

Airborne Hydromapping – a comprehensive tool for sustainable river management

Airborne Hydromapping - un outil complet pour la gestion durable de la rivière

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RÉSUMÉ

La connaissance détaillée sur la bathymétrie des rivières est nécessaire pour résoudre les défis actuels de l'ingénierie hydraulique. Airborne Hydromapping (AHM) est une méthode unique utilisée pour obtenir des données bathymétriques précises et détaillées concernant les plans d'eau peu profonds. La technique est basée sur un système laser nouvellement développé pénétrant l'eau (longueur d'onde verte). Airborne Hydromapping permet l'arpentage rapide et économique de vastes plans d'eau avec une précision de moins de 10 cm. Par conséquent, les données obtenues par AHM offrent un potentiel particulièrement élevé pour évaluer les processus fluviaux, enquêter sur les problèmes écologiques et pour effectuer l'étalonnage de simulations numériques le long des rivières.

ABSTRACT

Detailed knowledge about river bathymetry is required to solve the present-day challenges of hydraulic engineering. Airborne Hydromapping (AHM) is a unique method used to derive detailed and extensive bathymetric data for shallow water bodies. It is based on a newly developed water-penetrating laser system (green wavelength). Airborne Hydromapping enables the fast and economic monitoring of vast water bodies with an accuracy of less than 10 cm. Consequently, AHM-data are highly suitable for evaluating fluvial processes, for investigating ecological problems and for performing/calibrating reliable numerical simulations along river reaches.

KEYWORDS

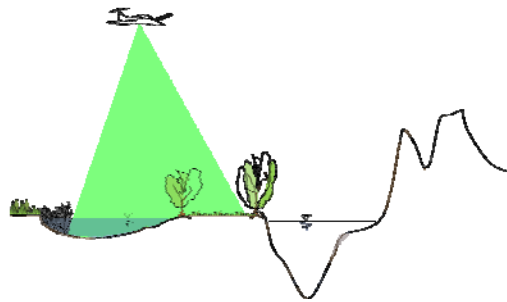
River bathymetry, airborne hydromapping, hydraulic modelling

1 AIRBORNE BATHYMETRY

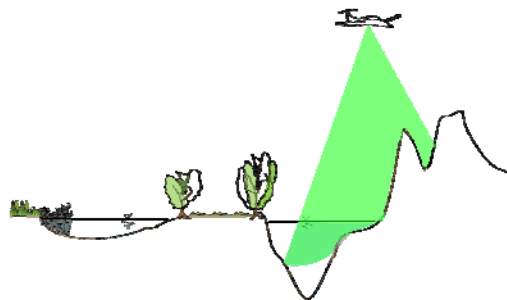
The underwater morphology is critical to understand fluvial behavior of rivers, their sediment transport and ecological state. Terrain data of riverbeds, riverbanks and floodplains enable reliable research to be done on hydraulic issues of river engineering.

Conventionally, classical airborne laser scanning (red wavelength) together with terrestrial surveys have to be applied to prepare digital terrain models (DTMs) of floodplains. Additionally, the underwater morphology has to be monitored by time and money consuming terrestrial survey methods because the red laser cannot penetrate through the water column. Therefore, the availability of detailed geometric underwater data of high spatial resolution and extent is limited in comparison to airborne laser scanning data of river floodplains.

