



## **Temporal variations of the polar moment of inertia and the second-degree geopotential**

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In order to study the geodynamic behaviour of the Earth at short (elastic Earth) and at a long geological periodic variations (for an almost perfectly liquid Earth), the changes of the moment of inertia are decomposed into two parts: the first described by a volume integral explains the effect of the density variations, while the second gives the impact of the surface variations using a surface integral. It is shown that both components have physical significance but their contribution is different in case of short (lunisolar) and long (connected to secular despinning) periods.

The temporal changes of the second order zonal coefficient  $J_{2,0}$  (often called as geodynamical shape factor) derived from moment of inertia in case of solid earth tides is dependent on surface variations by 40% less than on the part which is connected to mass redistribution. Contrary to this in case of the very long-term variations of the Earth rotation the impact of the surface variations is similar to the impact of the mass redistribution.

Based on mathematical considerations authors arrive to conclusion that only minor changes occurred during time interval from 2.5 to 0.5 Ga BP (i.e. during the Proterozoic and Phanerozoic ) in the main features of the inner structure of our planet which was practically finished at the very beginning of the history of the Earth. This conclusion coincides with recent results of geochemists who concluded that the formation of the core and of the main features of the mantle was complete 3.5-4.0 billion years ago.