



## Overview

- Sediment Mobility Tool Predicts:
  - Frequency of sediment mobilization at nearshore placement site
  - Cross-shore sediment migration direction
  - Axis of wave dominated sediment transport
- Currently being developed into a webtool including the Depth of Closure
- Tool is applied below to Duck, NC using WIS wave hindcasts

## Waves & Depth of Closure

- Wave characteristics are from waves transformed to the nearshore from closest WIS station
- The Depth of Closure (DOC) is calculated using equations from Hallermeier (1981) and Birkemeier (1985)

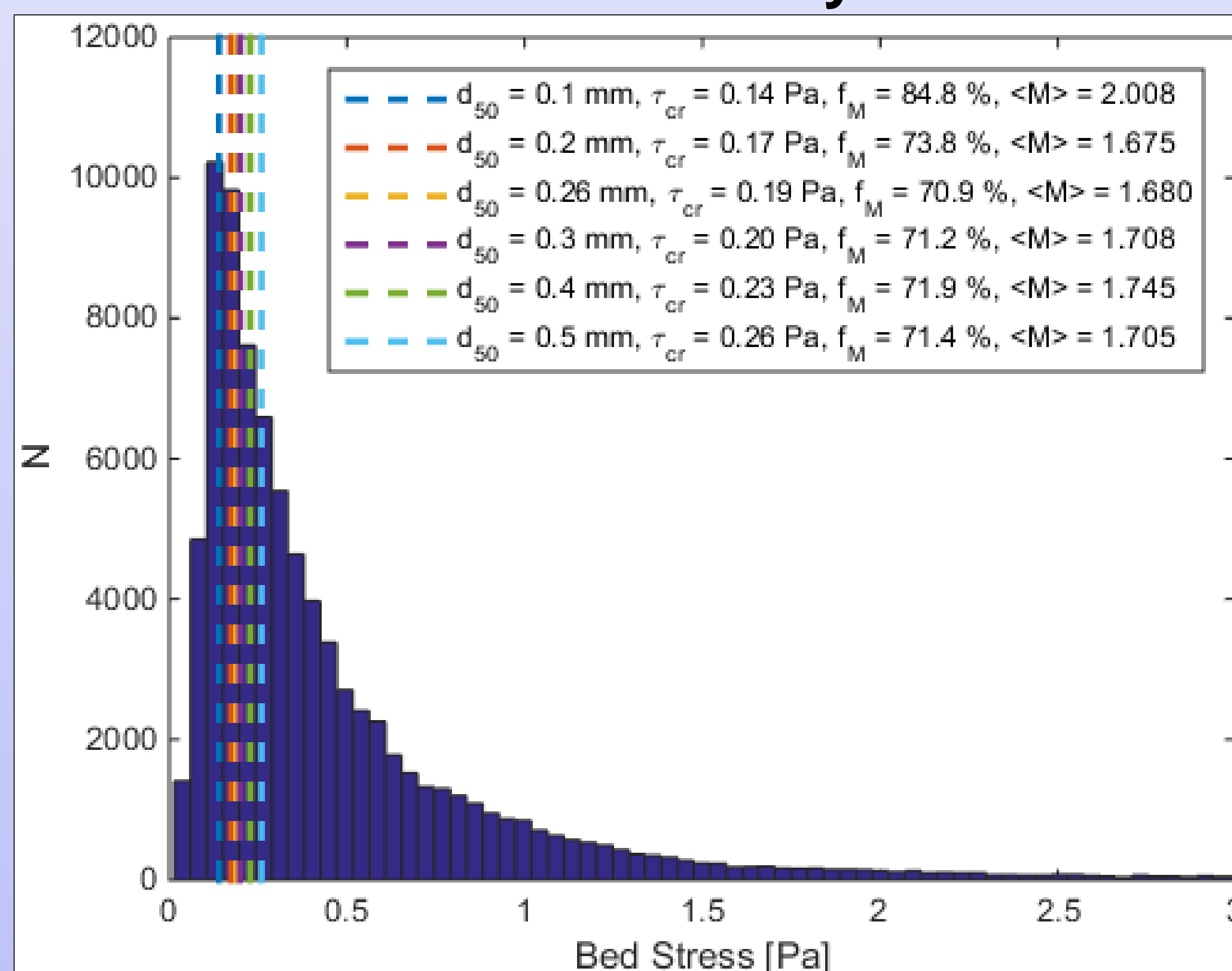
Wave Characteristics (1980 – 2012)	
H <sub>mo</sub> (m)	0.68
H <sub>e</sub> (m)	3.94
H <sub>0.1</sub> (m)	1.24
Stand. Dev. $\sigma$	0.47
T <sub>p</sub> (s)	8.7
T <sub>e</sub> (s)	14.5

[WIS Station 63218, 160° Shoreline Angle, Nearshore Placement Depth: 8 m]

