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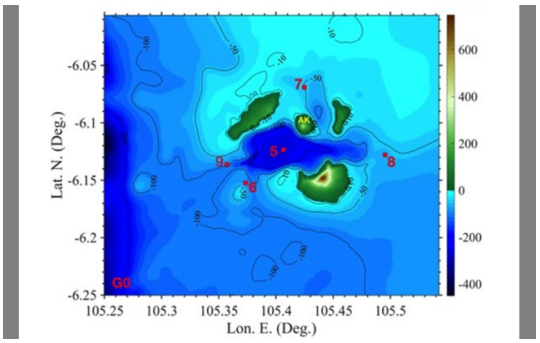
Supercomputer Models Accurately Simulate Tsunamis from Volcanic Events

URI researchers use SDSC's 'Comet' supercomputer to validate modeling

Researchers at the University of Rhode Island (URI) used San Diego Supercomputer Center's (SDSC) *Comet* supercomputer to show that high-performance computer modeling can accurately simulate tsunamis from volcanic events. Such models could lead to early-warning systems that could save lives and help minimize catastrophic property damage.



A supercomputer-generated model of the tsunami from the December 22, 2018 lateral collapse of the Anak Krakatau volcano in the Sunda Straits, Indonesia. Multiple simulations were run at the same time on SDSC's Comet supercomputer so researchers could consider different scenarios. Credit: S. Grilli, D. Tappin, S. Carey, S. Watt, S. Ward, A. Grilli, S. Engwell, C. Zhang, J. Kirby, L. Schambach, and M. Muin.

URI Distinguished Professor and Chair of the Department of Ocean Engineering Stephan Grilli and his team recently published research results in the Nature Scientific Reports. Their paper focused on the December 22, 2018 collapse of the Anak Krakatau volcano and subsequent tsunami, which was the first time in recent history an event such as this happened. The event allowed researchers an opportunity to test their models and modeling methodologies for accuracy against the observations that were recorded.

The URI scientists created their simulations while working with British Geological Survey collaborators, who surveyed the Indonesian area several times in 2019, where more than 400 people were killed during the late 2018 event. The URI models done using *Comet* successfully reproduced post-tsunami characteristics, tide gauge records, and eyewitness reports – suggesting that their landslide volume range and assumed collapse scenarios were accurate.

“As part of this project, we performed simulations on *Comet* that considered different volcanic collapse volumes, and it saved us a lot of time being able to model all of those scenarios concurrently on a supercomputer,” explained Lauren Schambach, a URI doctorate student. “As our understanding of the complex physics related to tsunamis grows, access to supercomputers such as *Comet* allows us to improve our models to reflect that, whereas if we did not have access, the amount of time it would take to such run simulations would be prohibitive.”

Ultimately, their supercomputer simulations demonstrated that, in cases such as Anak Krakatau, the absence of precursory warning signals, together with the short travel time following tsunami initiation, presents a major challenge for mitigating tsunami coastal impact.

However, Grilli said “we are hopeful that our continued research reduces warning systems from several hours to approximately ten minutes so that more people can reach safety prior to a tsunami.”

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