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# Quality assessment of the BeiDou-3 phase center offset calibrations in terms of the realization of the terrestrial reference frame scale

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**Abstract.** Thanks to the release of the phase center offset (PCO) calibrations for both, the ground (receivers) and space (satellite antennas) segment, BeiDou-3 became a new potential contributor to the realization of the terrestrial reference frame (TRF) scale of future International Terrestrial Reference Frame releases. This study focuses on the evaluation of the potential usage of the BeiDou-3 Medium Earth Orbit (MEO) constellation to the definition of the TRF scale. Firstly, we assessed the quality of the manufacturer-released PCOs within the BDS-3 MEO constellation including 24 satellites. Secondly, we evaluated the differences between the TRF scale derived from the BDS PCOs released by the China Satellite Navigation Office and the scale of IGS14. Two linear combinations of signals, namely B1I/B3I, and B1C/B2a, have been investigated. Considering that proper modeling of the direct solar radiation pressure is a prerequisite for the accurate determination of PCOs, special attention was given to the selection of the best processing strategy regarding the latest BDS-3 orbit modeling advances. Differences between the z-components of the satellite PCO as given by manufacturer calibrations and those estimated based on the IGS14 scale amount to 6.55 ± 12.56 cm and -0.32 ± 10.99 cm for B1I/B3I and B1C/B2a frequency pairs, respectively. On the one hand, the substantial deviation from the mean reflects the disparities in the quality of calibrations for the individual spacecraft, especially those manufactured by the Shanghai Engineering Center for Microsatellites (SECM). On the other hand, the difference between the two frequency pairs arises to a great extent from the doubtful quality of the SECM PCO calibrations, which certainly do not reflect the frequency dependence of the PCOs. Eventually, the mean scale bias w.r.t. IGS14 equals +0.546 ± 0.085 ppb, and +0.026 ± 0.085 ppb, for B1I/B3I and B1C/B2a solutions, respectively.