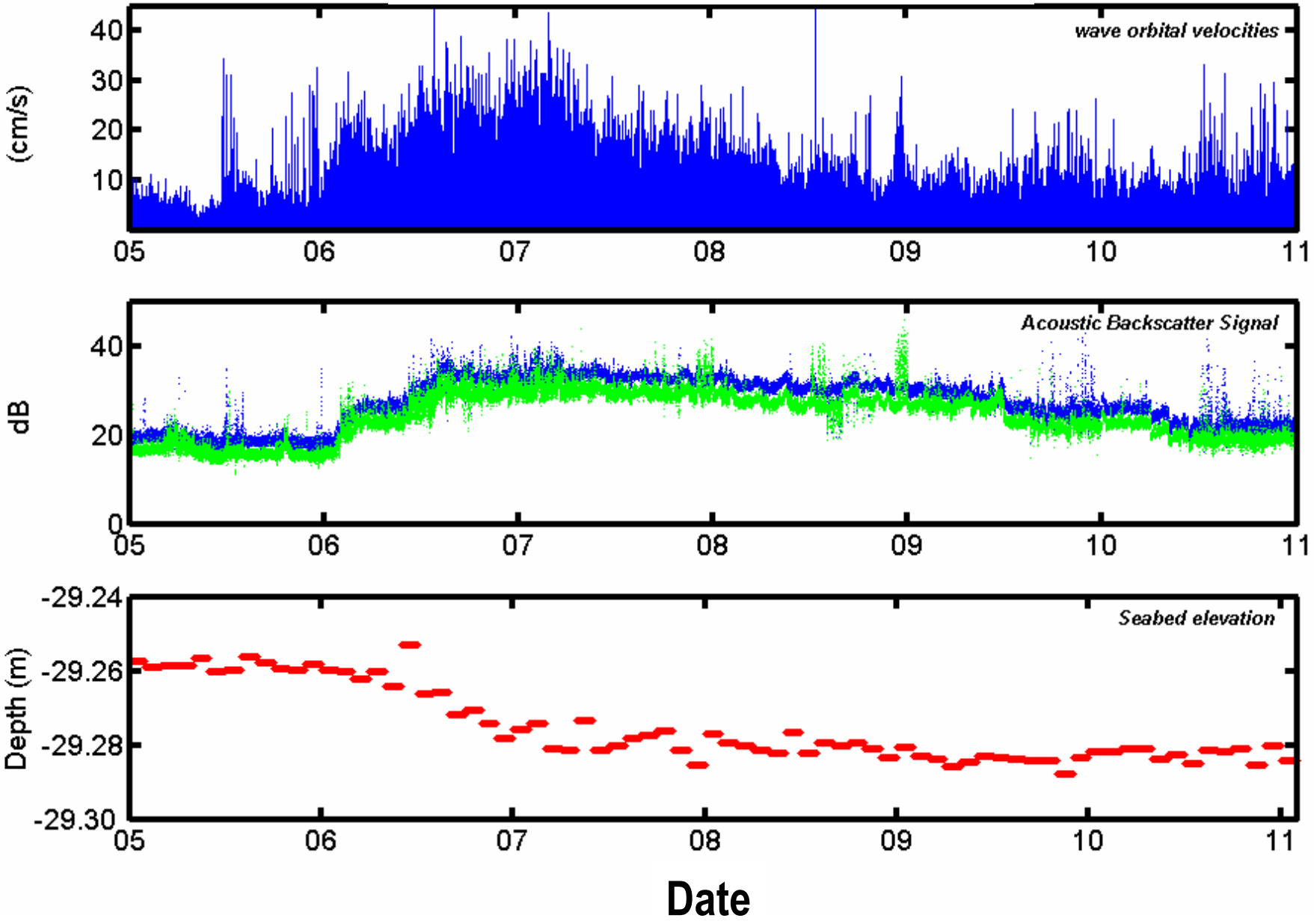


Near-bottom Flows

September 5 - 10, 2000

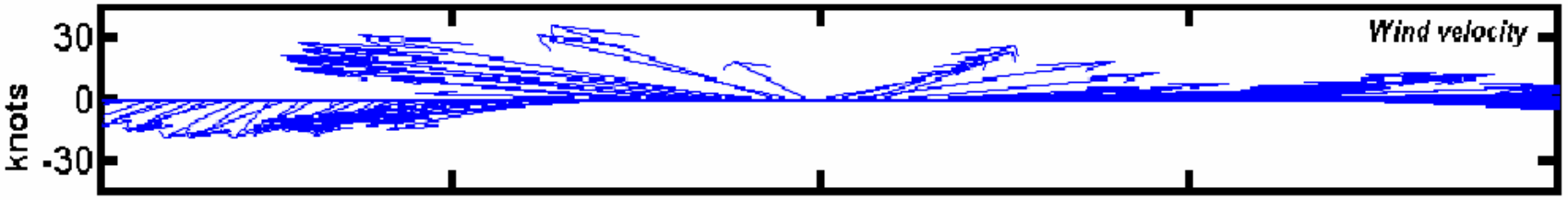


Sediment Mobility
September 5 – 10, 2000

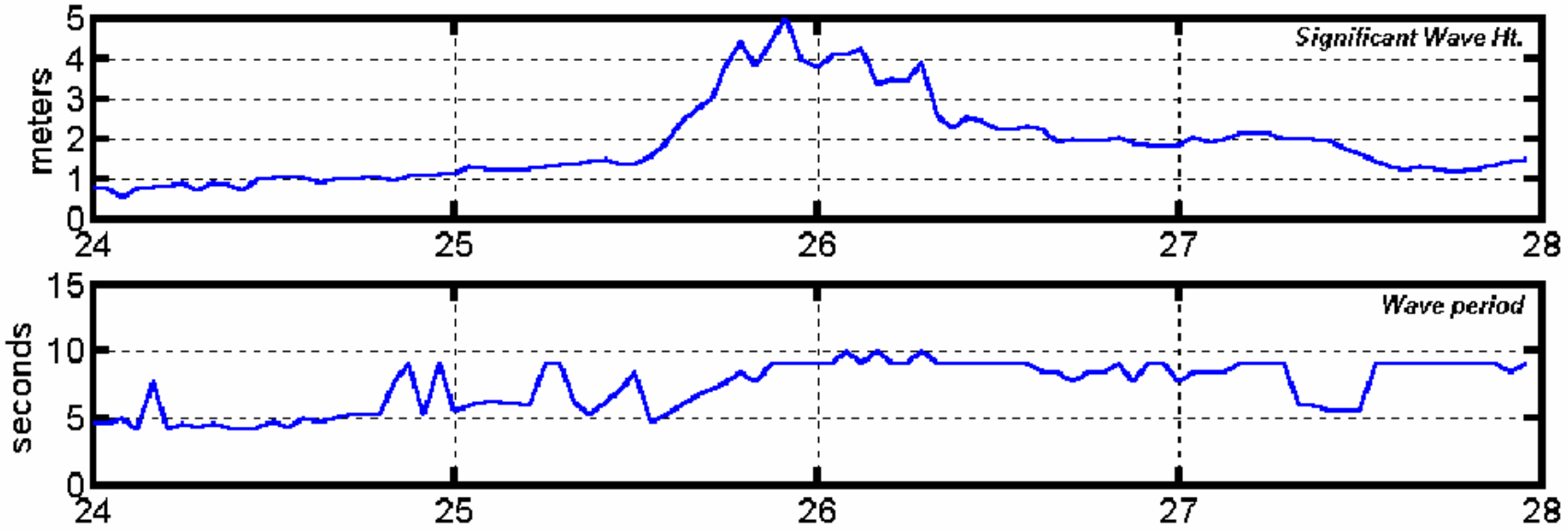


November 24 - 27, 2000

