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Tendency of the Earth Oblateness change due to Earthquakes

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The cumulative effect of earthquakes slightly and secularly decreases the Earth's oblateness parameter J_2, making the Earth less oblate (rounder) (although "buried" in the much larger decrease due to post-glacial rebound). Here we calculate the earthquake-induced, cumulative-to-date change in J_2 as a function of the radius in the Earth interior, $\Delta J_2\ (r)$, of all earthquakes according to the Global CMT catalog (close to 30,000 events from 1976). The calculation is via the normal-mode summation scheme using the CMT moment tensor for the seismic source mechanism on the SNREI Earth model PREM. The result for earthquake-induced co-seismic ΔJ_2 shows an average decreasing rate, -7.7 $\times 10^{-13}$ per year, where $\Delta J_2\ (r)$ also shows a decrease through the mantle and core (including the core-mantle boundary), except near the crustal depth where most earthquakes happen , and the ΔJ_2 contribution from the mantle doubles that from the core with time. We then attribute ΔJ_2 to major earthquake types: normal faulting and thrust faulting, and epicenter pole-ward or equator-ward to the nodal latitude of the degree-2 order-0 Legendre function: 35.26° N or S. We find that the secular tendency is decreasing ΔJ_2 by thrust faulting and increasing ΔJ_2 by normal faulting, and decreasing ΔJ_2 equator-ward to 35.26° and increasing ΔJ_2 pole-ward to 35.26°. Among these conditions, the strongest tendency (decreasing) is dominated by thrust faulting equator-ward to 35.26° N or S. We discuss and speculate on the dynamics of this tendency in relation to Earth's secular spin down.