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Optical frequency dissemination via fiber networks: The Clock Network Services (CLONETS) project and potential applications in the geosciences

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Precise measurement of time and frequency has been instrumental in the development of modern geosciences. It has enabled us to quantify many observations, including plate motion, the variations of Earth rotation, and modern-day sea level rise.

Over the past decade, European National Metrology Institutes (NMIs), together with National Research and Education Networks (NRENs) and partners from universities and research institutes have pioneered the dissemination of ultra-stable optical frequency and timing signals via optical fibers. Initially started as proof-of-concept experiments, this technology has matured to aim for a paradigm change: making precise time and frequency signals available to the wider scientific community and thereby enabling new research avenues.

The CLOck NETwork Services Design Study (CLONETS-DS) is a research and innovation action intended to facilitate the vision of a sustainable, pan-European optical fiber network for precise time and frequency reference dissemination.

Here, we will present the envisioned technology, its performance parameters, and discuss potential applications, requirements and limitations for geophysical applications, for example in geodesy (chronometric levelling, gravity field observation), seismology, and very-long-baseline interferometry (VLBI).

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