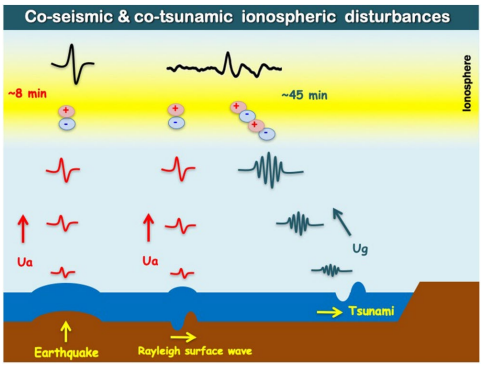
CSQ-37 Summary

Question	Knowledge Advancement Objectives	Geophysical Observables	Measurement Requirements	Tools & Models	Policies / Benefits
Can we estimate the tsunami potential of an earthquake in real-time ?	A) Forecast, model, and measure tsunami generation, propagation, and run-up for major seafloor events. Assess the tsunami potential of an earthquake in real time.	• GNSS receivers (total electron content, TEC, co-seismic crustal displacements) • ionosondes (maximum ionization height HmF2, virtual height h'F2, electron density Ne)	We need dual-frequency GNSS receivers, dense network, and higher data cadence (1Hz) for GNSS data (currently the "standard" resolution is 30-sec) and up to 30s in ionosonde data (currently the standard is 5 to 15 min which is insufficient).	Ground-based GNSS receivers in the vicinity of epicentres; methods of automatic detection of ionospheric disturbances; Empirical seismo-ionospheric models that will be developed soon.	Emergency plan-ning and response
	B) Monitor trans-oceanic propagation of tsunamis, estimation of the wave height and propagation speed from the ionosphere	• GNSS receivers (TEC) ionosondes (HmF2, h'F2, Ne) ground-based airglow cameras (fluctuations in the atmospheric density, sky luminosity) future space-borne airglow cameras	Denser networks on islands, higher resolution TEC data. For space-borne observations, we need a mission, or even a constellation.	Ground-based receivers on islands. DART buoys, GNSS buoys Empirical tsunami-ionospheric relationships that will be developed soon.	

CSQ-37 Narrative

The vertical displacements of the ground and the ocean surface during earthquakes and tsunamis generate acoustic and gravity waves that propagate upward and generate significant local perturbations in the ionosphere. These perturbations can be detected by ionospheric sounding. Retrospective studies have shown that ionospheric measurements can be used to estimate earthquakes magnitude and tsunami potential minutes after the mainshock (Astafyeva, 2019 ; Manta et al., 2020). This opens important perspectives to mitigate the damages caused by natural hazards. The development of real-time-compatible methods is an on-going effort.



References

Astafyeva, E. (2019). Ionospheric detection of natural hazards, *Reviews of Geophysics*, 57, 1265-1288.

Manta, F., Occhipinti, G., Feng, L. and Hill, E. (2020). Rapid identification of tsunamigenic earthquakes using GNSS ionospheric sounding, *Scientific Reports*, 10:11054.