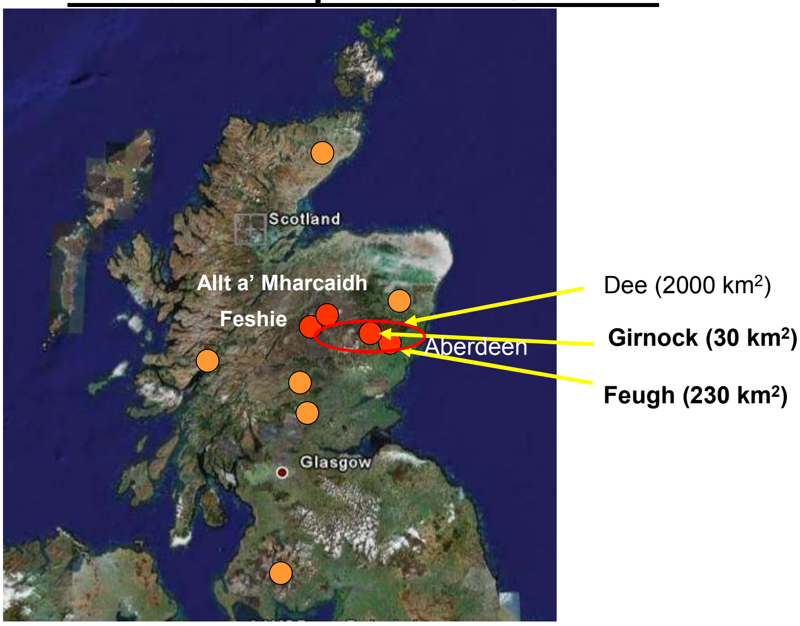
Welcome to the first North Watch Workshop!!

Contextualisation of insights – inter-site comparison in Scotland



Workshop in Ballater, Scotland, May 2007

"From Catchment Scale Process Conceptualisation to Predictive Capability"

- Uniqueness of place vs. transferable relationships
- Catchment inter-comparison – tracer input-output relationships ⇨ classification, typology

Using surrogates of transit times for inter-site comparison

SCIENTIFIC BRIEFING

HP TODAY

HYDROLOGICAL PROCESSES
Hydrol. Process. **23**, 945–953 (2009)
Published online 28 January 2009 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/hyp.7240

How does landscape structure influence catchment transit time across different geomorphic provinces?

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Abstract

Despite an increasing number of empirical investigations of catchment transit times (TTs), virtually all are based on individual catchments and there are few attempts to synthesize understanding across different geographical regions. Uniquely, this paper examines data from 55 catchments in five geomorphic provinces in northern temperate regions (Scotland, United States of America and Sweden). The objective is to understand how the role of catchment topography as a control on the TTs differs in contrasting geographical settings. Catchment inverse transit time proxies (ITTPs) were inferred by a simple metric of isotopic tracer damping, using the ratio of standard deviation of $\delta^{18}O$ in streamwater to the standard deviation of $\delta^{18}O$

Different landscape drivers

- Geomorphic evolution of catchment landscapes ⇨ differences in first order controls / hydrological behaviour in different geographical regions

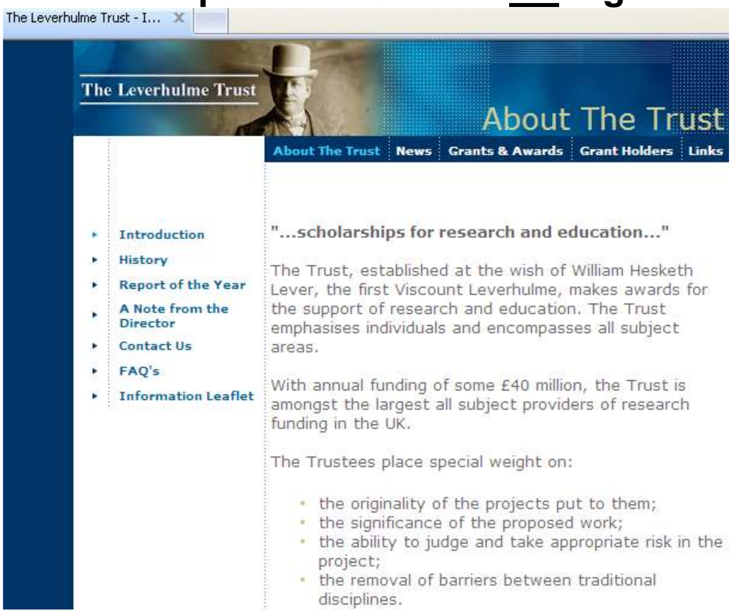
- Steep, montane catchments – topography good predictor for hydrological behaviour

