

Contributions to *Improved Processes and
Parameterisation for Prediction in Cold Regions*

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Contributions to *Improved Processes and Parameterisation for Prediction in Cold Regions*

Theme 1: Improved understanding of processes

- Radiation
- Turbulent transfer
- Snow redistribution

Theme 2: Parameterisation

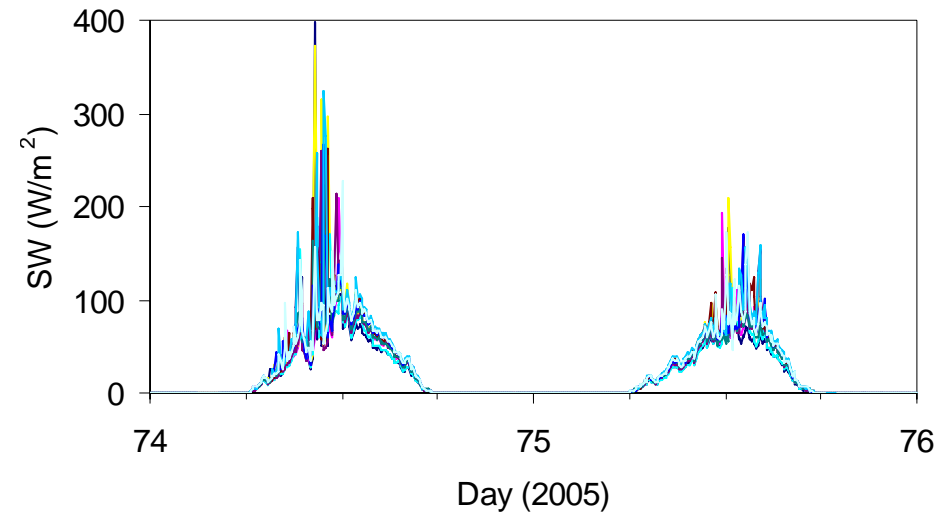
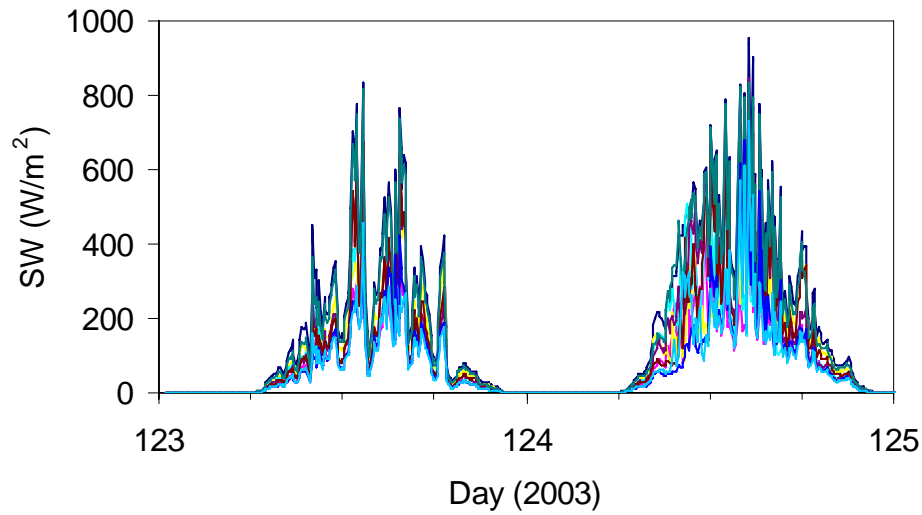
- Radiation
- Turbulent transfer
- Snow redistribution

Solar radiation to snow beneath shrubs and trees

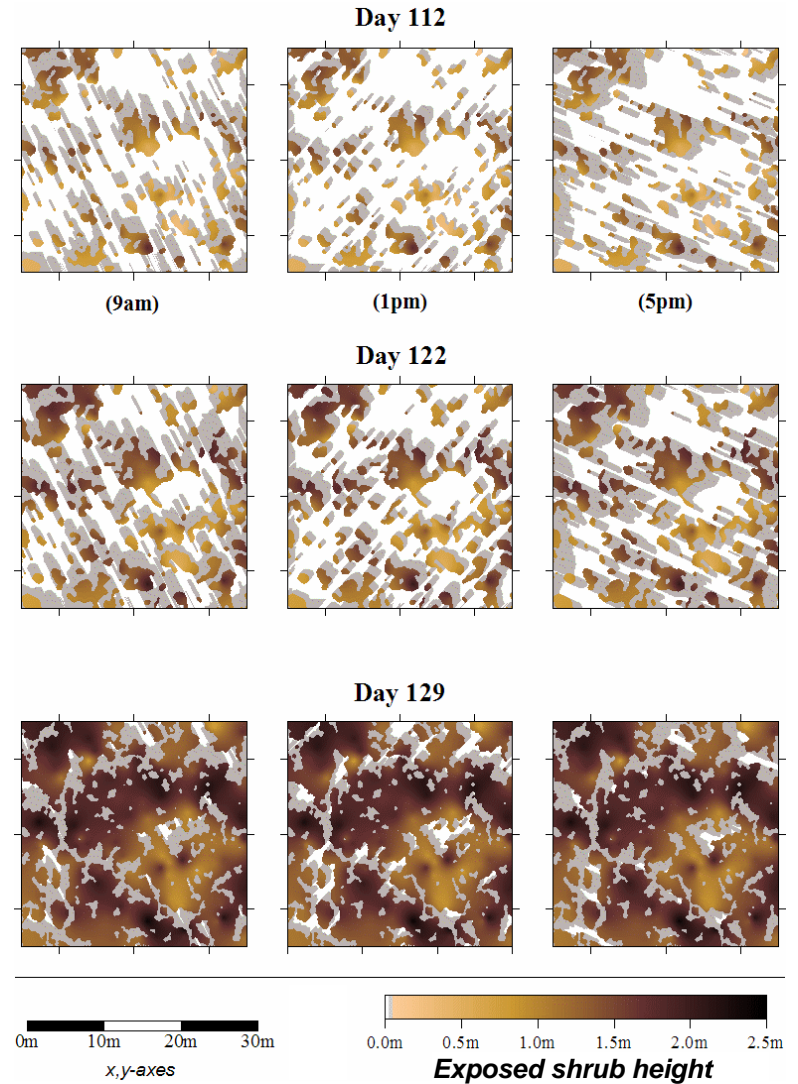
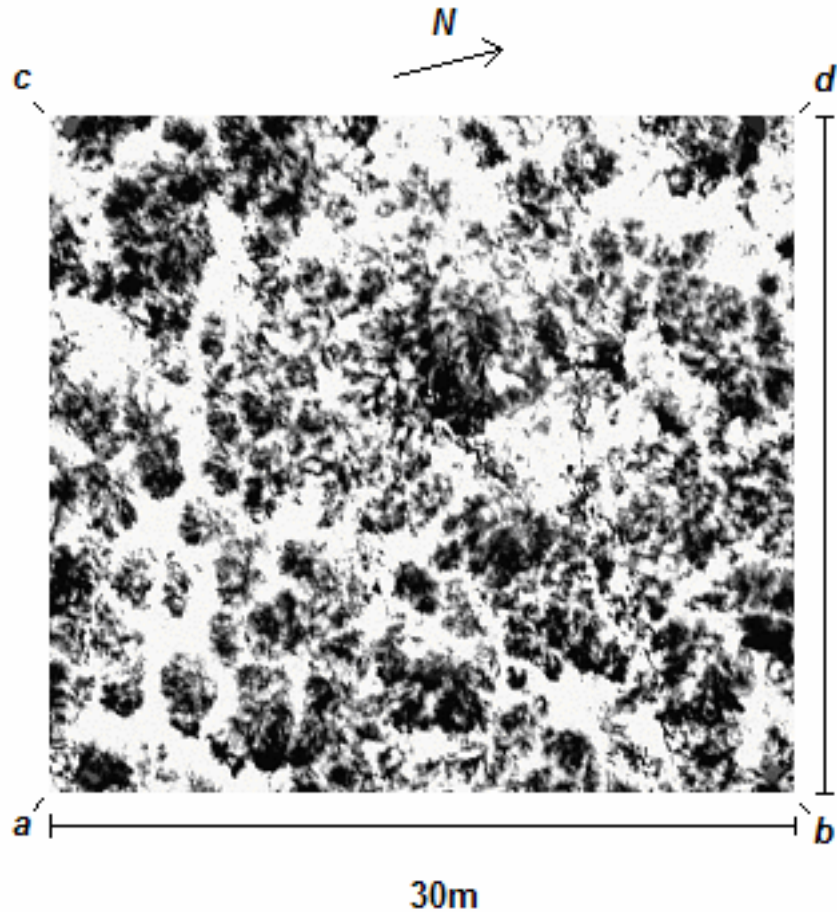
Wolf Creek shrubs



