

Waves & Currents in D2P Region

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Numerical Model

Coastal Modeling System (CMS)

- integrates CMS-FLOW and CMS-WAVE
- simulates the tidal and wave generated currents between Diamond Head and Ewa Beach
- qualitatively describes littoral transport pathways in the region



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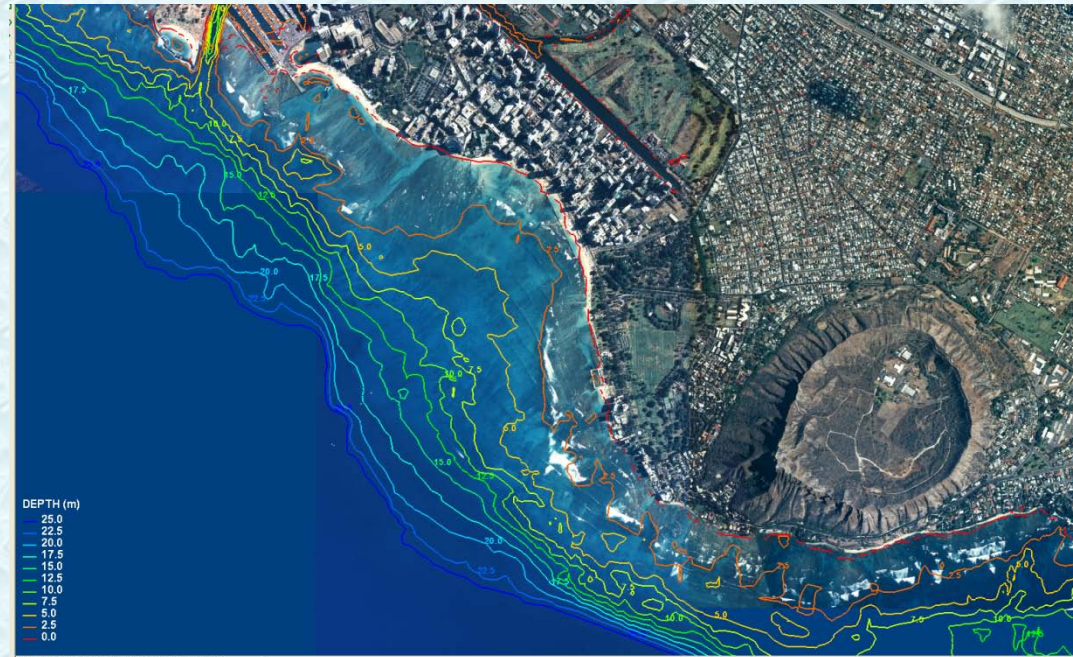
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Bathymetry

Data Set

- provided by the UH Department of Ocean and Resources Engineering
- includes SHOALS LiDAR soundings, FEMA topographic information and UH derived data to fill gaps



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Model Forcing

Tide and Offshore Wave Conditions

- Forcing conditions gathered from NOAA Tides and Currents Historic Data Measurement Honolulu Harbor gauge
- Offshore wave conditions obtained from Scripps Institute of Oceanography Coastal Data Information Program (CDIP) Directional Waverider Buoy 146 located at Kaunapali Harbor (Lanai, Hawaii)



