Development and release of WEC-Sim v5.0 open-source software

PRESENTED BY
Dominic Forbush, Ph.D, Sandia National Laboratories
What is WEC-Sim?

WEC-Sim (Wave Energy Converter Simulator)

Simulates dynamics of floating and submerged bodies in ocean waves and currents, solving Cummins’ equation in the time-domain, informed by boundary-element method coefficients.

https://github.com/WEC-Sim/WEC-Sim
Continuous integration is built on GitHub Actions using MATLAB unit testing framework. Useful for locally testing development, and automatically testing each new commit and pull request on public branches.
WEC-Sim v5.0 – Modeling cables

▪ Right: Schematic of the MBARI-WEC*.

▪ Far-right: Mechanics Explorer visualization of the MBARI-WEC. The end-points of the cable connection shown as oversize grey spheres.

▪ Below: Simulink/Simscape implementation

WEC-Sim v5.0 – Capytaine

Capytaine Development Timeline

Aug 6, 2017 – Sep 7, 2022

WEC-Sim relies on Boundary Element Method (BEM) solutions to define hydrodynamic coefficients. Supported codes are NEMOH, WAMIT, AQWA, and now Capytaine

- Open-source Python code: https://github.com/capytaine/capytaine
- Capytaine support is current and ongoing.
- Capytaine developer: Matthieu Ancellin
Previously, a simulation was run from the command line, reading information from `wecSimInputFile.m`, and Simulink models would close at run time.

Now, user option to specify parameters directly in Simulink dialog and run from GUI.

A more common workflow, and easier for debugging.

Example:

WEC-Sim/examples/RM3FromSimulink
WEC-Sim v5.0 – Wave Visualization

Wave Elevation and Geometry Visualization
time = 120.0 s
Advance the state of open source software within the wave energy sector

- Improve WEC-Sim **interoperability with open-source meshing, BEM and optimization** software to facilitate device performance improvements and cost reduction

- **Improve parallelization** to leverage HPC systems for scientific discovery

- **Support the development of the open-source BEM software Capytaine** – improving accuracy, speed and functionality.

- **Outreach and training**, including short courses, webinars, and additional WEC-Sim applications (e.g. offshore wind, flexible bodies)
Conclusion

User feedback guides development! Contributions are always welcomed.

- Report a bug, seek support, request a feature: https://github.com/WEC-Sim/WEC-Sim/issues

- Contribute to the WEC-Sim or WEC-Sim Applications: https://github.com/WEC-Sim/WEC-Sim/pulls

- Additional industry/research support available through the TEAMER program: https://teamer-us.org/

https://wec-sim.github.io/WEC-Sim

https://teamer-us.org/
For more information please visit the WEC-Sim website:
http://wec-sim.github.io/WEC-Sim

Dominic Forbush(Sandia)
dforbus@sandia.gov
GitHub: dforbush2