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Cost-effective GNSS sensors applied for crustal deformation purposes: insights from an experiment in NE-Italy

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The global data coverage of the Global Navigation Satellite Systems (GNSS) provides a fundamental and unique dataset for a wide range of applications, such as crustal deformation, topographic measurements, or near surface processes studies. However, a strong limitation is represented by the high costs of the GNSS receivers and the supporting software, which make them available only by the scientific communities capable of affording them. The GNSS technology has been continuously and rapidly growing and, in recent years, new cost-efficient (low-cost) instruments have entered the mass market, gaining the attention of the scientific community for potentially being high-performing alternative solutions. In this study, we matched in parallel a dual-frequency cost-effective receiver (u-blox ZED F9P) and two high-cost receivers, all connected to the same geodetic-class antenna. We tested the system by processing the data together with the observations coming from a network of GNSS permanent stations operating in North-East Italy. We compare the time-series obtained using cost-effective geodetic equipment with those obtained using geodetic-class instruments. We show that mm-order precision can be achieved by cost-effective GNSS receivers, while the results in terms of time series are largely comparable to those obtained using high-price geodetic receivers.