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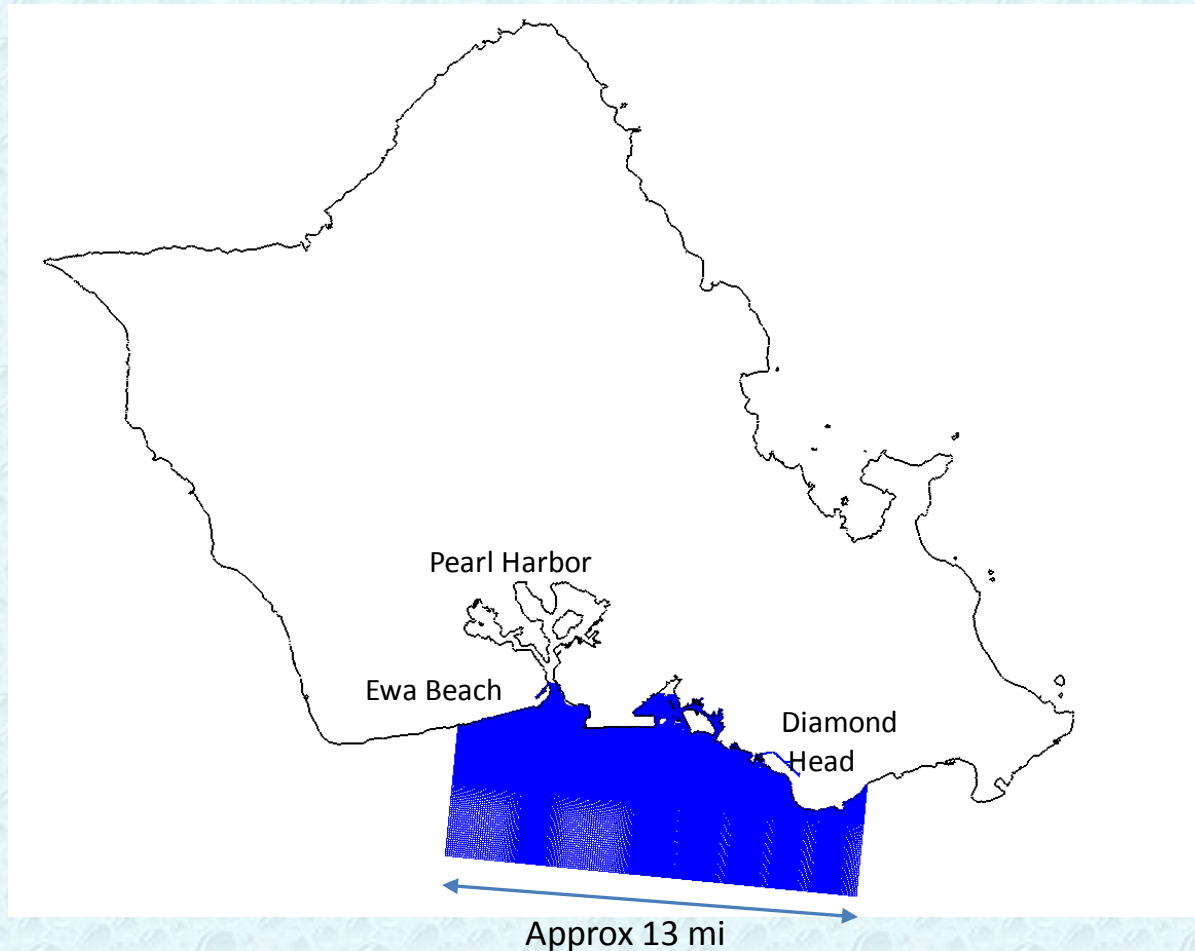
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Model Domain



