CSQ-38 Summary

Question	Knowledge Advancement Objectives	Geophysical Observables	Measurement Requirements	Tools & Models	Policies / Benefits
How does Earth's crust evolve in interaction with internal geodynamic processes, and how does this reshape the Earth's surface over the long-term ?	A) Quantify the long-term, present-day changes in Earth's surface and Moho topography due to processes of creation, evolution and destruction of Earth's crust : mountain building, long-term plate subduction, oceanic spreading, extensional tectonics.	. Gravity to constrain mass changes • Ground displacements by GNSS	• Long-term trends • High accuracy at medium spatial scales • 1 mm EWH* in 10 years @ 230-330 km resolution • Multi-satellite missions with orbit inclination choice can help to improve the gravity recovery.	Complementary datasets on surface water loads to separate long-term tectonic signals from solid Earth deformations associated with these loads. Models for the elastic and visco-elastic response of the crust and mantle to the water loads. Geodynamic models and ability to calculate accurately the corresponding geophysical observables (gravity, topography).	Understand the controls exerted by deep geodynamic processes on long-term changes of our near-surface environment.

* EWH = equivalent water height

CSQ-38 Narrative

Deeper geodynamical processes contribute to the evolution of the Earth's crust and long-term reshaping of the surface, such as processes of mountain building at convergent plate boundaries, the long-term subduction of tectonic plates in-depth subduction boundaries – which also contributes to long-term inter-seismic stress build-up on active faults – the creation of crust at oceanic spreading ridges or active extensional tectonics in different areas of the world (Sabadini et al., 2019). They can be coupled with the climatic system, as in the case of mountain building coupled with erosional processes, or in the case of the subduction of oceanic plates which brings water into the Earth's mantle, strongly impacting rocks rheology. Observing the long-term surface manifestations of these geodynamical processes is key to advance the modelling of the Earth's interior dynamics and the knowledge of its physical properties, which remains a challenge today (see Question 7). This is also needed, in order to understand how the global Earth dynamics impacts the long-term evolution of our near-surface environment (the crustal layer) and the slow inter-seismic deformations at plate boundaries.

References

Sabadini, R. et al. (2019). *Gravitational Seismology - Final Report - EO Science for Society*, Contract N: 400123555/18/I-NB