

Abstract Submitted
for the APR13 Meeting of
The American Physical Society

The Global Non-Holonomy of the Rotating Space of the Earth Affects Hafele-Keating Experiment DMITRI RABOUNSKI, LARISSA BORISSOVA, Retired — The deviation of time registered in the “around-the-world clocks experiment” (Hafele J. and Keating R., *Science*, 14 July 1972, 166-170) is originally explained due to: 1) General Relativity (gravitation is lower at the flying airplane’s altitude); 2) Special Relativity (the airplane’s speed and the Earth’s rotation). However as was shown in the 1940’s by Schouten and then Zelmanov, if the observer cannot be moved to the rotation-free frame, the space rotation is a non-vanishing effect of General Relativity, and is due to the non-holonomy of space (the non-orthogonality of the three-space to the lines of time). This is the case of Hafele-Keating experiment (the Earth’s rotation cannot be stopped). We thus constructed the metric of the real space of the Earth which bears the gravitational field and rotation. We then proved that this metric satisfies Einstein’s equations. Finally, an exact formula is deduced for Hafele-Keating experiment. Despite a hundred nanoseconds of the time correction, and the use of the GPS navigation, the obtained result is useful in the case where is no the GPS connexion, in a long-term submarine travel for instance.

Dmitri Rabounski
Retired

Date submitted: 17 Dec 2012

Electronic form version 1.4