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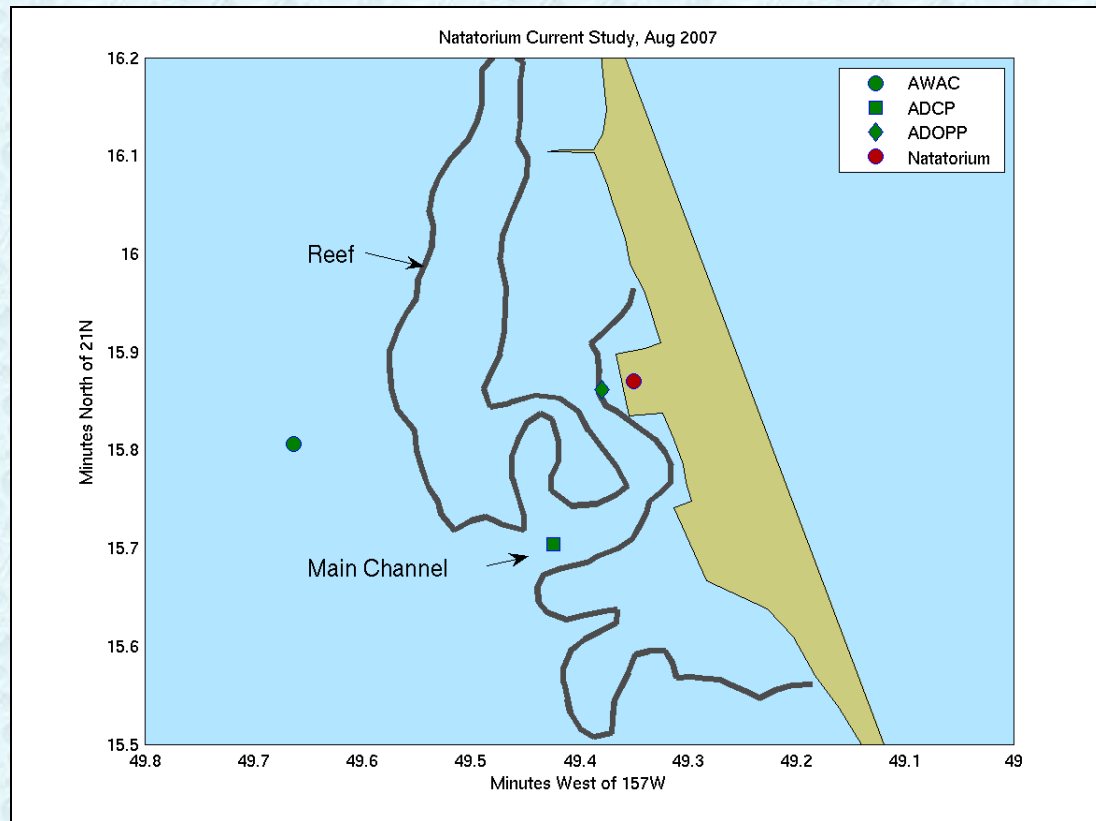
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Field Data

Data Collection

- August 23-30, 2007 in the vicinity of the Natatorium
- Nortek AWAC (waves/currenets), RD Instruments ADCP (currents/waves), and Nortek Aquadopp current profiler (currents)