Marmot Creek level forest



Modelling solar radiation to snow beneath shrubs



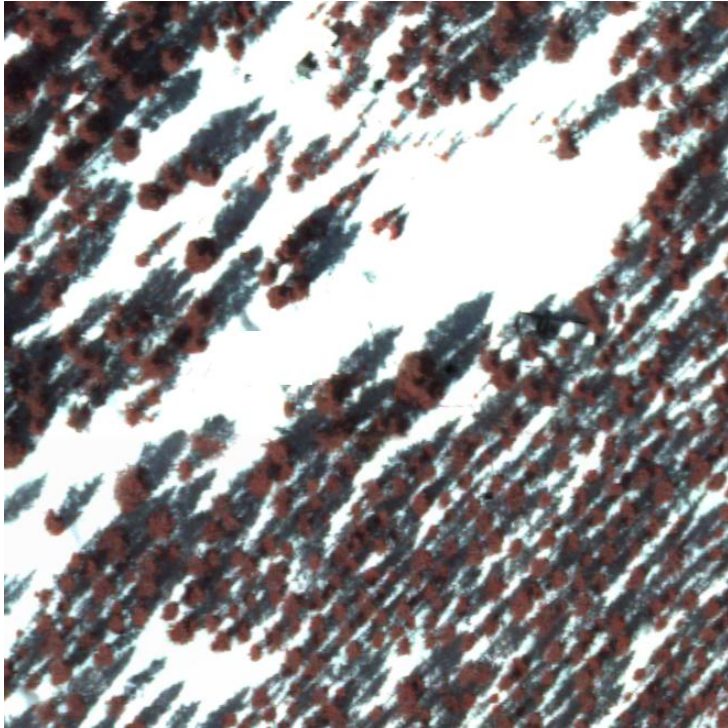
Aerial photograph

Shadow simulation

Bewley et al. (2006). *Arctic, Antarctic and Alpine Research*, in press

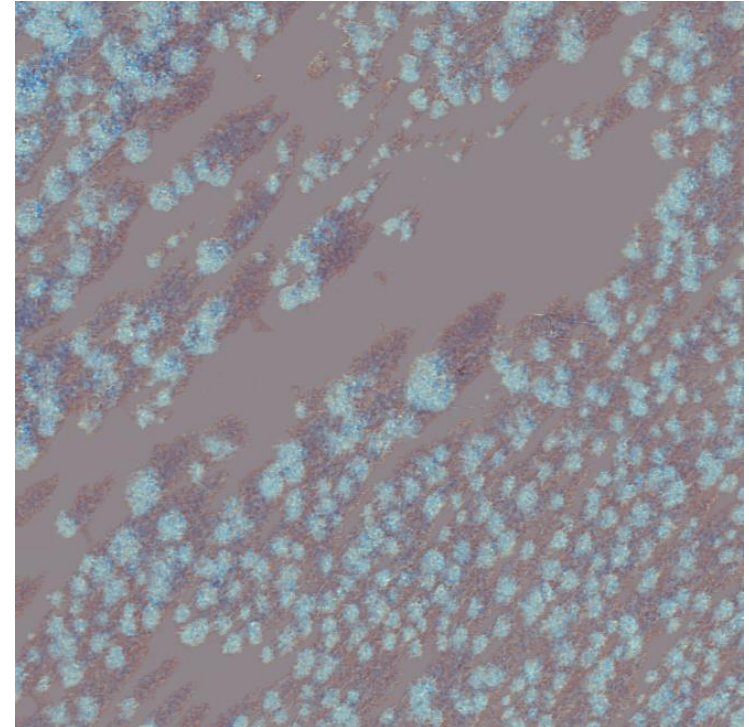
Mapping and modelling forest canopies

**Colour infrared orthophotograph
(lodgepole pine forest, Colorado)**



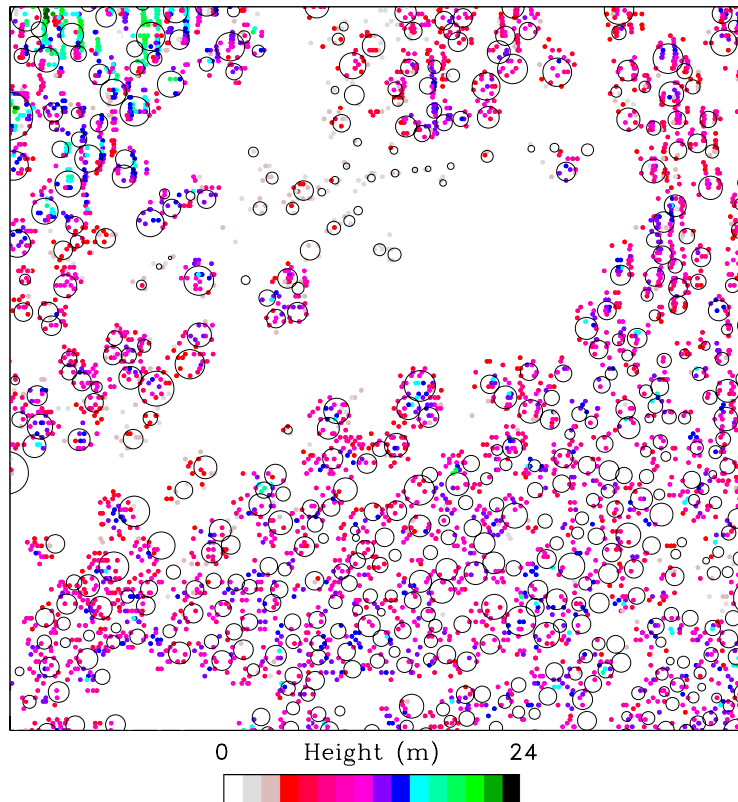
← 100 m →

Normalized difference index

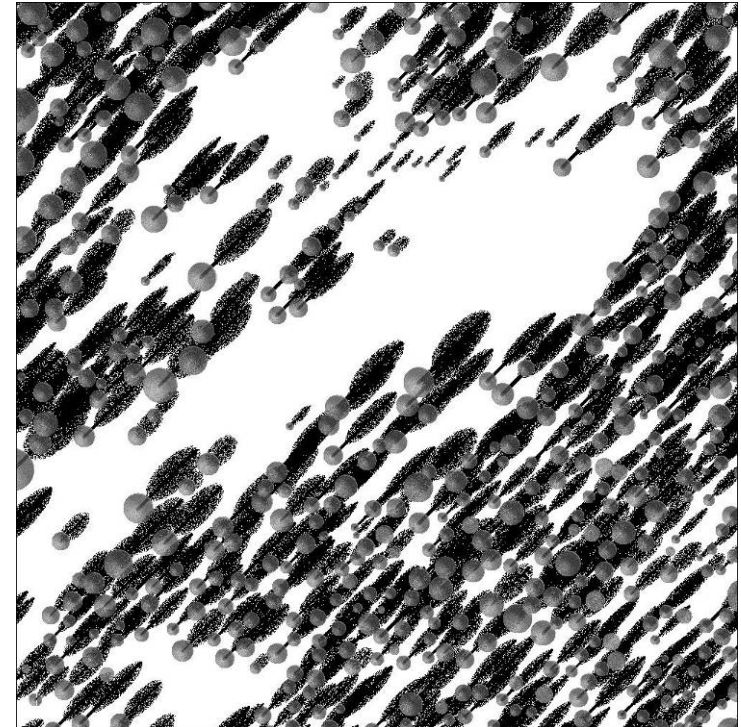


Mapping and modelling forest canopies

