

Focusing Point May Amplify Tsunami Power



The earthquake zones off certain shorelines — like those of Japan and Java — make them especially vulnerable to tsunamis, according to a new study. The zones can produce a focusing point that creates massive and devastating tsunamis. When focusing occurs, the scaling relationship breaks down, resulting in waves which do not lose height as they get closer to shore and hence produce flooding that can be as much as 50% deeper.

Utku Kanoglu, professor at the Middle East Technical University and senior author of the study, observed this with a team in Northern Japan, which was struck by the Tohoku tsunami of 2011, and in Central Java, which was struck by a tsunami in 2006.

The researchers discovered that on the side of the earthquake zone where the wave propagates trough-first, there is a location where focusing occurs — strengthening it before it hits the coastline with an unusual amount of energy not seen by the crest-first wave. Based on the shape, location and size of the earthquake zone, that focal point can concentrate the tsunami's power right on to the coastline.

In addition, before this analysis, it was thought that tsunamis usually decrease in height continuously as they move away from where they are created and grow close to shore, just as wind waves do. The study's authors instead suggested that the crest of the tsunami remains fairly intact close to the source.



“While our study does not preclude that other factors may help tsunamis overgrow, we now know when to invoke exotic explanations for unusual devastation: only when the basic classic wave theory we use does not predict focusing or if the focusing is not high enough to explain observations,” said Vasily Titov, a researcher at the National Oceanic and Atmospheric Administration’s Pacific Marine Environmental Laboratory and study co-author.

The study was published online on Feb. 27 in [Proceedings of the Royal Society, Series A](#). It represents the collected efforts of researchers from institutions in France, Greece, Ireland, Turkey and the United States.

Image courtesy: US Navy.