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Estimation of Earth rotation resonance parameters through VLBI analysis

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The VLBI observations enables the investigation of the Earth rotation resonances in the retrograde diurnal band with respect to a terrestrial frame, associated with the Free Core Nutation (FCN), the Free Inner Core Nutation (FICN), and the common polar motion. The resonance parameters (period and quality factor) determine the frequency transfer function $T(\sigma)$ from the theoretical luni-solar nutation terms $\eta_R(\sigma)$ of a rigid Earth to the nutation terms observed by VLBI $\eta(\sigma)$: $\eta(\sigma) = T(\sigma)\eta_R(\sigma)$. Therefore they can be obtained by inverting the former relations constituted by a set of observed and theoretical nutation terms. We revisit this problem by considering 40 years of VLBI observations and more complete atmospheric-oceanic non-tidal perturbations, that have to be removed from the observed nutation terms before inversion. The inclusion of the complete atmosphere and ocean correction produce a significant change of the FCN quality factor and FICN parameters. On the other hand the nutation analysis allows us to investigate the frequency dependence of the polar motion resonance in the diurnal band: for the retrograde nutation terms close to 18.6 years, the polar motion period is close to 396 days, and for nutation terms around 13.66 days, the analysis leads to a period of 383 days (see Bizouard et al, EGU 2019 for a geophysical interpretation).