Lidar and canopy delineation



Shadow simulation

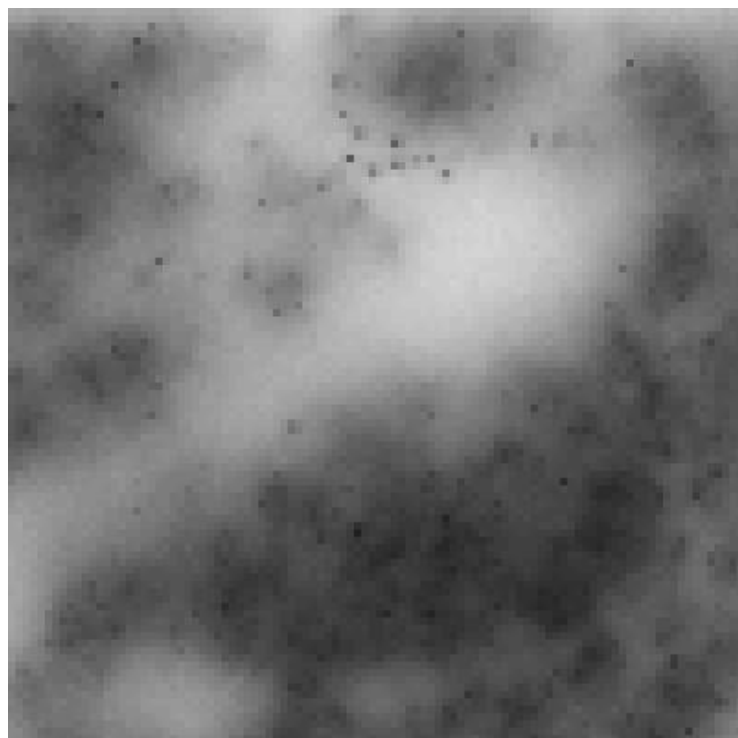


Essery et al. (2007). In preparation for *Journal of Hydrometeorology*.

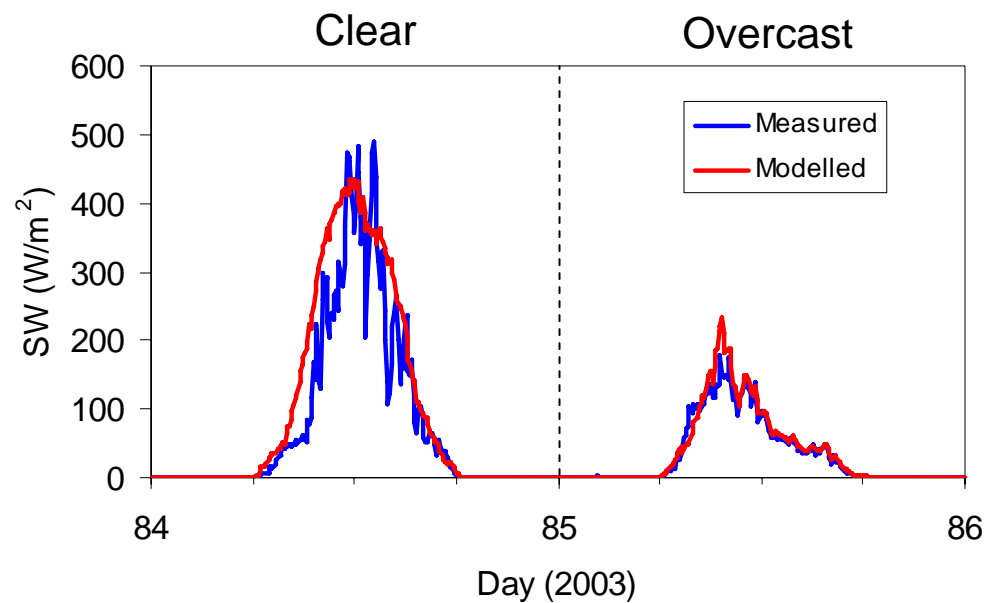
Miller (2003). National Snow and Ice Data Center, digital media

Modelling forest canopy transmission

Simulated skyview

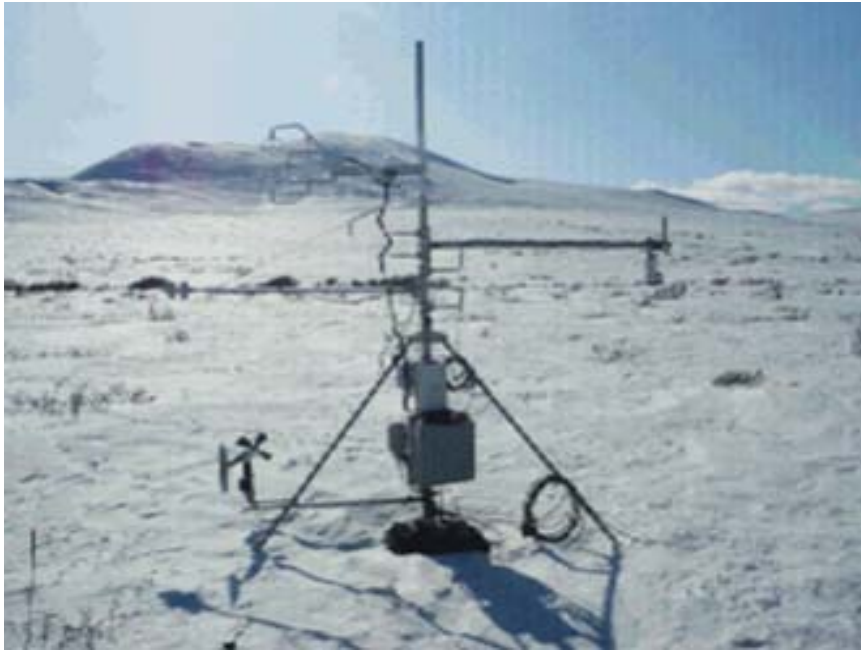


Simulated skyview

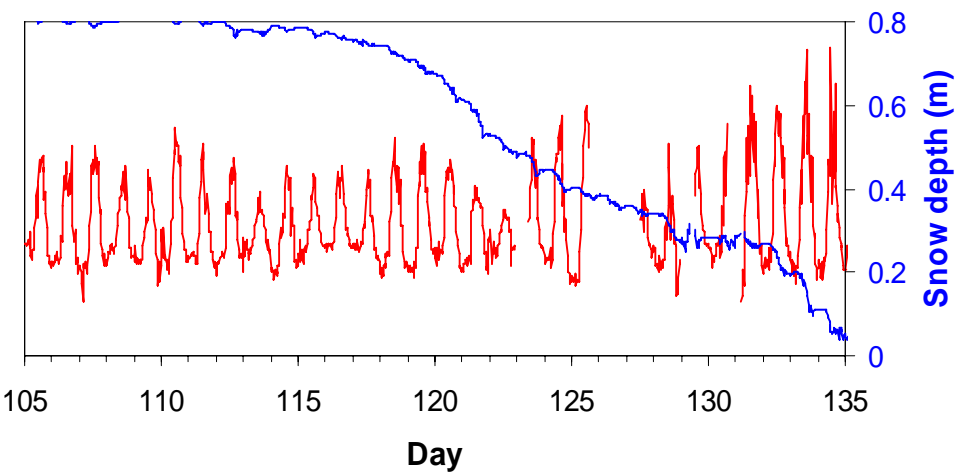
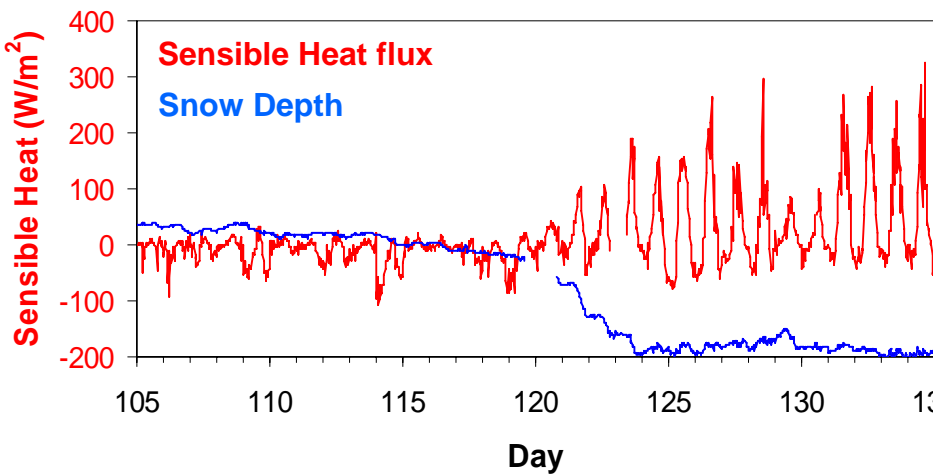


Essery et al. (2007). In preparation for *Journal of Hydrometeorology*.

