CSQ-50 Summary

Question	Knowledge Advancement Objectives	Observables	Measurement Requirements	Tools & Models	Policies / Benefits
How we could Improve The large-scale bathymetry of the deep oceans?	A) Map Sea floor morphology at high spatial resolution <1km deep ocean <100 m coastal At global scale only the 17-18% is covered 1 km resolution	• Sea floor tectonic active areas • Active volcanoes underwater • Sea floor structures and channels	Bathymetry maps of coastal areas Spatial Res:<50 m(global) Bathymetry on deep ocean Spatial Res: <1km Update frequency <1 year	Altimetry measurements High resolution Stellite and airborne Optical imagery Airborne LIDAR	Improve the knowledge of tsunami risk in coastal areas. Improve models for probabilistic tsunamic hazards
	B) improve modeling of tsunami run-up and its impact on coastal populations.	• Wave velocity • Depth of the water • Wave heights	Radar altimeters measurements continuously	Models for Time Variations of Tsunami Height and Wavelength in Distant Tsunami Propagation	
	C) Improve the systematic measurements of sea floor seismicity along marine active faults	• earthquake magnitude • fault mechanisms • fault displacement	Seismic networks on land and on sea floor. GPS data networks Gravity field data	Probabilistic tsunami hazard and risk analyses as PTHA and PTRA (Basili et al., 2021)	

CSQ-50 Narrative

Tsunami (from Japanese “harbor wave”) is an unusually large wave occurring in a result of the displacement of a large volume of water. Tsunamis are usually produced by submarine earthquakes but can also be generated by landslides or underwater volcanic eruptions. The tsunami propagation speed depends on the depth of the ocean/sea and can be approximated by the following formula:

$$v \approx \sqrt{gb} \qquad (1)$$

where b is the depth of the ocean, and $g \approx 9.8ms^{-2}$ is the force of gravity. As such, tsunamis in deep water move very fast – speeds such as 500 kilometres per hour (300 miles per hour) are quite typical; enough to travel from Japan to the US, for instance, in less than a day.

Tsunamis are one of the most destructive hazards on Earth, yet satellites are only peripheral in monitoring their generation and propagation. Mapping ionospheric waves has recently provided some limited information on tsunami propagation. Improved models of the shape of the seafloor as well as high-resolution coastal topography are critically needed to improve modeling of tsunami run-up and its impact on coastal populations. The topography of the deep ocean floor (>1,000 m) affects the overall velocity, focusing, and amplitude of the wave as it propagates across an ocean basin. The detailed topography of the shallow ocean floor (<1,000 m) and coastal areas affects the velocity, amplitude, and inundation of the wave as it flows over the land.