Wind Conditions

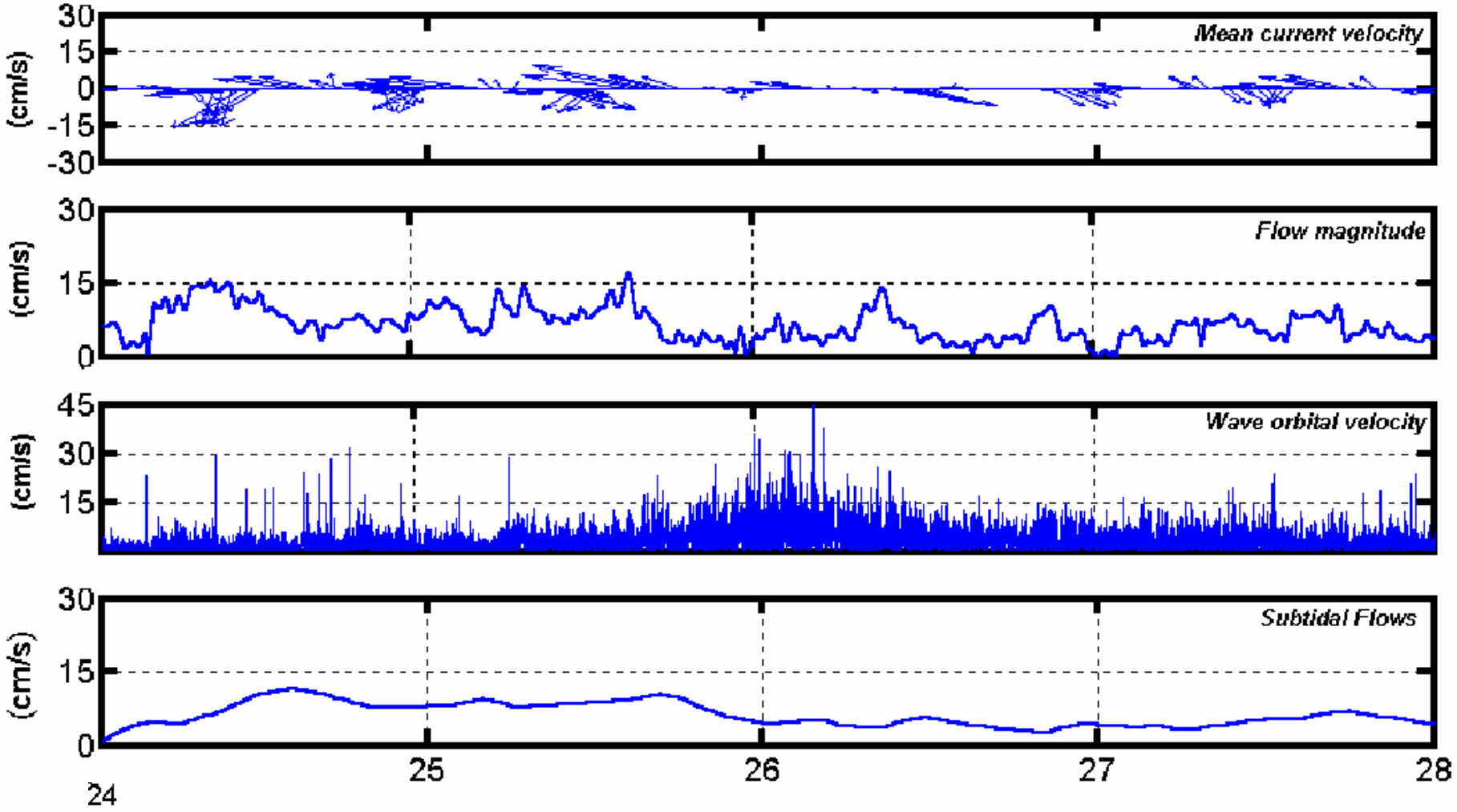


Wave Characteristics

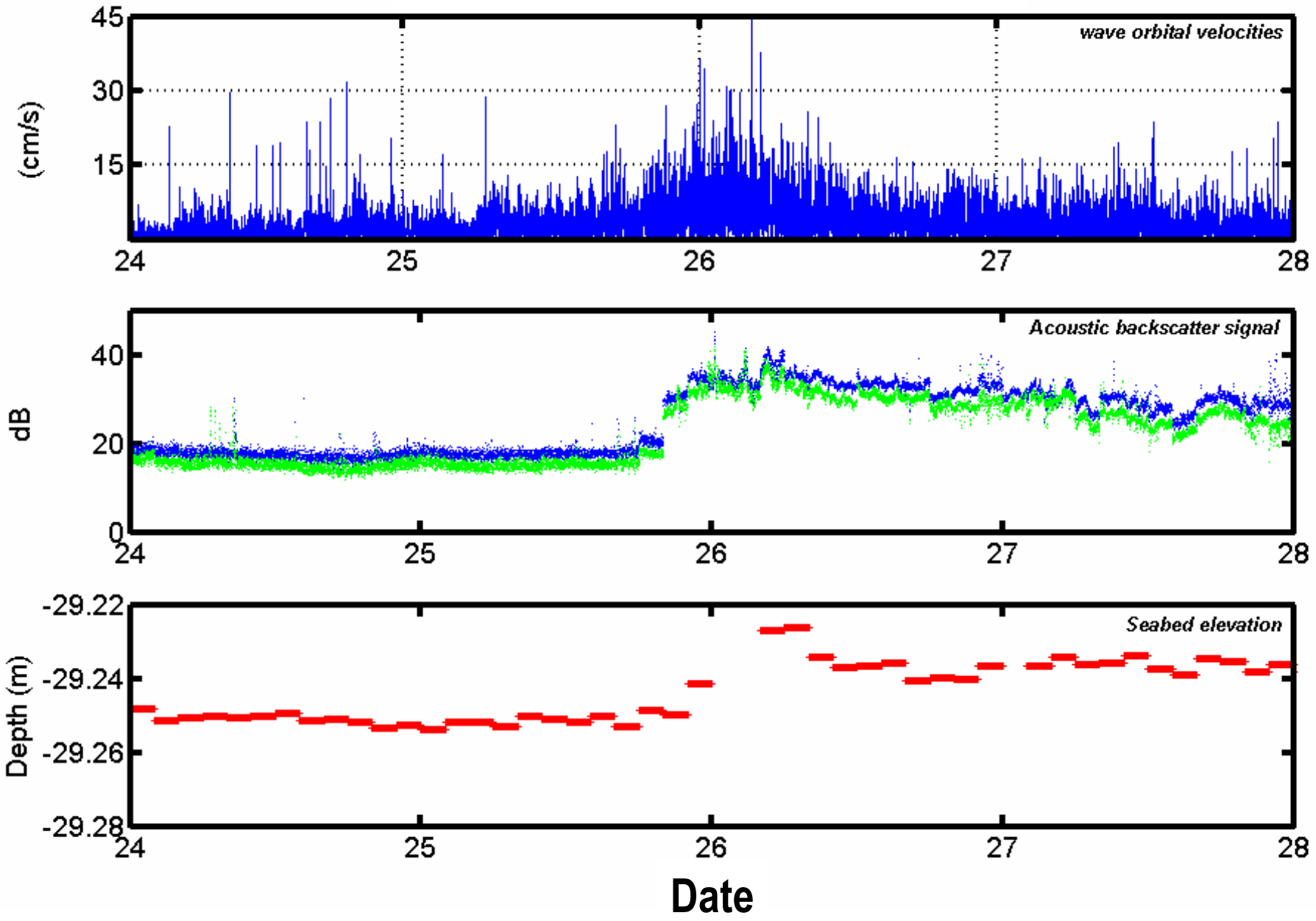


Near-bottom Flows

November 24 - 27, 2000

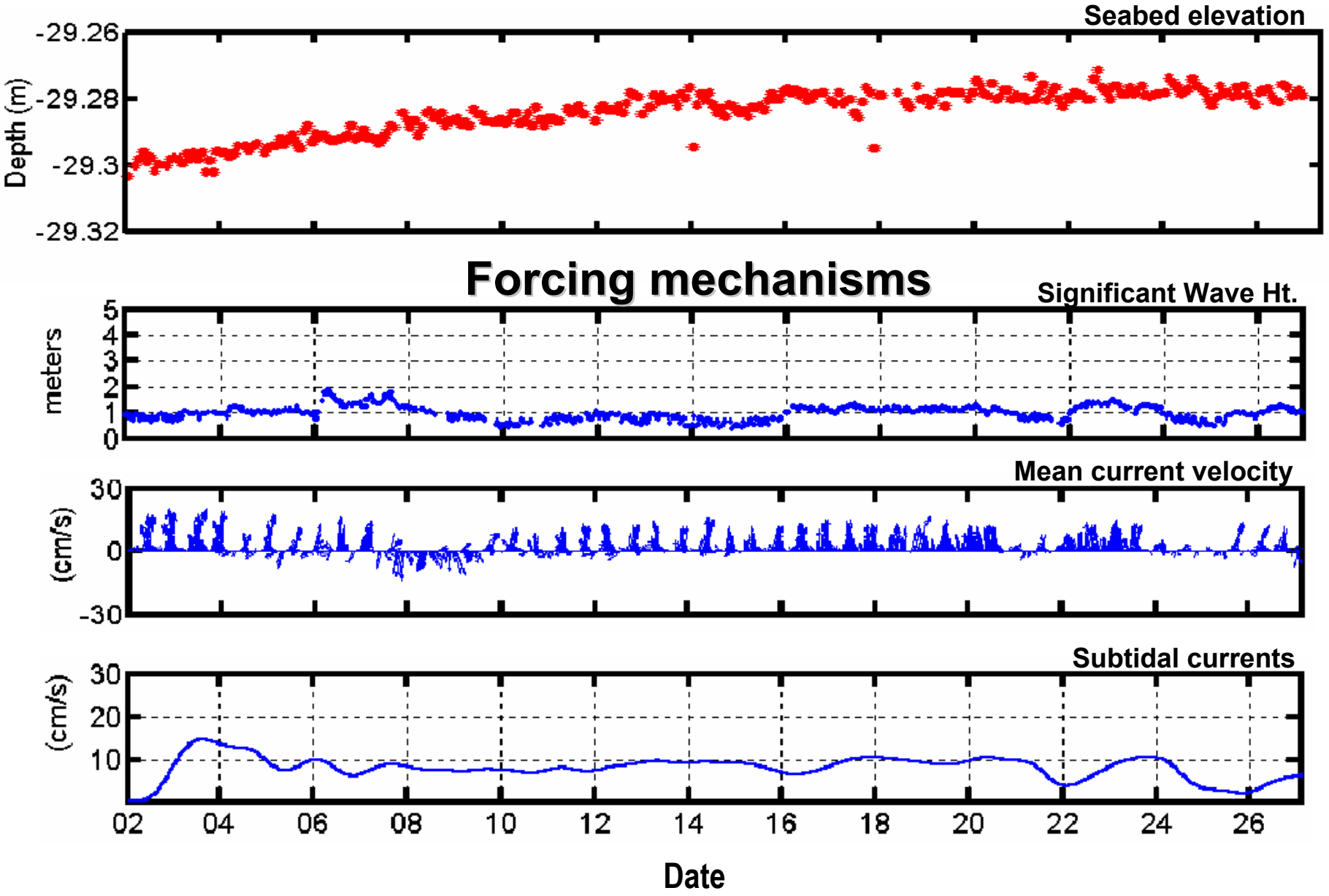


Sediment Mobility
