Revisiting Experimental Catchment Studies in Forest Hydrology (Proceedings of a Workshop held during the XXV IUGG General Assembly in Melbourne, June–July 2011) (IAHS Publ. 353, 2012), 33-41.

The use of LiDAR elevation data to map channel continuity in southeast Australia

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Abstract In forests managed for timber production, headwater streams are protected from timber harvesting through establishment of buffer zones. However, uncertainty about the location and extent of channels affects sustainable timber harvest planning. The capability of Light Detection and Ranging (LiDAR) data to produce a good DEM enables the identification of headwater streams under forest cover, and detection of convergent areas related to channelisation processes. The aim of this study is to test the capability of LiDAR elevation data in estimating the channel network, and in identifying channel heads and disconnected channels. The estimated channel network is compared to that obtained using a classical method – TauDEM – on the basis of a slope–area threshold. The study area is part of the Lower Cotter experimental catchments, an alpine headwater catchment located in the Brindabella Range in southeastern Australia. While the TauDEM cannot detect disconnected channels, LiDAR provides complementary results for channel continuity. However, both methods are inaccurate in predicting the location of channel heads. Additional hydrologic data from the paired-catchments are recommended to develop a logistic regression model of the channel initiation for accurate channel network extraction.

Key words channel network; channel head; disconnected channel; light detection and ranging (LiDAR); digital elevation model (DEM)