



## **The synergetic approach towards improvement of the short-term seismic hazard assessment: Retrospective testing of the multiparameter integration in case of 5 August M6.9 Loloan and 28 Sept Mw 7.5 Sulawesi Indonesia 2018 Earthquakes**

Fu Yuan Chang (1), Valerio Tramutoli (2), Dimitar Ouzounov (3), Katsumi Hattori (4), Xuhui Shen (5), Sergey Pulinetz (6), Xue-Min Zhang (7), Jann Yenq Liu (1), Nicola Genzano (2), Rui Yan (5), Da-Pung Liu (5), and Chi-Kuang Chao (1)

(1) Center for Astronautical Physics and Engineering (CAPE), National Central University, Taoyuan, Taiwan (fychang1228@gmail.com), (2) School of Engineering, University of Basilicata, Potenza, Italy (valerio.tramutoli@unibas.it), (3) Center of Excellence in Earth Systems Modeling & Observations (CEESMO) Schmid College of Science & Technology, Chapman University, Orange, USA (dim.ouzounov@gmail.com), (4) Department of Earth Sciences Graduate School of Science, Chiba University, Chiba, Japan (hattori@earth.s.chiba-u.ac.jp), (5) Center of Earthquake Observation from Space, Institute of Crustal, Beijing, China (shenxh@seis.ac.cn), (6) Space Research Institute, Russian Academy of Sciences (IKI) Moscow (pulse1549@gmail.com), (7) Institute of Engineering Mechanics, China Earthquake Administration (zhangxm96@126.com)

From the combined use of independent observations, the major improvements of the quality (in terms of reliability and space-time precision) of short-term seismic hazard estimation, are expected. Among the others, satellite observations can guarantee the global coverage and temporal continuity required in order to dynamically update seismic risk at a large scale. Several satellite techniques have already demonstrated the predictive potential of specific tropospheric (e.g. Outgoing Longwave and Thermal InfraRed Radiation) and ionospheric (Total Electronic Content, Plasma Density, etc.) parameters. Long-term correlation analyses have been performed in order to quantitatively characterize such a potential together with the main limits (particularly in term of false positive rates) associated to each of them. New (after the precursory DEMETER mission) dedicated satellite missions have been recently started (like the China Seismo-Electromagnetic Satellite, CSES; FORMOSAT-5/Advanced Ionospheric Probe, F5/AIP), which promise, together with a continuously increasing network of ground-based observatories, to further complement already existing satellite systems. This paper present, in the case of strong earthquakes occurred in Indonesia in the August-September 2018, a first, retrospective, experiment of short-term seismic hazard assessment based on the joint analysis of independent consolidated and new (mostly from CSES) satellite EM observations. The added value of their combined (vs individual) use will be evaluated both in terms of reliability of the forecast and improvement of probability gains.