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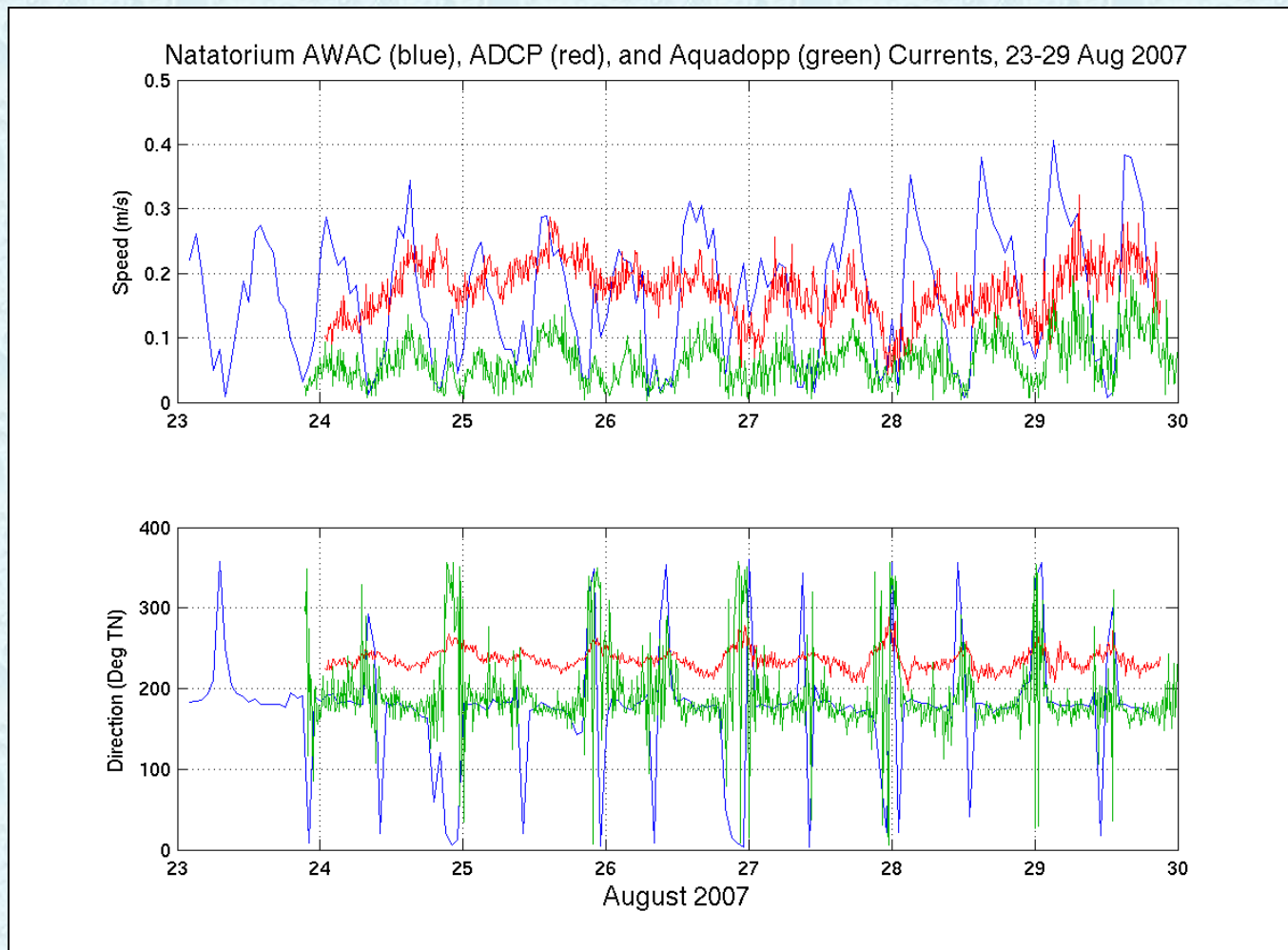
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Field Data

Typical Nearshore Current Speeds



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CMS Model Storm Simulations

South Swell

Kona Storm

NW Swell

SSE Swell

Date	Duration	Peak Wave Height (m)	Typical Wave Period (s)	Typical Wave Direction	Tidal Range (m)
8/17/07 to 9/8/07	23 days	1.34	12 – 15	S (180)	0.8
12/10/08 to 12/17/08	8 days	2.59	12 - 17	SSE (160)	0.9
1/14/09 to 1/21/09	8 days	2.7	10 - 14	W (270)	0.6
8/23/07 to 8/30/07*	8 days	1.34	12 - 15	SSE (150)	0.8