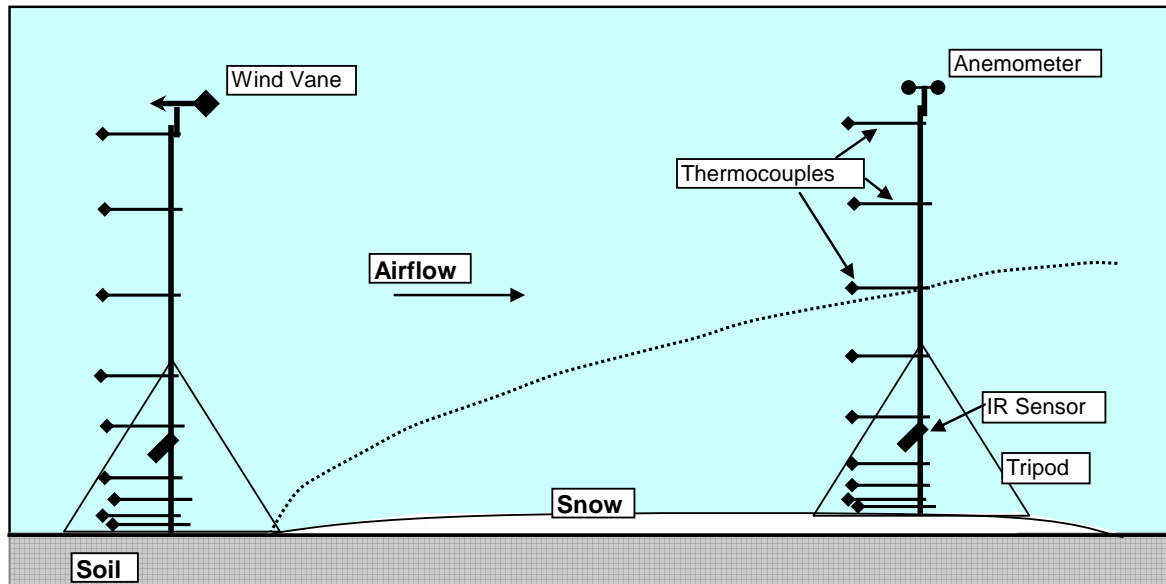
Granger Basin plateau



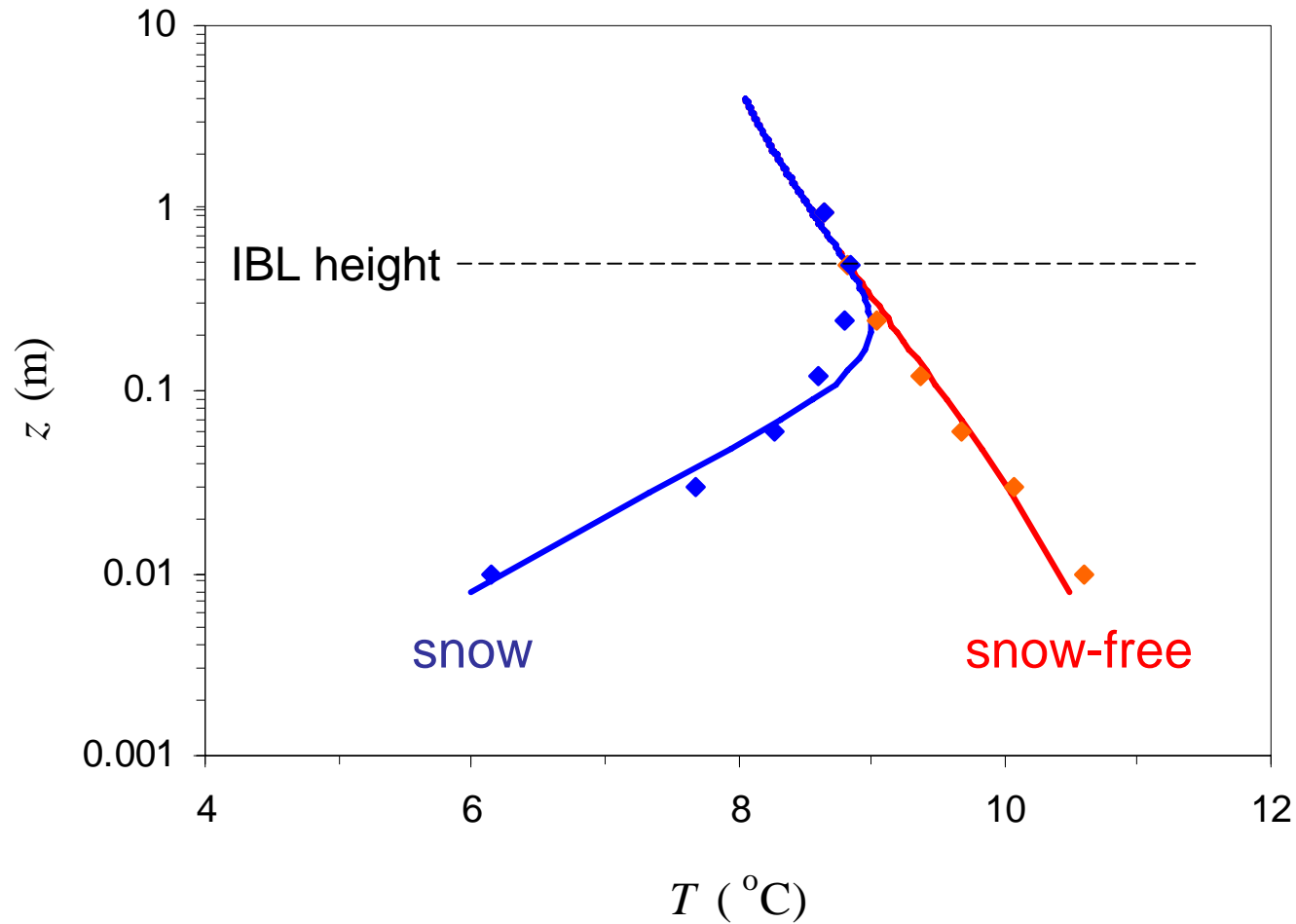
Granger Basin valley



Advection of heat over patchy snow

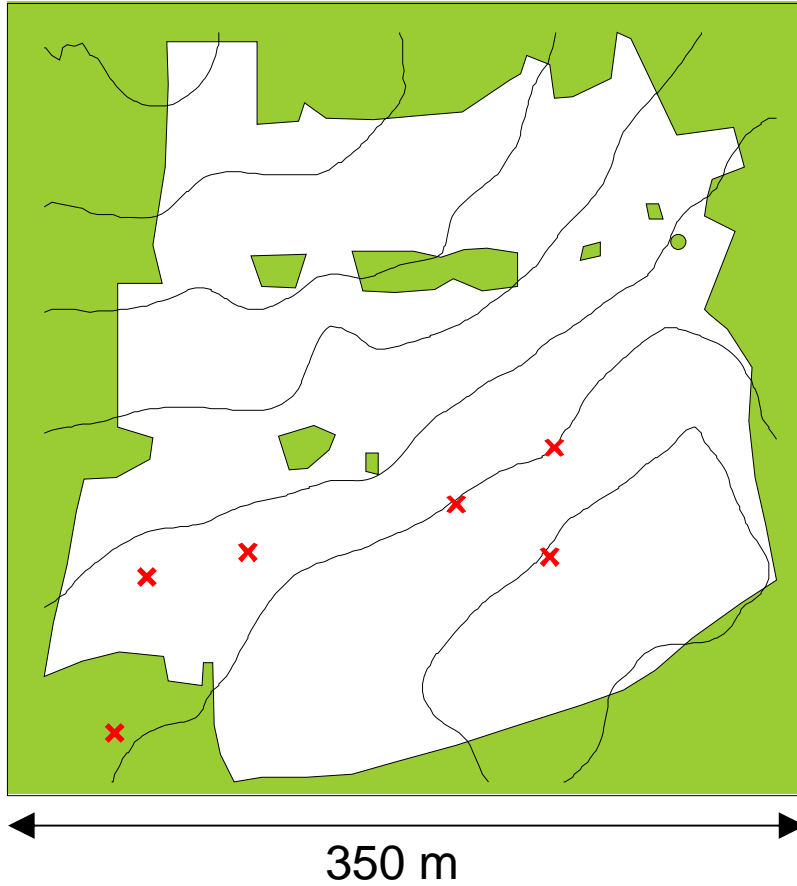


Measured and modelled temperature profiles



Turbulent development in clearings

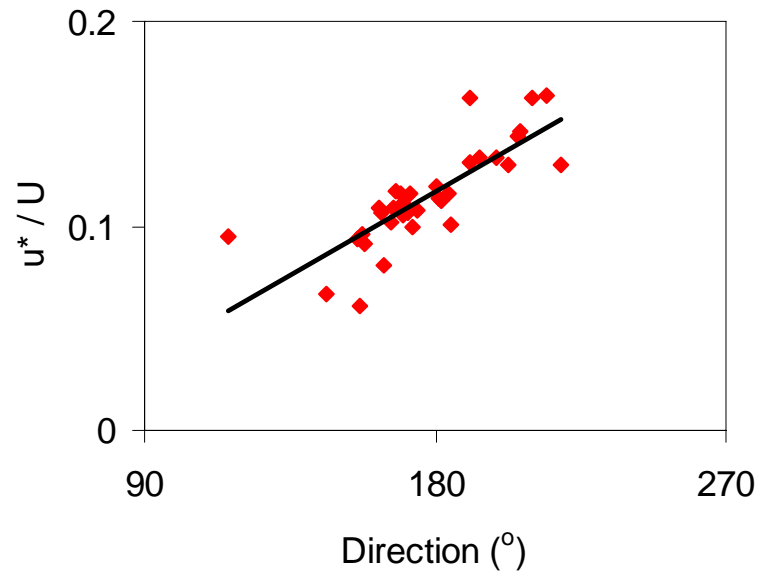
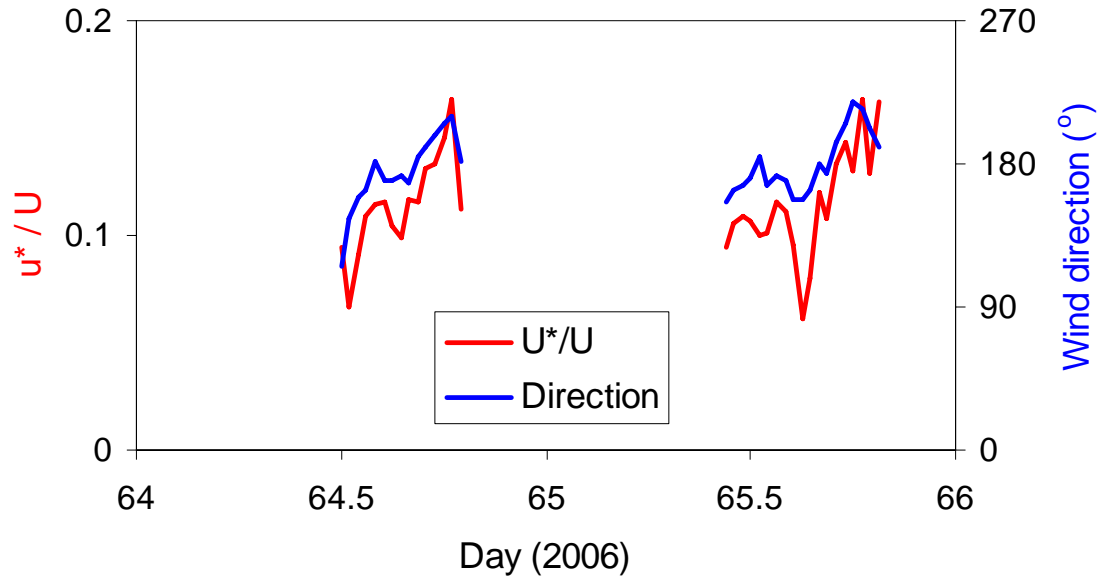
Hay Meadow EC profile locations



