Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

STT55-P03 会場:コンベンションホール 時間:5 月 22 日 18:15-19:30

水平加速度補正のための厳密解とその使用法
Precise formula for horizontal acceleration correction and method for its effective use

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We provide a precise formula for horizontal acceleration correction and discuss a method for its effective use in airborne gravity measurements using the SEGAWA airborne (helicopter-borne) gravimeter.

In order to determine a gravity anomaly from the observed acceleration data using a gravimeter, it is necessary to perform vertical acceleration correction, Eotvos correction, normal gravity correction, free-air reduction, and horizontal acceleration correction. These corrections (with the exception of the vertical acceleration correction and horizontal acceleration correction) each have precise individual formulas. The precise formula for the horizontal acceleration correction has not yet been presented because it is considered to be an optional correction. In fact, horizontal acceleration correction is unnecessary if the gravimeter sensor remains vertical at all times.

In previous horizontal acceleration corrections, the equations that give the component acceleration vectors acting on the gravimeter with a platform off-level angle and that give the off-level angle of the platform were linearized. Of course, the linearization of the equations is a valid technique for simplifying calculations and for finding the essence of the problem. In the present horizontal acceleration correction, the linearized equations are normally used because the off-level angle is generally kept very small using a gyroscope. However, this equation cannot deal effectively with sudden large acceleration changes caused by turning which changes the measurement profile.

In this study, we first provide the precise formula mentioned above for horizontal acceleration correction without linearization and evaluate the effects of the nonlinear terms in a new solution. In addition, we suggest a method for estimating the true values of the gravity and the off-level angle by successive iteration because our equation requires the true values to estimate the correction amount by deriving the true gravity value and the off-level angle.

キーワード: 航空重力測定, 水平加速度補正
Keywords: Aieborne gravity measurement, Horizontal acceleration correction, Precise formula for horizontal acceleration correction