* Wave Direction shifted 30 degrees east (CCW) to represent southeasterly swell



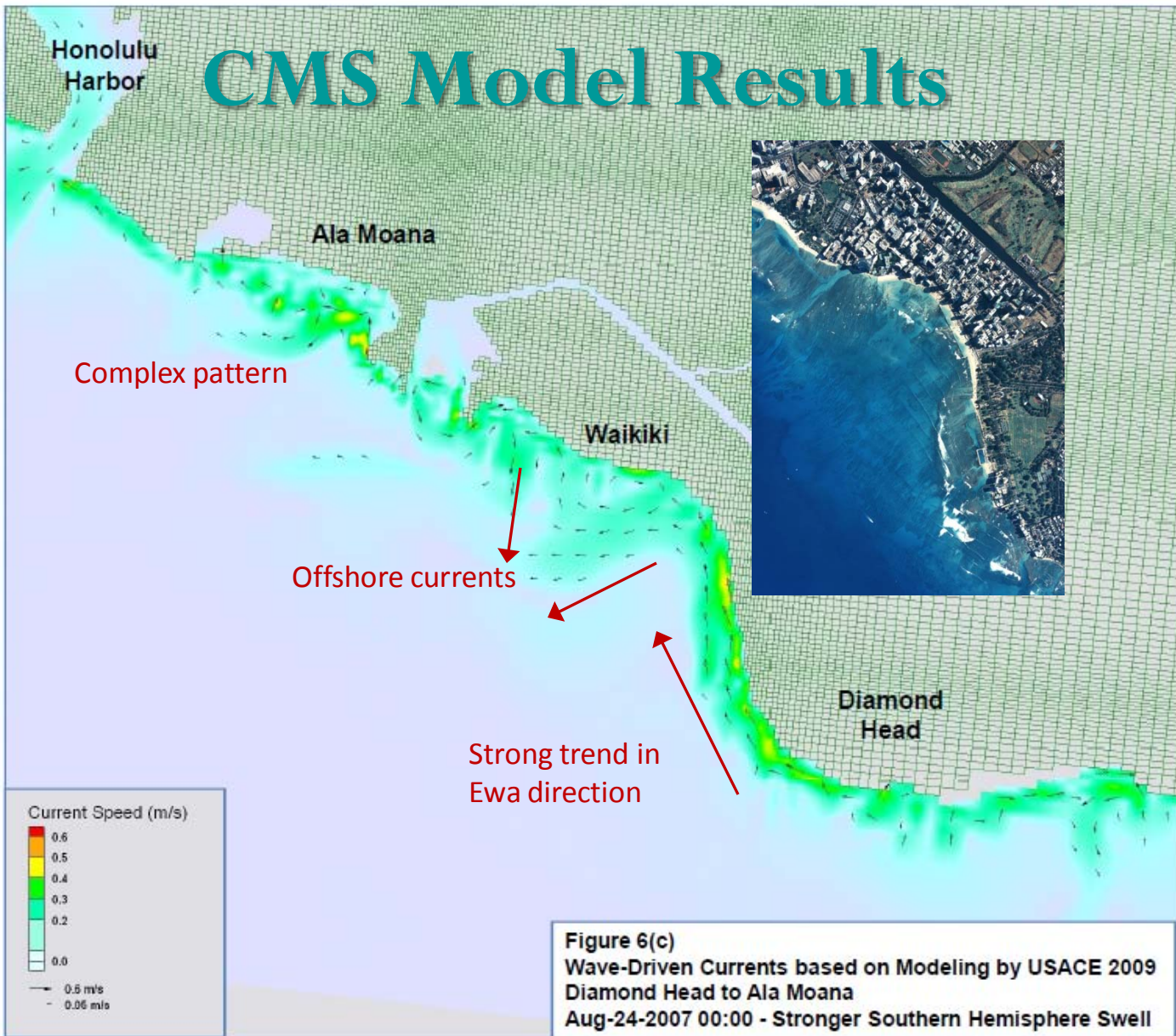
