

Periodic Change in the Earth's Rotation Velocity

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Abstract : The phenomenon of seasonal variations in the Earth's rotation velocity was discovered in the 1930s when a crystal clock was developed and analyzed in a quantitative way for the first time between 1955 and 1968 when observation data of the seasonal variations was analyzed by an atomic clock. According to the previous investigation, atmospheric circulation is supposed to be a factor affecting the seasonal variations in the Earth's rotation velocity in many cases, but the problem has not been solved yet. In order to solve the problem, it is necessary to apply dynamics to consider the Earth's spatial motion, rotation and change of shape of the Earth (movement of materials in and out of the Earth and change of the Earth's figure) at the same time and in interrelation to the accuracy of post-Newtonian approximation regarding the Earth body as a system of mass points because the stability of the Earth's rotation angular velocity is in the range of $10^{-8} \sim 10^{-9}$. For the purpose, the equation was derived, which can consider the 3 kinds of motion above mentioned at the same time by taking the effect of the resultant of external force on the Earth's rotation into account in a relativistic way to the accuracy of post-Newtonian approximation. Therefore, the equation has been solved to obtain the theoretical values of periodic change in the Earth's rotation velocity and they have been compared with the astronomical observation data, so to reveal the cause for the periodic change in the Earth's rotation velocity.

Keywords : Earth rotation, moment function, periodic change, seasonal variation, relativistic change

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