November 24 - 27, 2000

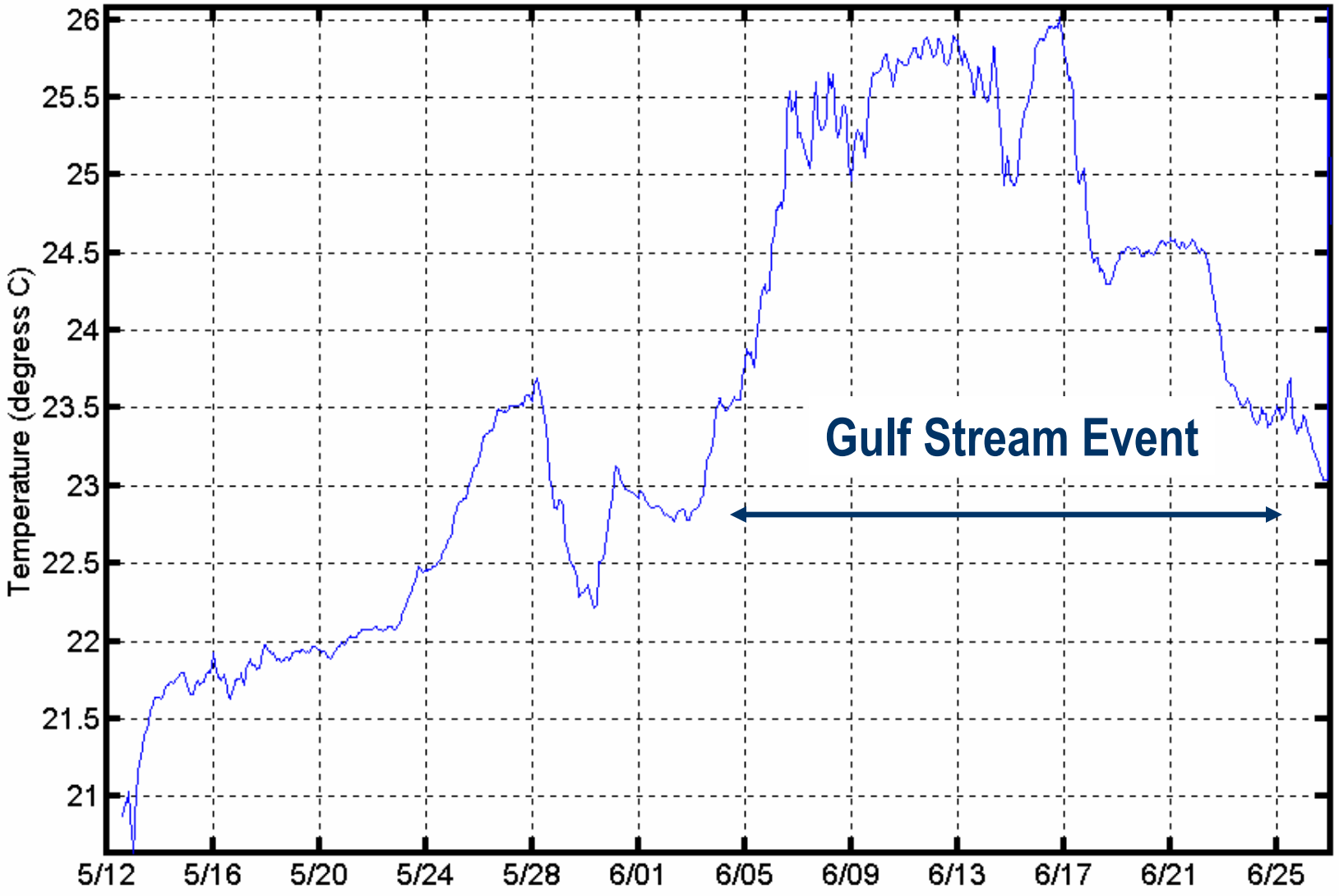


	Forcing Mechanisms	Sediment Response
Fair weather-No wind	• Waves (< 1.0m) • Bottom Current ~10 cm s^{-1} Tidal	None
Spring Nor'easter SE → N	• Waves (> 2.0m) • Bottom