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Sensitivity of local permanent networks estimates with respect to the elaboration parameters

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A local GNSS permanent network materializes, through its stations coordinates estimation and distribution, the global reference frame; these estimates are provided by the classical network adjustment process, usually performed by scientific software (f.e. Bernese Software), including some near reference permanent station used as a constraint. GNSS data modeling is still a complex and actually not totally understood process: the final results can be very sensitive to elaboration parameters variations and an ultimate elaboration approach has not yet been defined; for this reason, IERS conventions as well as IGS and EPN guidelines are periodically updated in order to reflect the state of the art. The purpose of this work is to evaluate the differences in the adjustment results and quality indexes provided by the adoption of different network adjustment approaches. The different approaches are analysed from a methodological point of view; moreover, the relevant results are tested and compared on one year of data of one Italian local (Lombardia Regione) GNSS permanent network.

First, the focus is on the consequences of the global reference frame permanent stations choice. The normal practice is to constrain some global, IGS or EPN, reference station in the local network adjustment; however, from a technical point of view, this could degrade results accuracy in zones where IGS or EPN stations are too sparse, like for example central-southern Italy: a possible solution is to adopt national zero order permanent networks: they should be adjusted in IGS and used to constrain the adjustment of local networks. Another analyzed effect concerns the estimates differences implied by the different constraining strategies for constraining stations. Even different baseline creation strategies could cause differences in the estimates: Bernese's

OBS_MAX, MIN_DIST and a new method based on a weighted mean of them are compared. The last analyzed problem concerns the troposphere estimation: particularly the approach including only zenithal troposphere delay estimates is compared with the approach of modelling also horizontal gradients too.