Geophysical Research Abstracts
Vol. 12, EGU2010-15221, 2010
EGU General Assembly 2010

Alternative analysis of airborne laser data collected within conventional multi-parameter airborne geophysical surveys

Andreas Ahl, R. Supper, K. Motschka, and I. Schattauer
Geological Survey of Austria, Neulinggasse 38, A-1030 Vienna (E-mail: Andreas.Ahl@geologie.ac.at)

For the interpretation of airborne gamma-ray spectrometry as well as airborne electromagnetics it is of great importance to determine the distance between the geophysical sensor and the ground surface. Since radar altimeters do not penetrate vegetation, laser altimeters became popular in airborne geophysics over the past years. Currently the airborne geophysical platform of the Geological Survey of Austria (GBA) is equipped with a Riegl LD90-3800VHS-FLP high resolution laser altimeter, measuring the distances according to the first and the last reflected pulse.

The goal of the presented study was to explore the possibilities of deriving additional information about the survey area from the laser data and to determine the accuracy of such results.

On one hand the difference between the arrival time of the first and the last reflected pulse can be used to determine the height of the vegetation. This parameter is for example important for the correction of damping effects on airborne gamma-ray measurements caused by vegetation. Moreover especially for groundwater studies at catchment scale, this parameter can also be applied to support the spatial assessment of evapotranspiration. In combination with the altitude above geoid, determined by a GPS receiver, a rough digital elevation model of the survey area can be derived from the laser altimetry.

Based on a data set from a survey area in the northern part of Austria, close to the border with the Czech Republic, the reliability of such a digital elevation model and the calculated vegetation height was tested. In this study a mean deviation of -1.4m, with a standard deviation of $\pm$3.4m, between the digital elevation model from Upper Austria (25m spatial resolution) and the determined elevation model was determined. We also found an obvious correlation between the calculated vegetation heights greater 15m and the mapped forest published by the 'Department of Forest Inventory' of the 'Federal Forest Office' of Austria.

These results encouraged us to apply these methods to airborne geophysical data sets from the United Mexican States. One survey was targeted to provide additional data for advanced groundwater modeling in remote areas of the karstic plateau of Yucatan. Within the other project a sustainable source of water supply for a small settlement on the isolated island of Socorro, 700 km off the Mexican main coast had to be detected. At both survey areas no accurate elevation models or area-wide information about vegetation heights where available before the airborne geophysical survey. The results of these investigations will be presented.

From an evaluation of the results it can be concluded that the use of laser altimetry not only provides essential information about the ground clearance of the geophysical instruments but also increases the benefit of the airborne survey for the client by delivering additional information about the survey area.

It is clear that the accuracy of the resulting data cannot compete with a high resolution laser scanning survey. However in areas where such information is not available an obvious additional benefit can be achieved without the need to spend money for additional survey campaigns. Currently further studies are launched to investigate the possibility to increase the accuracy of the altitude data by determining roll and pitch of the helicopter by the use of differentially corrected multiple L1/L2 band GPS receiver mounted at fixed positions on the helicopter platform.

The above study was partly financed by the Austrian Science Fund, Xplore (L524-N10) project.