

Hypothetical Change in the Earth's Moment of Inertia due to Global Warming in High Schools Physics Teaching

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Apstrakt. Students in secondary schools are well aware of the rotational movement of the Earth around its axis of rotation. If we want to determine its rotational kinetic energy or describe long-term changes in its rotation, we need to know the moment of inertia around the axis of rotation, which is considered as an optional topic in Slovenian high schools. The moment of inertia depends on the mass of the object and its distribution in relation to the axis of rotation. In this paper, we show the calculation of the Earth's moment of inertia around its rotational axis. We further evaluate the hypothetical change in the moment of inertia due to ice melting and the resulting sea level rise as an extreme consequence of global warming. We consider the melting of the ice in Antarctica and Greenland, as these are two key influences that contribute to the redistribution of the planet's mass during ice melting, while the influence of the melting of other ice is negligible. We assume that the surface of all connected seas rises equally, which is considered in the model as a spherical shell. In the end, we calculate the increase in the Earth's moment of inertia, the decrease in the angular speed of rotation and the extension of the time of one revolution of the Earth, and consequently the time by which one year would be longer due to the redistribution of mass as a result of the melting of the ice.