

# Global early warning system by Complex-Envelope (CE) Processing of Seismic Waves

\*Rudolf Unger<sup>1</sup>

1. Delft University of Technology

Given a pandemic situation such as C-19 or any other potential mutation, and an earthquake striking at some point during its development, how could science aid to confront two simultaneous disasters?

We answer from a) an anthropological/psychological point of view and b) a seismic technology perspective.

A) Strict isolation and a disaster such as earthquake or volcanic eruption imply antagonist forces and strategies which require original and dynamic disaster preparedness. Michael Levitt (Nobel 2013) has alerted on the dangers of strict confinement and has compared SARS-Cov-2 and its predecessor SARS-Cov (2003) and its effects on the lives of the populations (suicides, domestic violence, etc.) including worries which lower the immune system. Enhancing the immune system and implementing hygiene are important steps as is social physical distancing. Cognitive approach strengthens the mind through statistics and understanding of the process.

B) As we are learning again from C-19 the importance of early warnings and open global data sharing, we need to enhance the search for medical and natural disaster precursors, and to develop efficient global Big Data (BD) communicating precursor systems. To achieve this objective, we elaborate on a system for continuous Active Geophysical Monitoring (AGM, controlled-source high-resolution 3D time-lapse monitoring of Earth physics parameters and potential earthquake precursors), Geophysical Exploration (GE) resolution optimization and multiple-signal analysis by Complex-Envelope (CE) Processing of Seismic Waves.

CE = dual time series of Instantaneous Amplitude (IA) and Instantaneous Phase (IP), obtained through quadrature processing of (seismic) wave time series. We show significant CE contributions in Nuclear Test Ban Treaty (NTBT) earthquake vs. underground explosion verification and monitoring (automatic detection and classification), in AGM, and in GE.

Should two disasters happen simultaneously, technology provides precise (seismic) methods to accurately contribute to a better preparedness and stronger psychological stamina to face reality.