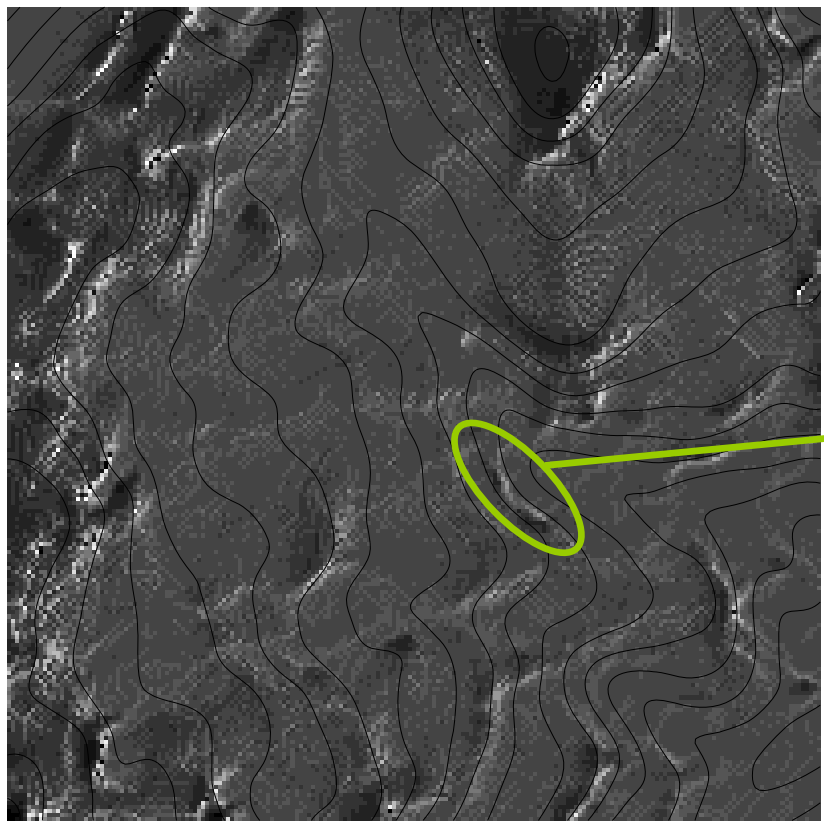
University of Saskatchewan EC sledge



Turbulent development in clearings



Simulation of Granger Basin slope drift

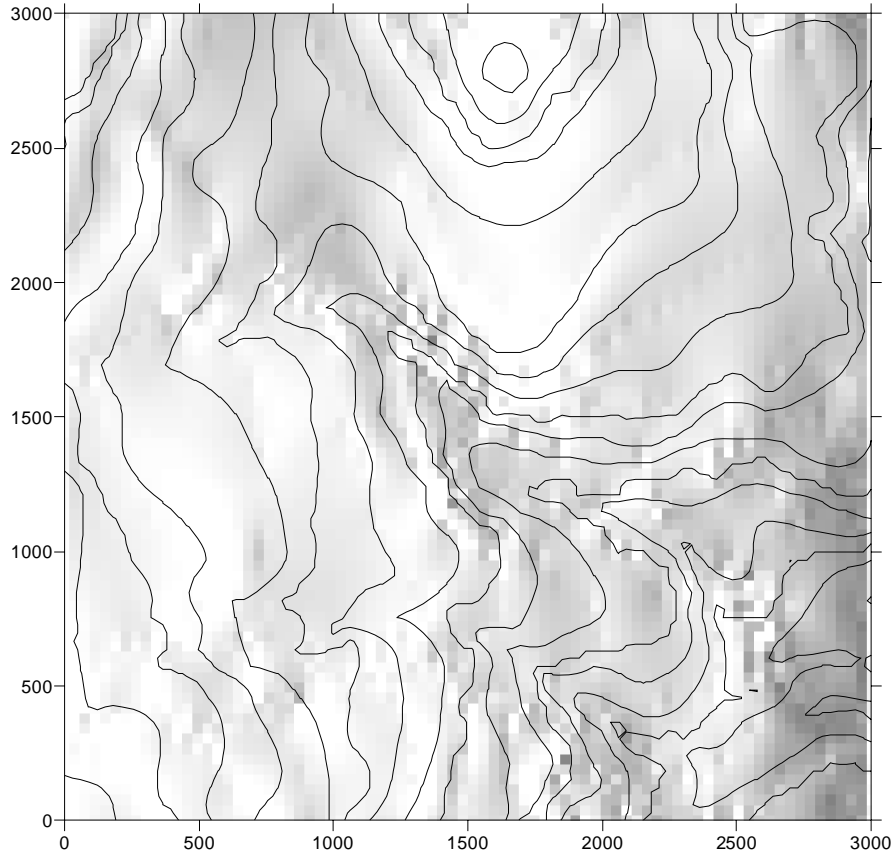


←—————→

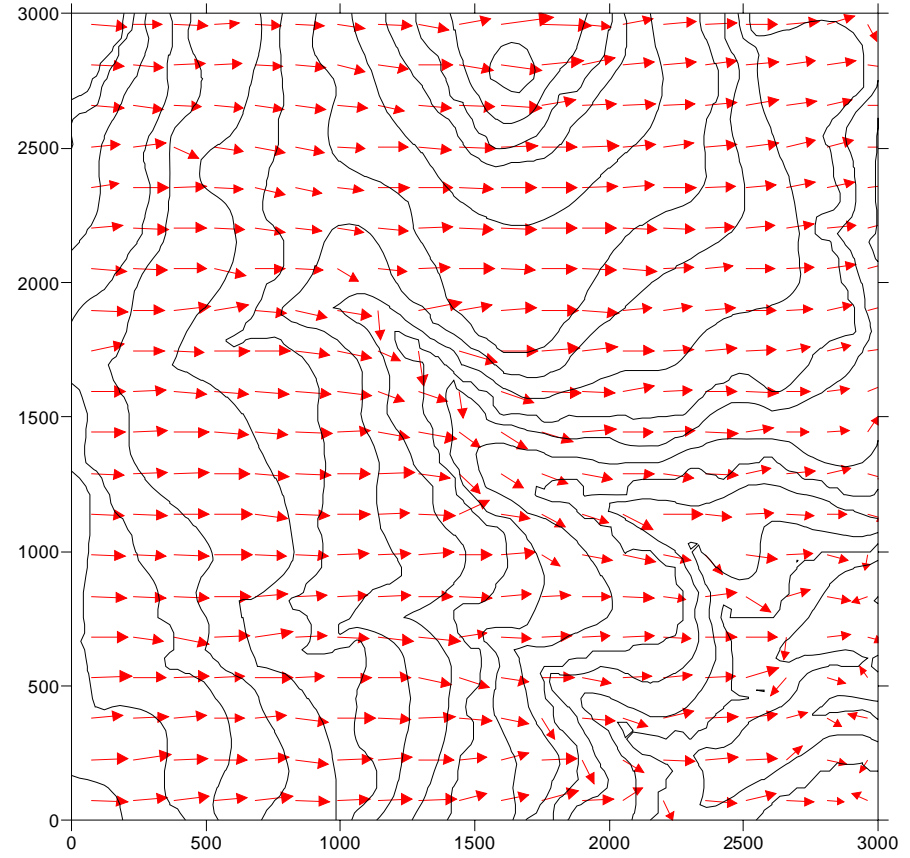
