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Airborne laser scanning in support of hydrologic applications

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Airborne laser scanning (ALS) has revolutionized the way of how we obtain digital terrain models suited for a diverse range of hydrologic applications. Accuracies of the calculated terrain heights in the order of 25 cm can be achieved depending on land cover and flight parameters. Such precise terrain information can e.g. be used for delineation of break lines, overland flow patterns and flood risk areas. Consequently, this technique has raised significant interest and, in the aftermath of the disastrous floods 2002, has become the standard technique to map river courses and entire provinces in Austria. Additionally, vegetation height can be retrieved quite accurately from ALS data. This data may be of use to characterise roughness, flow resistance, transpiration, and other hydrologic parameters. However, research of how to effectively exploit this information is only at its beginning. On the one side, we must obtain a better physical understanding of the interaction of the laser beam with the vegetation and ground surface. For example, we currently have little understanding of how much the laser beam penetrates into different vegetation types. Rather, all currently applied algorithms distinguish terrain from vegetation points solely based upon the spatial relationship between recorded laser hits. It is expected that improvements in sensor specifications (e.g. full-waveform digitising, short pulse width) will provide an important impetus to investigate these issues. On the other side, hydrologists need to start using these data in their models in order to provide critical feedback to the remote sensing community. It should not be expected a-priori that the models are capable of ingesting this new type of data, rather it may be necessary to develop new process algorithms. In this presentation we show ALS results from several catchment areas in Austria (Danube, pre-alpine forest catchment, alpine catchment). The intention is to raise the interest of hydrologists and identify critical research questions.