Current 24 hr lag ~10 cm s^{-1} Subtidal	• Suspended Seds: low • Small net change
Southerly Wind Event N → S	• Waves (> 4.0m) • Bottom Current < 10 cm s^{-1} Tidal	• Suspended Seds: high • Net accretion
Late Summer Nor'easter FW → NE	• Waves (> 2.5 m) • Bottom Current > 25 cm s^{-1} Subtidal	• Suspended Seds: high • Net erosion

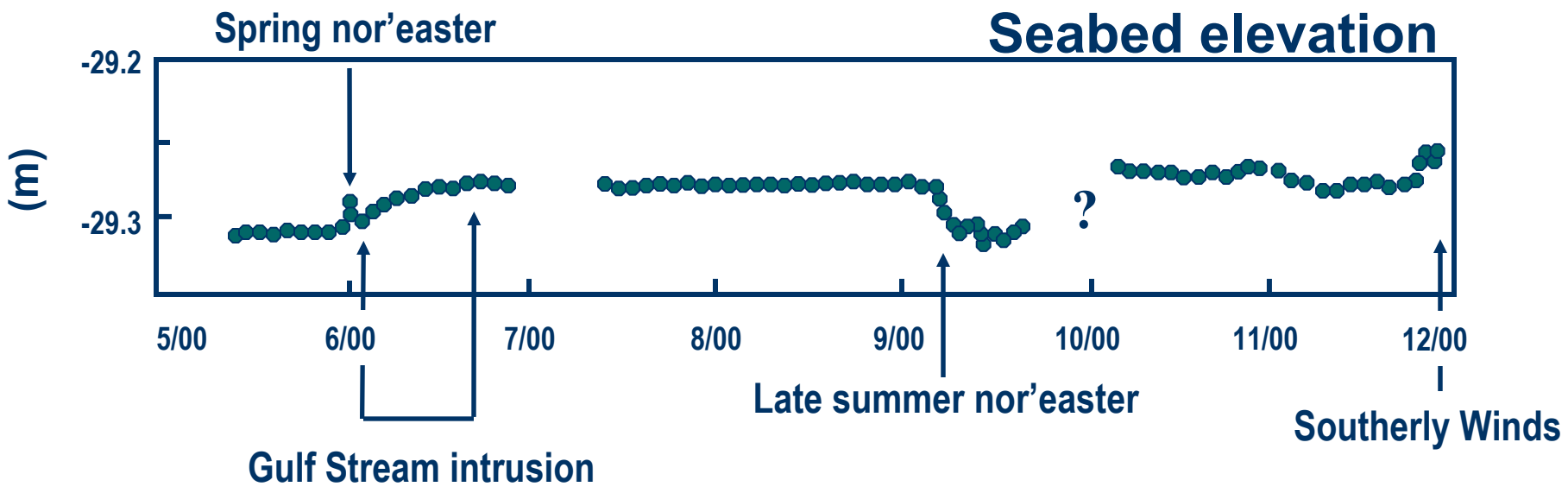
…..But, significant changes in sea floor elevation were observed during periods of fair weather…….



May 12 – June 26, 2000



Summary


Spring nor'easter
Seabed elevation
-29.2
-29.3
(m)
?
5/00
6/00
7/00
8/00
9/00
10/00
11/00
12/00
Late summer nor'easter
Southerly Winds
Gulf Stream intrusion

CONCLUSIONS

- Although surface waves and currents respond rapidly to local storm winds, sediment transport processes depend strongly on wind duration and pre-storm conditions.

- Subtidal flows are a key physical forcing mechanism of sediment transport at this site