VIC-GL Calibration in the Fraser Basin

The VIC-GL model was calibrated at 46 sites over the Fraser basin. Model calibration is governed by the desire to exploit the spatially distributed nature of the VIC-GL model. Thus, in addition to discharge (Q), selected parameter sets for sub-basin were constrained using snow covered area (SCA), evapotranspiration (ET) and basin-average glacier surface mass balance (B). Calibration performance is evaluated using the metrics and evaluation periods described in Table 1. Performance metrics include the Kling-Gupta efficiency (KGE; Gupta et al. 2009), the Nash-Sutcliffe efficiency for log-transformed discharge (LNSE; Nash and Sutcliffe 1970) and the bell membership function (BMF; Zhao and Bose 2002). The possible value ranges for the various metrics are -∞ to 1 for KGE (1 is best), -∞ to 1 for LNSE (1 is best) and 0 to 1 for BMF (1 is best). All selected sub-basins had sufficient data over the collective calibration period (1991-2000). Calibration periods differed slightly by variable (see Table 1).

Table 1 - Calibration metrics and evaluation periods.

	Discharge (Q)	Evapotranspiration (ET)	Snow Cover (SCA)	Glacier Mass Balance (B)
Statistics	KGE, LNSE	BMF	KGE	BMF
Calibration Period	1991-2000	1991-2000	2000-2005	1985-1999

Model performance is generally high over the calibration period (Fraser_VICGL_48_Sites_metadata.csv):

- *KGE* ranging from 0.61 to 0.99
- NSE_Q ranging from 0.51 to 0.99
- $LNSE_Q$ ranging from -0.56 to 0.99
- Relative bias (RBias) between zero and 19%
- KGE_{SCA} scores range from 0.69 to 0.95
- BMF_{ET} scores range from 0.37 to 0.71
- BMF_G scores range from 0.04 to 1.00