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The November 2023 displacement of the Roncovetro Landslide (RE, Italy) as measured by a small wireless network of Ultra-WideBand (UWB) sensors

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The Roncovetro landslide is a complex active earth flow located in the Enza Valley (Emilia-Romagna Region, Italy). It carves the southern flank of Monte Staffola from its summit to the riverbed of Tassobbio stream, with a total involved volume of ~ 3×10^6 m^3. This ~ 2.5 km landslide has a maximum width of 300 m and a 30-40 m wide channel that separates the depletion zone from the accumulation zones. Since the clay fraction is largely dominant, the landslide mainly behaves like a fluid-viscous earthflow. capable of reaching maximum velocities of up to 10 m/day. The perennial activity of the Roncovetro landslide is characterized by phases during which the detachment is limited to deep creep, sliding, and flowing, as well as major events that result in the interruption of the white road between Roncovetro and Vedriano villages.

In recent years, the Roncovetro landslide has been selected as a test site for evaluating new monitoring technologies based on Ultra-Wide Band (UWB) wireless sensors. Currently, it has been designated as a study area for the "Land-slide Enhanced Monitoring Network (LEMON)" project funded by the INGV. As part of the LEMON project, a small network of UWB wireless sensors has been installed on the landslide body to monitor its movement. The technology used was previously described in Intrieri et al. (2018) and Mucchi et al. (2018). The installed network consists of five sensors, comprising one master node and four slave nodes. The master node and one slave node were placed outside the area recently affected by displacements, while three nodes were positioned inside the landslide body. The acquisition frequency was set at one acquisition every three hours, totaling eight acquisitions per day.

In November 2023, the Roncovetro landslide experienced a significant displacement that once again swept away the white road. This displacement was fully recorded by the UWB network. Additionally, an Unmanned Aerial System (UAS) survey was conducted before and after the displacement to offer a comprehensive view of the movement.

In this work, we first describe the technological improvements and updates made to the UWB wireless network compared to previous works. Second, we describe the November 2023 displacement of the Roncovetro landslide as recorded by the UWB network with a frequency of one acquisition every three hours. And finally, we compare the data provided by the UWB network with the changes in the landslide detected through the comparison of pre- and post-UAS-derived orthophotos.