

EGU2020-8494

<https://doi.org/10.5194/egusphere-egu2020-8494>

EGU General Assembly 2020

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Research and Development of Universal Equipment for Geological Hazard Monitoring and Early Warning

Juan Ma¹, Mingzhi Zhang², Gan Qi³, Gloria Xing⁴, and Zack Huang⁵

¹China Institute of Geo-Environment Monitoring, Technical method for the prevention and Management of geological disasters, China (majuan@cigem.cn)

²China Institute of Geo-Environment Monitoring, Technical method for the prevention and Management of geological disasters, China (zhangmz@cigem.cn)

³China Institute of Geo-Environment Monitoring, Technical method for the prevention and Management of geological disasters, China (Qig@cigem.cn)

⁴China Institute of Geo-Environment Monitoring, Technical method for the prevention and Management of geological disasters, China (xinggl@cigem.cn)

⁵China Institute of Geo-Environment Monitoring, Technical method for the prevention and Management of geological disasters, China (Huangz@cigem.cn)

Hilly and mountainous areas account for 65% of the total land area in China. There were 286,708 potential geological hazard sites registered at the end of 2018, among which 276,600 were small- and medium-sized. Small and medium geological hazards are a priority in geological disaster prevention. However, due to their large number and the high prices of professional monitoring equipment, it is difficult to find a cost-effective and accurate monitoring technology, method, or means for their long-term disaster monitoring. To this end, this paper aims to explore a reliable, cost-effective, precise, easily installable, low-power solution for small and medium geological hazard monitoring and early warning, centring on characteristic quantities such as deformation before collapse, landslides, and other disasters, and some key impact factors such as rainfall, moisture content, stress, and displacement velocity. Using universal equipment based on microelectromechanical sensing technology and narrowband IoT technology, laboratory simulations and field tests were performed to research the equipment in terms of adaptation scenarios, effective monitoring ranges, installation methods and locations, and normalization of data reporting content, thus setting up a scientific method for small and medium geological hazard monitoring and early warning.