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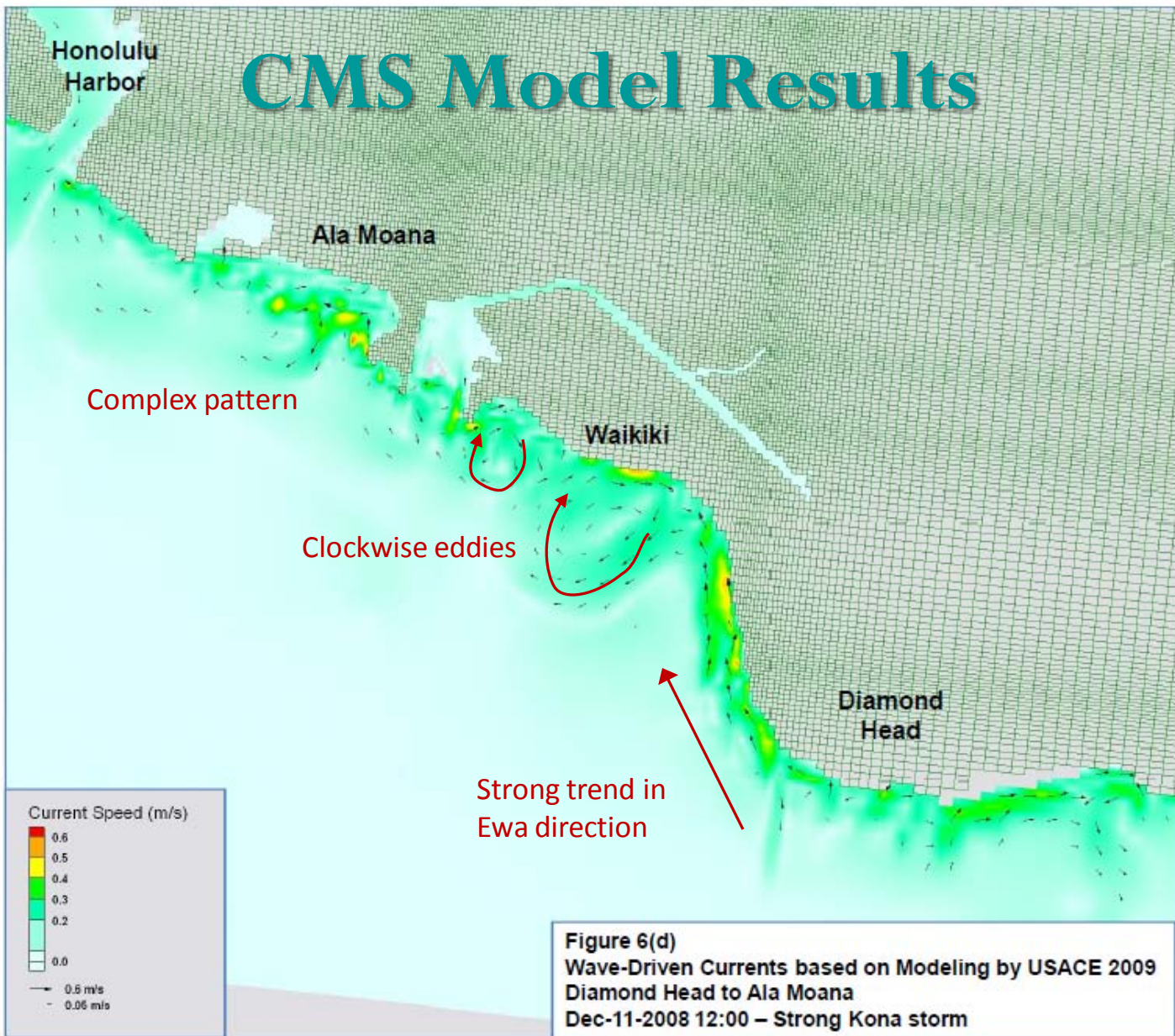
