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MEGLIO: an experiment to record seismic waves on a commercial fiber optic cable through interferometry measures with an ultra stable laser.

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The experiment MEGLIO follows the seminal work of Marra et al. (2018) where the authors demonstrate the possibility to observe seismic waves on fiber optic cables over large distances. The measure was based on an interferometric technique using an ultra stable laser. In theory, this active measurement technique is compatible with a commercial operation on a fiber, i.e. the fiber does not need to be dark. In 2019, Open Fiber, the largest optic fiber infrastructure provider in Italy, has decided to test this new technology on its own commercial network on land.

A team of experts in the different fields has been gathered to achieve this goal : besides Open Fiber, Metallurgica Bresciana; INRiM, which initially developed the technique, for their expertise on laser and sensors; Bain & Company for the analysis and the processing of the data; INGV for the expertise in the seismology field and for the validation of the observations.

The first year has been dedicated to developing the sensors. In the meantime, a buried optic cable has been chosen in function of its length and the seismicity nearby. The best candidate was the fiber connecting the towns of Ascoli Piceno (Marche, Italy) and Teramo (Abruzzo, Italy) for a length of around 30 km. Although this technique allows using cable lengths larger than 5.000 km, for this first test we have decided to keep the length short. Actually the cable is mainly buried underneath a road with medium traffic, passes across different bridges and viaducts, starts in the middle of a town and loops in the middle of another town. Thus we expected a strong anthropic noise on the data.

The measurement on the field started in mid June 2020 and the system was operational in early July. We also installed a seismic station at one end of the cable. During these first six months, we have compared the observations on the fiber with the Italian national seismic catalog and the

worldwide catalog for the major events. We consider the first results a success. We have detected so far nearly all the seismic activity with magnitude larger than 2.5 for epicentral distance lesser than 50 km. Moreover, we have recorded large events in Mediterranean region and teleseisms. Finally we have recorded new and interesting noise signals. Collecting additional events will be helpful for a better characterization of the technique, its performances and for a statistical analysis.