3 km

Linear simulation of westerly flow over Granger Basin

Windspeed

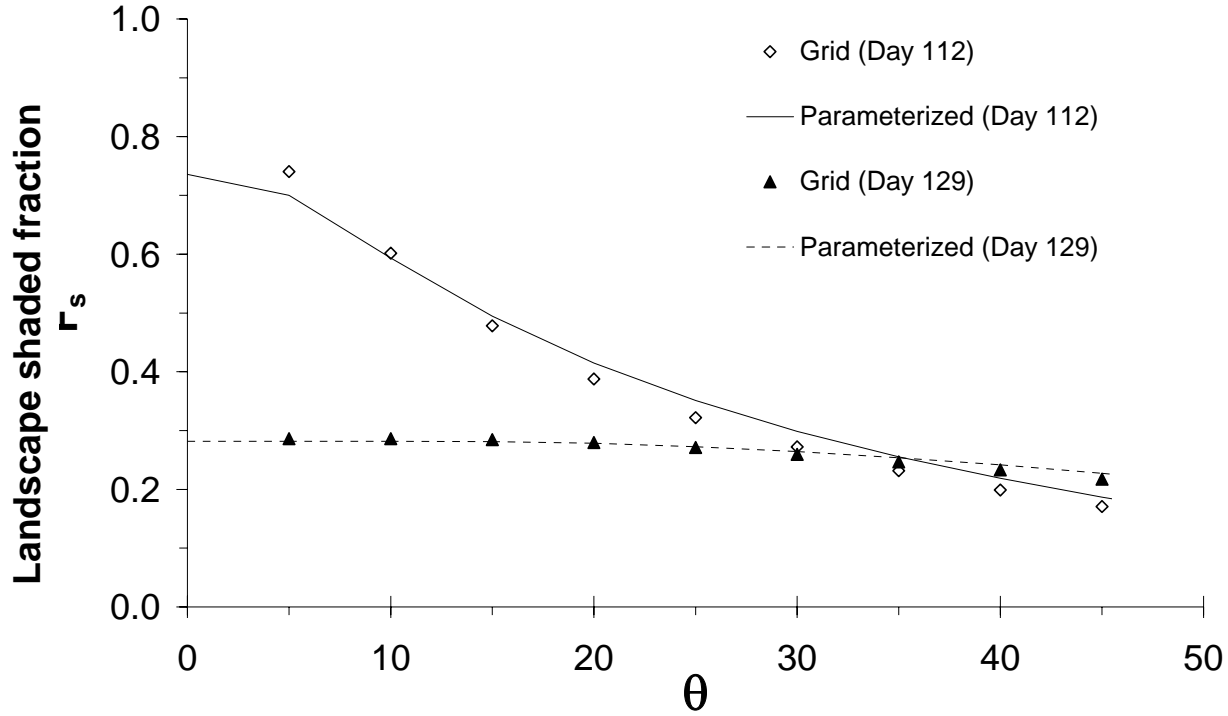


Direction



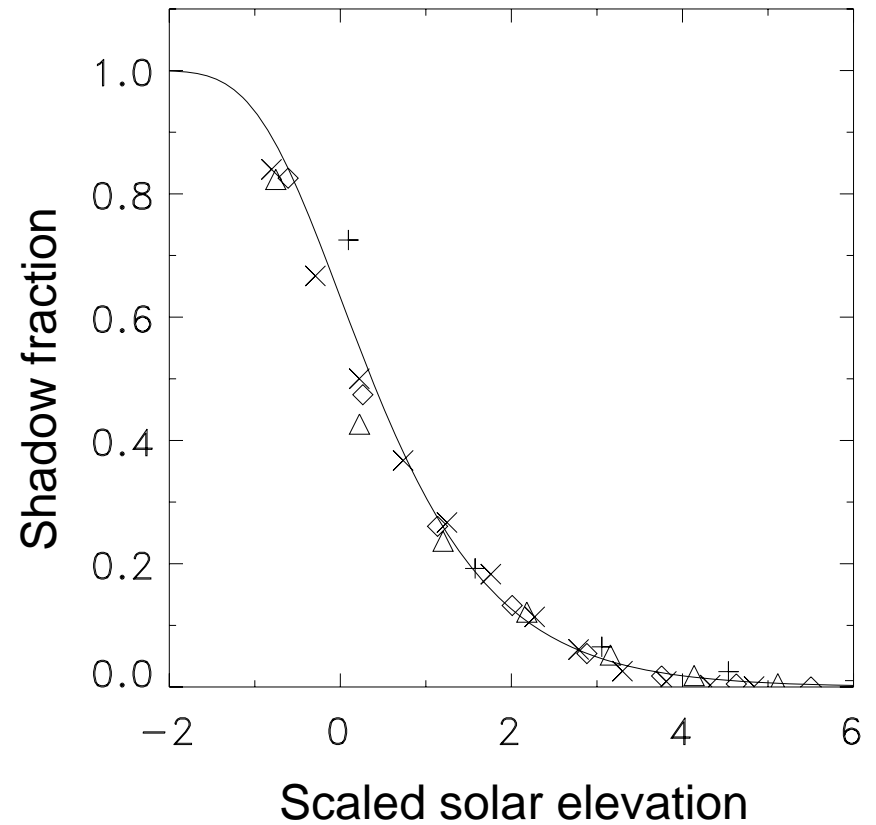
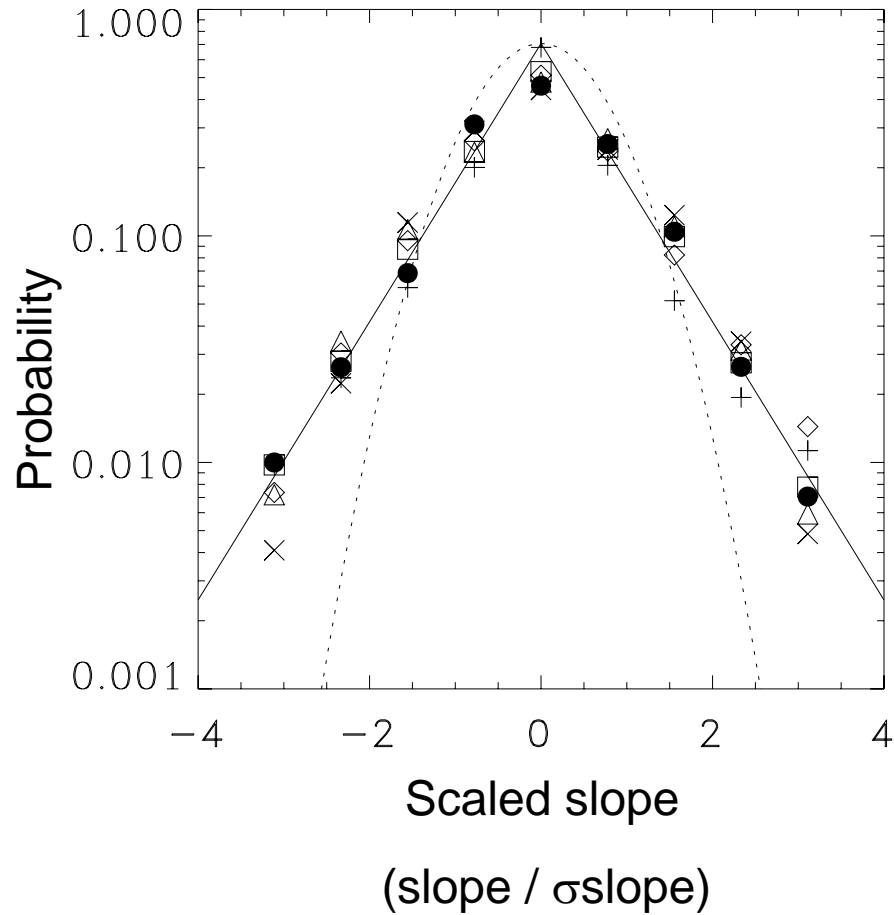
← 3 km →