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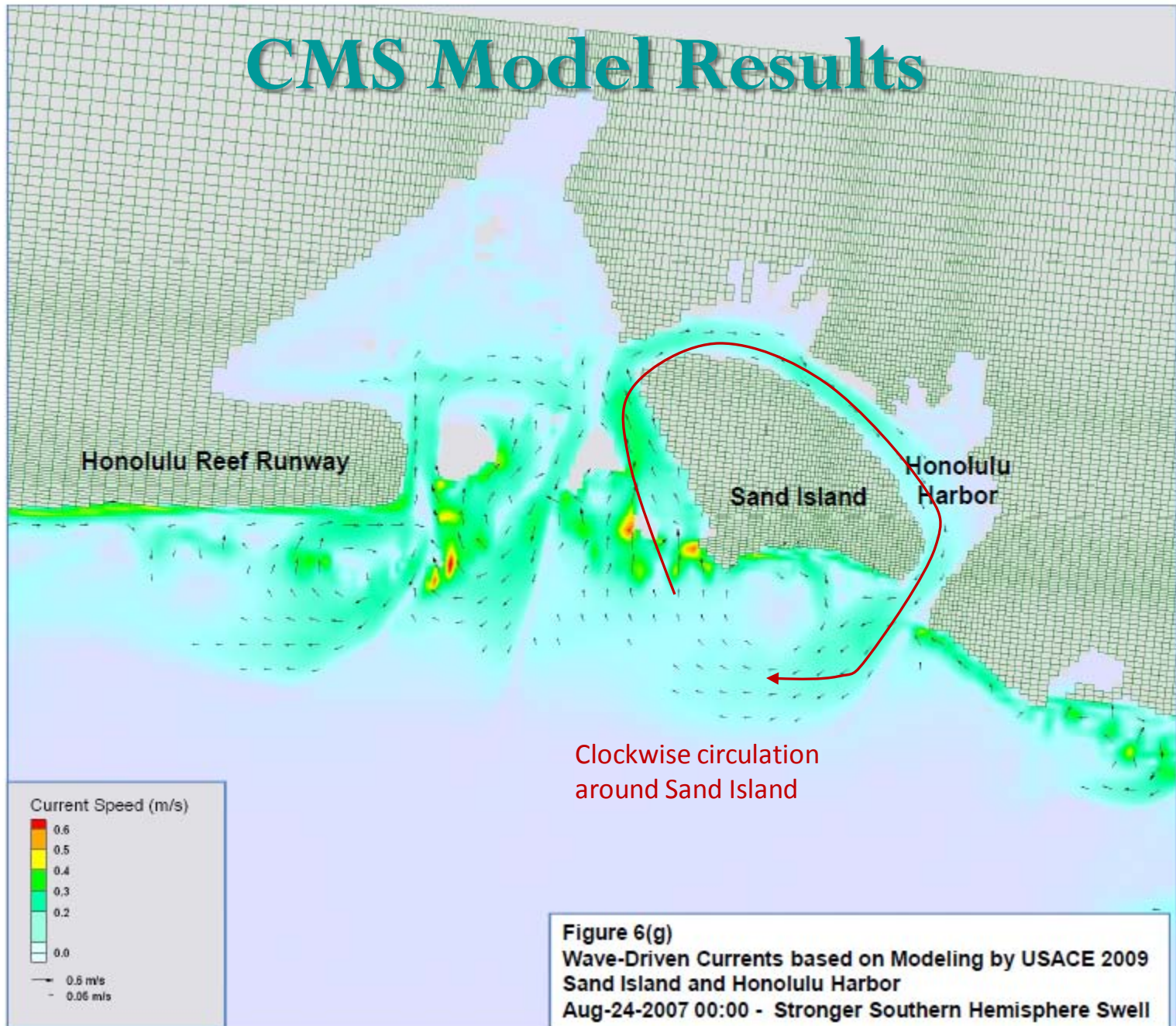




