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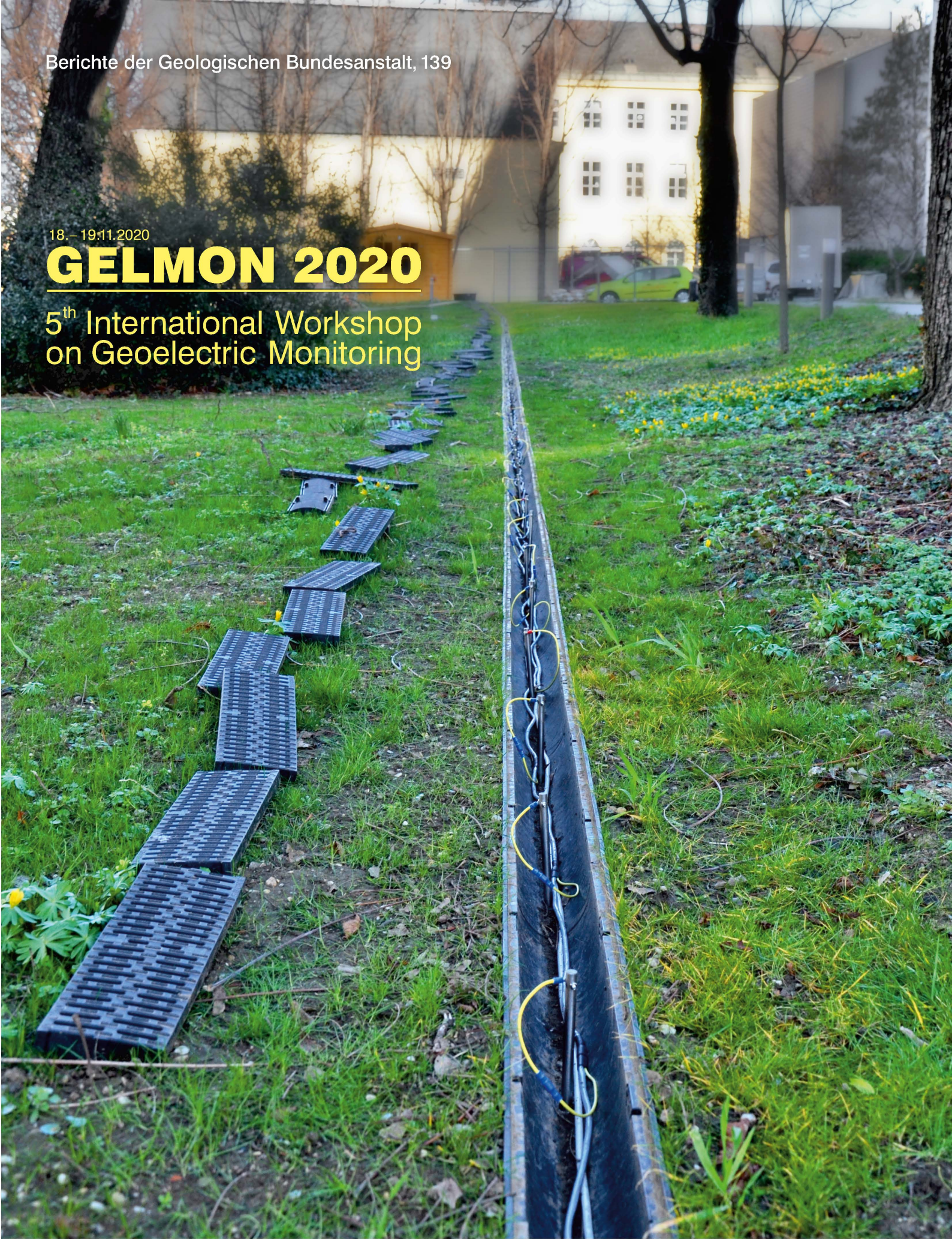
5th International Workshop on Geoelectric Monitoring



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The latest installation of G.RE.T.A. along the tailings dam of a copper mine in Chile

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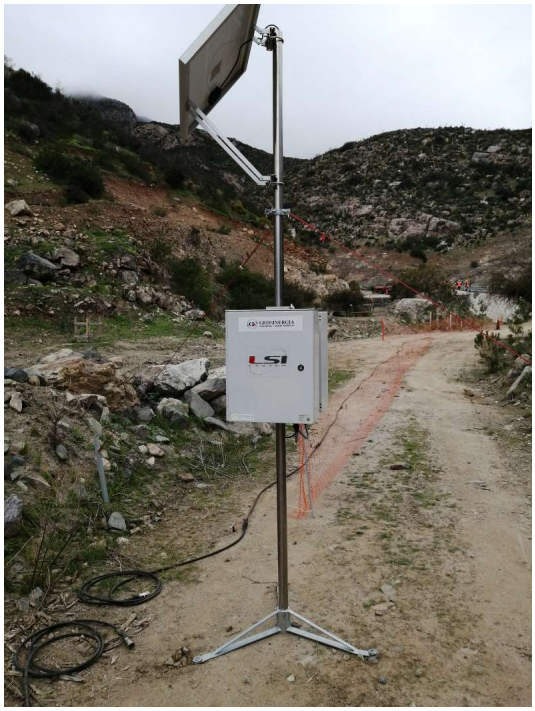
During 1915-2020 (August), 351 failures of tailings dams have occurred, from which, 10 very serious incidents occurred from 2010. Therefore, monitoring tailings dams is becoming a burning subject, especially that no standardized method exists to ensure the stability of these structures.

During last decades, electrical resistivity tomography (ERT) has been increasingly applied to monitor earthen embankments similar to tailings dams. We recently proposed a permanent geoelectrical monitoring to assess heterogeneities and integrity of tailings dams, both in terms of cavity formations and water accumulation.

G.RE.T.A. (Geo REsistivimeter for Time-lapse Analysis), is an Italian autonomous programmable system designed by LSI Lastem with the scientific support of Politecnico di Milano. The system includes a remotely controlled low-power resistivity meter with two cables equipped with 48 electrodes (plate, mesh or rod), that can be also buried in shallow trenches. The device is permanently connected to a cloud software to send real-time data, where they are automatically inverted. In order to monitor subsurface variations, time-lapse data analysis algorithms make differences for any desired measurements in real-time. Thresholds of resistivity variations can be set by the user and alarms will be launched when the defined secure changes are not satisfied, indicating anomalous changes. A couple of G.RE.T.A. are in operation along the levees of rivers or irrigation canals and the latest advanced device was installed in August 2020 by Geosinergia Ingeniería Y Medio Ambiente, on the tailings dam of a copper mine located north of Santiago, Chile.



The ERT profile is placed at the base of the tailings dam in order to recognize possible under-seepages that can pollute the groundwater and the surrounding exposed area, with the presence of a city. The system is positioned downstream of two retaining ponds and the aim is to understand whether the variations of water level in the ponds provokes any underseepage.

In this case the surface installation is selected: rod electrodes are used with the Wenner array with a = 3 m (total length of 141 m) approaching a maximum penetration depth around 23 m.

Figure caption: Installation of G.RE.T.A. on the tailings dam in Chile. The box contains the measuring and communication modules, the system is powered by a solar panel. The 2 cables are equipped with 48 electrodes, 3 m apart.