Shrub canopy gap shadow fractions



$$F_s = \frac{\bar{l}}{\bar{W} + \bar{G}} \quad l = h_c / \tan \theta$$

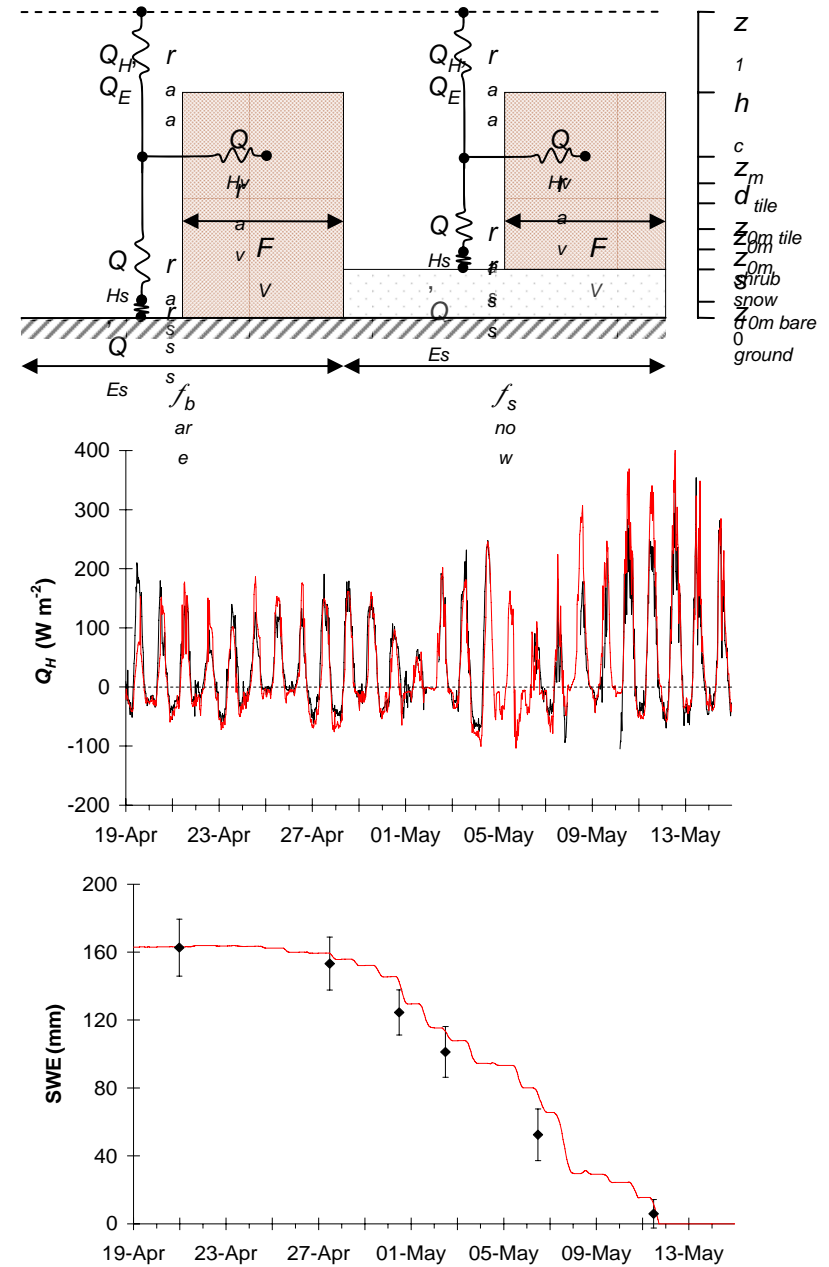
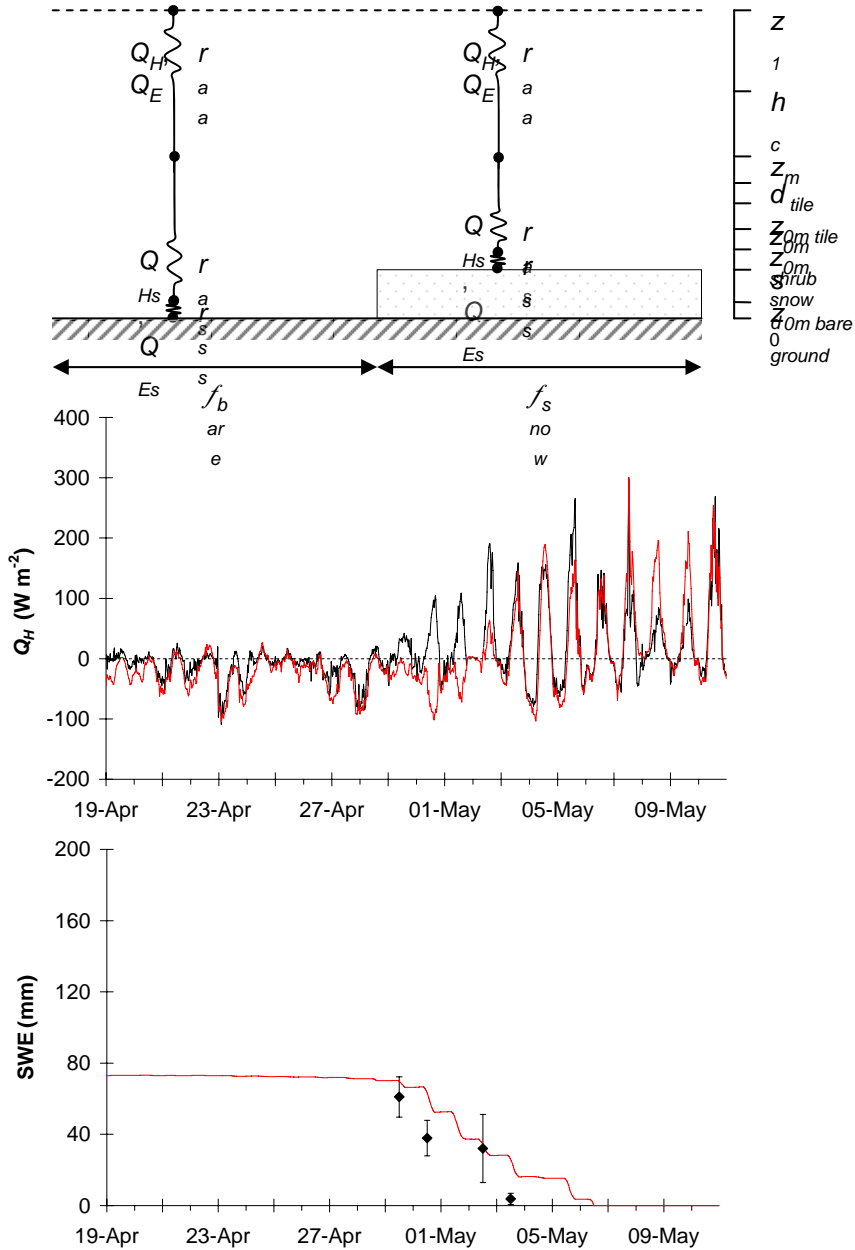
Parameterisation of shortwave radiation over topography