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CMS Model Results



CMS Model Results

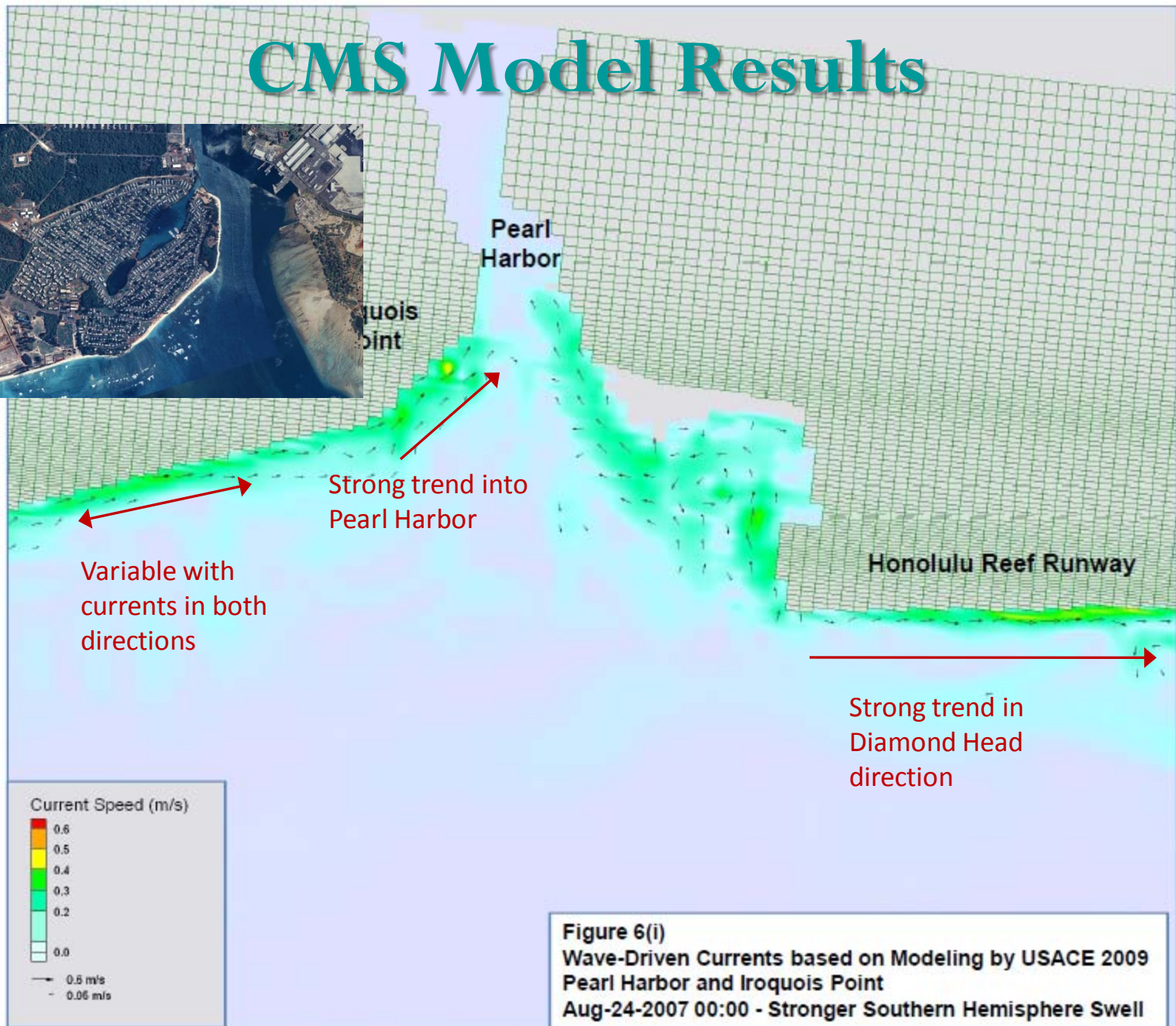


Figure 6(i)
Wave-Driven Currents based on Modeling by USACE 2009
Pearl Harbor and Iroquois Point
Aug-24-2007 00:00 - Stronger Southern Hemisphere Swell

CMS Model Results

- **Waves (not tide) are the primary forcing that generate currents in the nearshore and induce transport of sediment**
- **Currents under various wave conditions (South swell, Kona, etc.) show similar overall trends with variability in magnitude and eddy strength**
- **Results in many areas validate shoreline trends ~ Waikiki and Iroquois Point areas**
- **Currents are very complex due to abundant nearshore reef and manmade channels in reef**



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