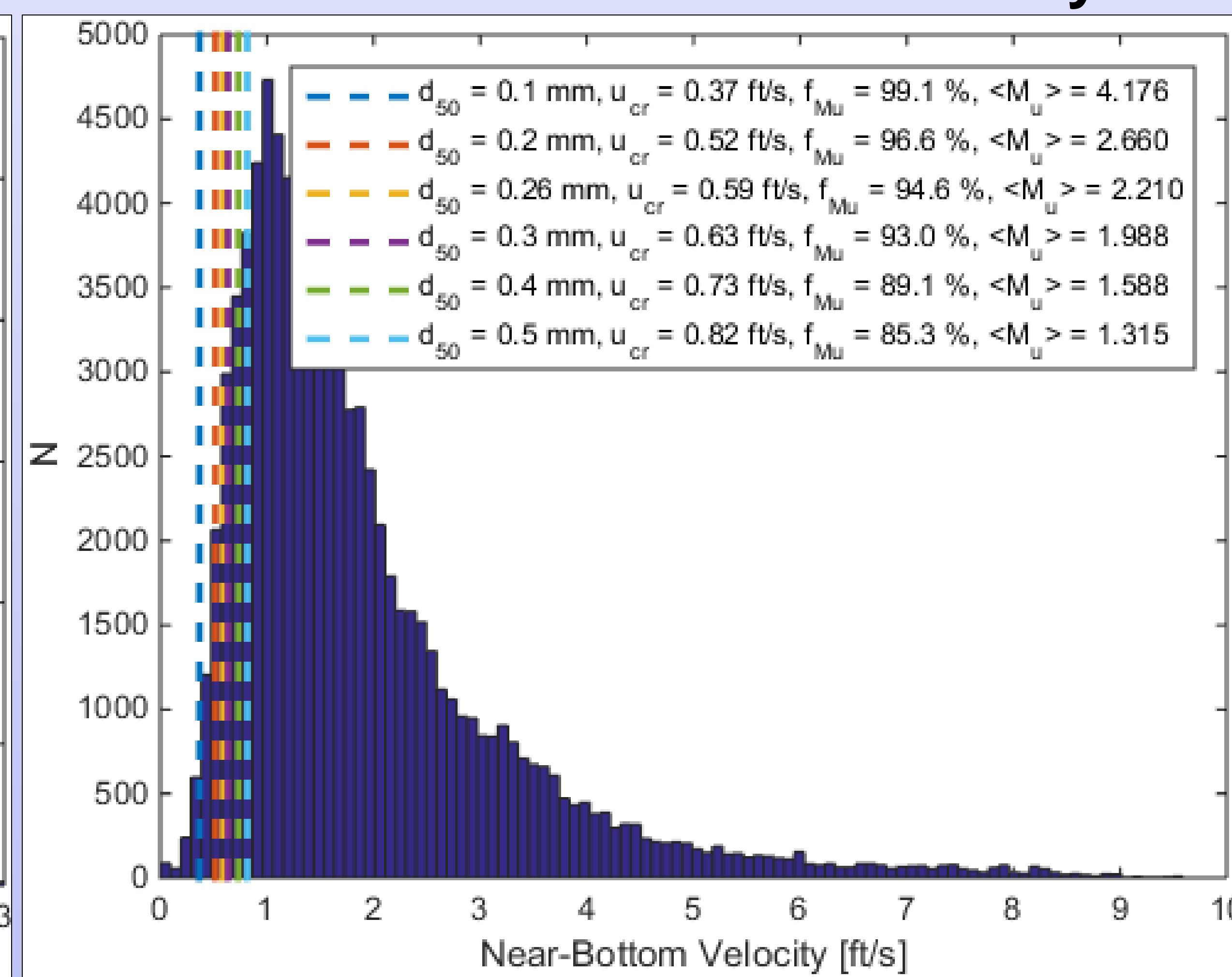
Depth of Closure (1980 – 2012)	
Hallermeier Inner (m)	8.5
Hallermeier Inner Simplified (m)	6.6
Hallermeier Outer (m)	13.3
Birkemeier (m)	6.5
Birkemeier Simplified (m)	6.2

[WIS Station 63218, 160° Shoreline Angle, Nearshore Placement Depth: 8 m]

## Linear Wave Theory



## Stream Function Wave Theory



## Freq. of Sediment Mobility

- Calculated with Linear and Stream Function Wave Theories
- Using both methods provides a range of sediment mobilization frequency
- Stream function wave theory is more appropriate closer to shore when the wave becomes more asymmetric
- Applied to several grain sizes

## Migration Direction

- Cross-shore migration predicted with Dean Number:  $D = H_o/\omega T$  where  $H_o$  is deep water wave height,  $\omega$  is sediment fall speed, and  $T$  is wave period
  - $D > 7.2$ , Offshore migration
  - $D < 7.2$ , Onshore migration (Larson & Kraus, 1992)
- Wave rose provides axis of wave dominated sediment transport

d (mm)	Predicted Sediment Migration
0.1	75% Offshore
0.2	92% Onshore
<b>0.26</b>	<b>97% Onshore</b>
0.3	99% Onshore
0.4	99% Onshore
0.5	100% Onshore

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