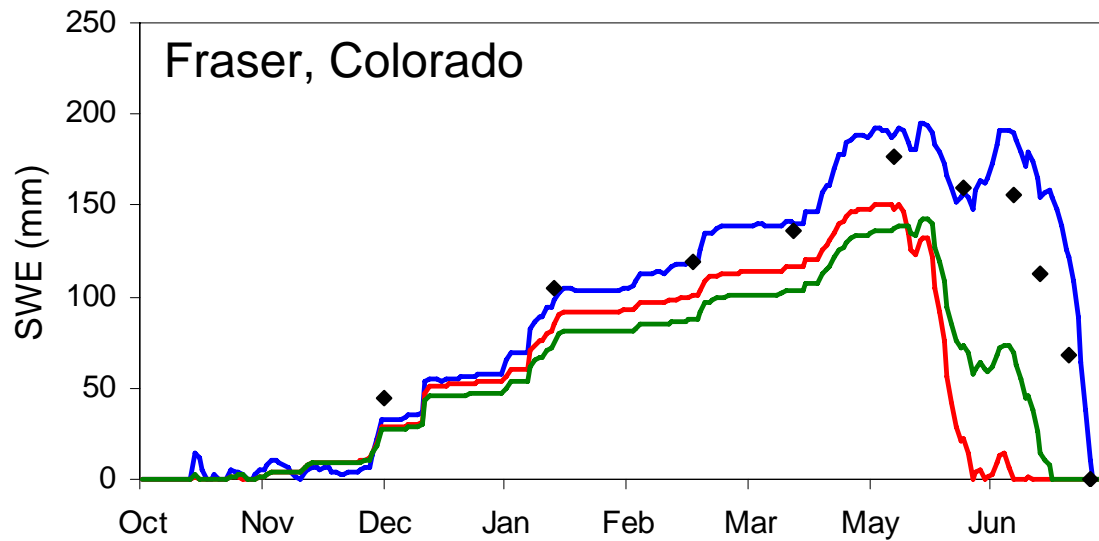
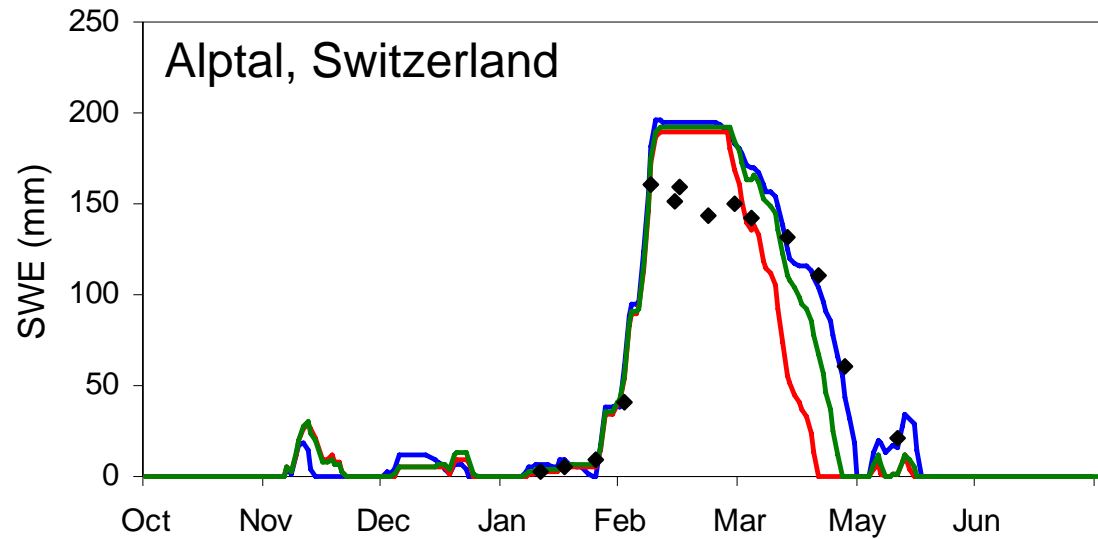
Granger Basin plateau

Theme 2- turbulent transfer

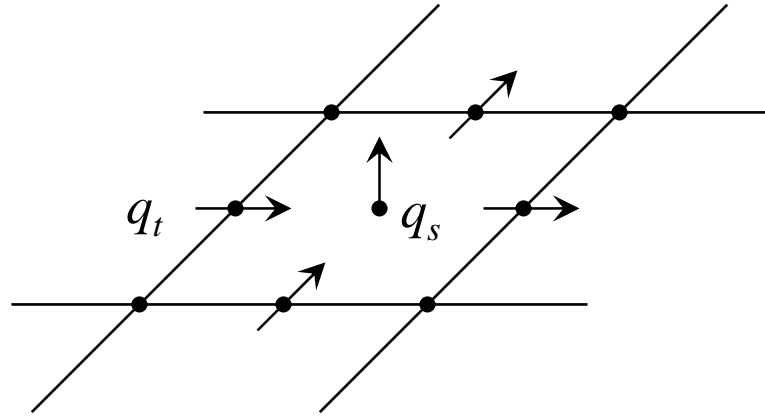
Granger Basin valley



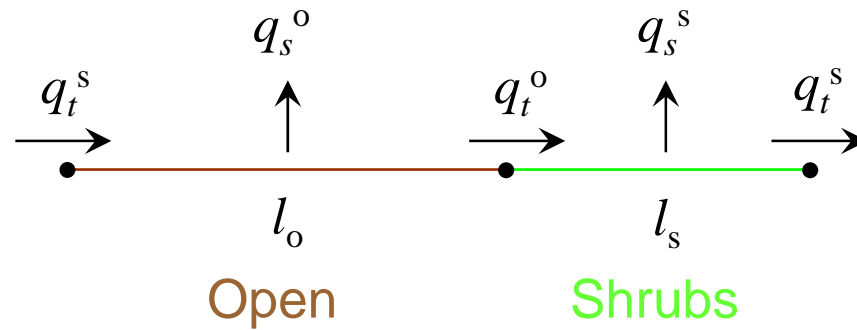
Forest snow model intercomparisons



Distributed model



Mosaic model



Distributed and mosaic simulations of snow accumulation

