

Abstract: Postgraduate diploma in science thesis, Department of Geography, University of Canterbury (2003).

A distributed glacier melt model for the Cameron Stream catchment, New Zealand

The ability to determine flow rates of rivers with glacial catchments is of value for many reasons including efficiency improvements in hydroelectricity generation and agricultural irrigation. By consideration of solar energy inputs, the diurnal variation in flow of the Cameron Stream, a 5% glaciated catchment in Canterbury, New Zealand is modelled.

The model utilises GIS techniques and requires no measured meteorological data. Solar radiation is determined after considering topographic effects providing a total energy flux input to the glacier. The energy input is considered to be used in melting snow and ice. The propagation of the melt water from the glacier to the stream is modelled using a triple linear reservoir model, and propagation down stream using a flow velocity to flow rate relationship. For the 19th March 2003 the model estimated a daily $0.165 \text{ m}^3\text{s}^{-1}$ amplitude variation 14 km from the Cameron Glacier terminus. An index of agreement of 0.95 was found between the modelled flow rate and the measured flow rate at this point. The model estimates that 17% of the stream flow is derived from glacier melt, and that melt from the ice regions of the glacier is the major contributor to flow variation.

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