An Introduction to the Marine Energy Atlas

May 27, 2021
Welcome!

WPTO R&D Deep Dive Webinar Series
A bi-monthly look into the ongoing work of WPTO sponsored projects and program areas

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Logistics

• This webinar will be recorded and made available to registrants.
• Attendees’ microphones are muted and attendees are not visible on video.
• Feel free to submit questions in the chat box throughout the session to be addressed in Q&A. Be sure to select “Everyone.”
• If you have technical issues, try calling into the webinar via phone.

Thank you for participating!
Speakers and Panelists

Speakers

Levi Kilcher, PhD
Principle Investigator

Haiku Sky
Product Portfolio Manager

Aidan Bharath, PhD
Lead Researcher

Panelists

Paul Susmarski
Lead Developer
Why is Marine Energy Resource Data Important?

- **Public Knowledge**
  - Marine energy opportunities from local to global scales

- **Project Design**
  - Where to build projects
  - How to design arrays
  - Selecting technologies that maximize resource potential

- **Technology Design**
  - Determining what environmental conditions technologies should be designed for:
    - Maximum wave heights or current speeds
    - Extreme events and turbulence
    - Suspended sediments, sea ice, bottom composition

- **Techno-Economic Assessment**
- **Grid Integration Research**
- **Market Assessment**
- **Array-Design Tools**
- **Device Engineering Tools:** WEC-Sim, MHKiT, SAM, etc.
Marine Energy Resource Characterization

Official Project Title: Model Validation and Site Characterization for Early Deployment MHK Sites and Establishment of Wave Classification Scheme

Delivering data and information for next-generation marine energy project siting, project planning, device design, and device certification.

- Marine Energy in the U.S.: An Overview of Opportunities
- Wave and tidal measurements at early-market sites
- High-resolution wave and tidal models
- Classification schemes proposed for inclusion in IEC standards
- Marine Energy Atlas – NOW!
High-Resolution Wave Dataset

Spatial Datasets:
- 200-m spatial resolution spanning U.S. EEZ
- More than 4 million grid points spanning East Coast, West Coast, and Hawaii
- Alaska, Gulf of Mexico, U.S. Territories and Freely Associated States coming soon.
- Three-hour temporal resolution spanning 32 years (1979 – 2010)
  - Extend to 2020 next year

Virtual Buoy Datasets:
- One-hour temporal resolution at hundreds of sites
- Includes directional wave spectra

Data is freely available on AWS: registry.opendata.aws/wpto-pds-us-wave
High-Resolution Wave Dataset

- **Full Dataset can be Programmatically Accessed via MHKiT:**
  - Data Access and Processing examples are provided:
    - [WPTO Wave Hindcast Examples](#)
  - Code base is continually maintained and updated with new functionality and processing methods.

**Dataset Accessible via Amazon Web Services:**

**Spatial Datasets**
- **Millions of points, 3-hour resolution**
  - Energy Period (s)
  - Maximum Energy Direction (deg true)
  - Omni-Directional Wave Power (W)
  - Significant Wave Height (m)
  - Water Depth (m)
  - Directionality Coefficient
  - Peak Period (s)
  - Mean Absolute Period (s)
  - Mean Zero-Crossing Period (s)
  - Spectral Width

**Virtual Buoy Datasets**
- **Hundreds of points, 1-hour resolution**
  - All spatial variables
  - Directional Wave Spectrum \( \text{m}^2 \text{Hz}^{-1} \text{deg}^{-1} \)

**Bold variables plotted on Atlas**
- All variables available via Atlas “data downloader”
Marine Energy Atlas - Application Introduction

Marine Energy Atlas
maps.nrel.gov/marine-energy-atlas
What Has Changed?

Marine Hydrokinetic Atlas → Marine Energy Atlas
Marine Hydrokinetic Atlas

- Original version released in 2012
- Subsequent iterations built on OpenCarto framework
- Contains 169 data layers across multiple resource types
What is OpenCarto?

• A framework of web-based geospatial applications & services
• Open-source software packages
• Custom code base
• Tech stack based circa 2013 web technologies
Marine Energy Atlas – Overview

**Marine Energy Atlas**

- Launched April 2021
- Built on **VADR** framework
- Modern open-source software packages
What is VADR?

• Visualization Analysis Research & Design (VADR) platform
• Monorepo for codebase
• Web application framework
• Web service framework
• CI/CD infrastructure
• Suite of AWS cloud resources
Marine Energy Atlas – How is it better?

- Performant
- Scalable
- Modern
Demo of the Marine Energy Atlas

maps.nrel.gov/marine-energy-atlas
Q&A

Submit questions in the chat box and be sure to select “Everyone.”

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