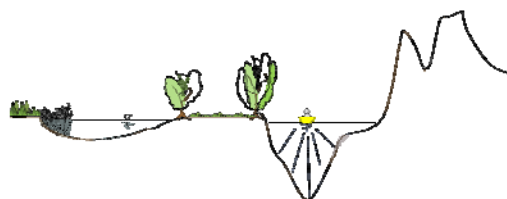
Airborne Hydromapping is a new technology for the very detailed survey of rivers, lakes and reservoirs. This technique was developed for hydraulic engineering applications within the scope of a research project between the University of Innsbruck (Tyrol, Austria) and RIEGL LMS (Horn, Lower Austria). This airborne-operated, water penetrating laser system allows a comprehensive monitoring of shallow water bodies. Airborne Hydromapping enables the bathymetric survey of water bodies – e.g. in Alpine catchment areas, mountain rivers and lakes – from a plane or a helicopter. The results of these measurements are very accurate, and a high point density is achieved. It is not necessary to enter sensible river ranges for measurements, which is of important ecological advantage. Complex processes including hydraulics, sediment transport, and river ecology, related to Alpine catchment areas, rivers, inland deltas and reservoirs can be evaluated at an up to now unequalled level of detail. Data are of compatible and consistent quality and quantity above and below the water table. This allows to maintain a consistent level of detail throughout the evaluation process over wide areas. Numerical models will benefit from this new technology.



Full survey of shallow water areas, land and vegetation



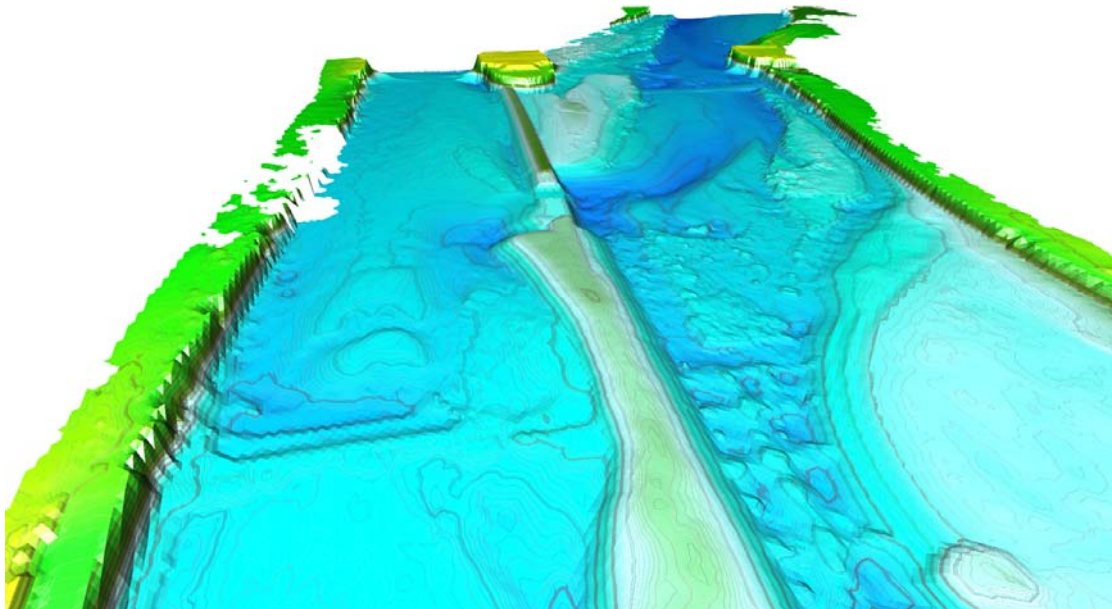
Sometimes limited penetration in deep water and/or under turbid conditions



Subsequent surveys with echosounder systems in remaining areas only!

Airborne Hydromapping – Survey Procedure

Currently, the measurements are taken by a laser system operated in a small plane, which is based both in Augsburg (Germany) and Innsbruck (Austria). Nearly every river system in Europe can be reached within one day. Measurements are performed fast (numerous kilometers per hour) and very comprehensively (point densities up to about 50 points per square meter). Airborne Hydromapping offers a variety of significant technological advantages, so that this technology pushes the door wide open to substantially improve our understanding of the complex hydraulic, morphologic and ecologic processes in rivers, lakes and reservoirs. It is well suited for being used in many rivers and lakes within the Rhone catchment area.



River Bathymetry by Airborne Hydromapping (Example from an urban reach of a gravel river in Southern Germany)

LIST OF REFERENCES

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