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Flood warning systems for railways

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In August 2002 a flood wave at the river Salzach stopped a passenger train on an overflown track between Werfen and Golling (Salzburg). In August 2005 a big flood destroyed railway tracks in Western Austria and caused a freight train to derail, in the east of the country a flood wave at the river March (Lower Austria) set railway tracks under water.

Events like the mentioned induced the Austrian Federal Railways (ÖBB) to commission the feasibility study "Flood Waters Warning Systems for Railways". To stay competitive in the increasing international competition certain demands on line-availability and a maximum security level are important issues for the ÖBB. Certifications of security as well as standardised safety measures in the context of flood warning and flood control measures are fundamental for building the customer's confidence.

In a first step to develop a new warning system a study was carried out to show that by means of the existing forecasting system a flood warning could have been issued in sufficient time. The existing warning system supplies forecasts for gauges along the river, this information has to be transferred to the critical location. The forecasted runoff was combined with additional steady and unsteady hydraulic river stage simulations taking into account the contribution of the catchment area between the gauge and the critical location to calculate critical water levels along the reach for the event of August 2002. Challenging for the hydraulic simulations were the steep decline and the canyon "Salzachöfen" in the reach.

This paper also addresses the application of the result of the feasibility study to implement a two-stage warning system between the Hydrological Service Salzburg and

the ÖBB which already provided an appropriate flood warning in summer 2006. The internal flow of information concerning flood warnings will be presented.

The final goal of the project is the development of tools for flood warning of rail tracks along/crossing rivers for the main routes in Austria. Identification of dangerous sections is carried out by means of the "Hochwasserrisikozonierung Austria – HORA" project and knowledge of the ÖBB. Depending on the situation, hydraulic and/or hydrological analyses are carried out.

The aim of the project is to provide elementary tools; depending on the local situation a combination of these tools should give a sufficient flood warning. Tools for monitoring are developed to cope with uncertainties in meteorological and hydrological forecasts.