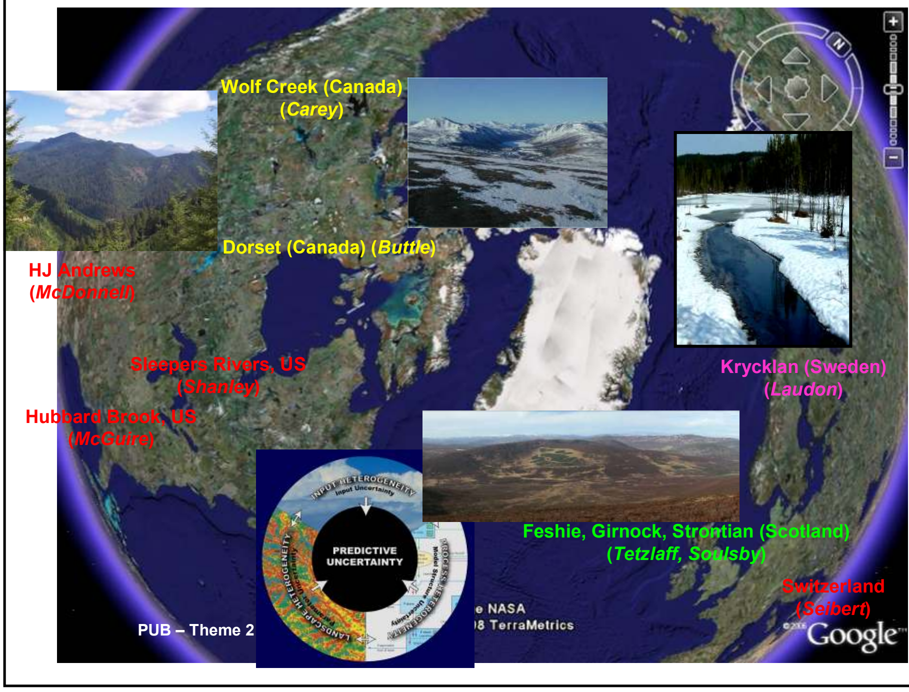
- Subdued, often glaciated landscapes – soils as better predictor

⇨Differences constrain developing **generalised theories** and **macroscale laws** in catchment hydrology

⇨ Even more complicated when **climate** is taken into account

NORTH-WATCH: Northern Watershed Ecosystem Response to Climate Change





Objectives of North Watch network

- Bring together leading, cognate researchers working at **long-term experimental catchments** in different parts of the northern region (*comprising sensitive boreal, subartic and sub-alpine environments*)

- **Inter-site comparison**: comprehensive, interdisciplinary and regional understanding of recent effects of climatic change

- Predicting the **integrated consequences** of climate change on physical, chemical and biological characteristics of water resources

⇨Use of existing long-term data and process knowledge

5 NorthWatch workshops

Date	Workshop	Location	Co-ordinator
Sept 2009	I: Climatic drivers, hydrological regime and environmental change	Ottawa, Canada	Carey
March 2010	II: Hydro-climatic variability and biogeochemistry	Umeå, Sweden	Laudon
Sept 2010	III: Hydroecological responses to climate change	Aberdeen, Scotland (Berlin, Germany?)	Tetzlaff
March 2011	IV: Using empirical data and models in a learning framework for prediction	Hubbard Brook, USA	McGuire
Sept 2011	V: Integrated response of northern watersheds to climate change	Aberdeen, Scotland	Soulsby & Tetzlaff

Specific workshop objectives

O1. What aspects of climate are the main drivers of the hydrological regime and are these showing clear, directional changes in response to global warming?

O2. How is catchment biogeochemistry being affected by any climatic and hydrological change and is water quality changing significantly as a result?

O3. To what degree is there any detectable ecological response to such changes in the quantity and quality of stream flow?

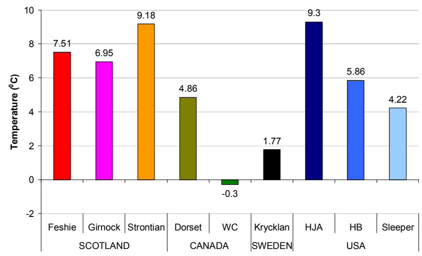
O4. How can recent empirical data be integrated with models to provide a learning framework for predicting the likely integrated response of water resources to climate change?

O5. To what extent does the synthesis of existing data show a regionalised response to climate change?

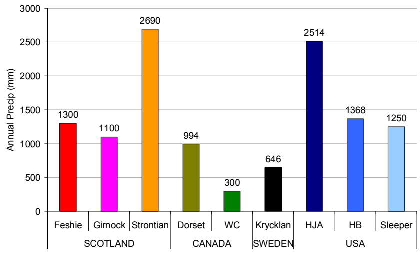
The core sites

Area: 0.4 – 230 km^2
Mean altitude: 240 – 1320 masl
Relief (max-min alti.): 1450 – 95 m

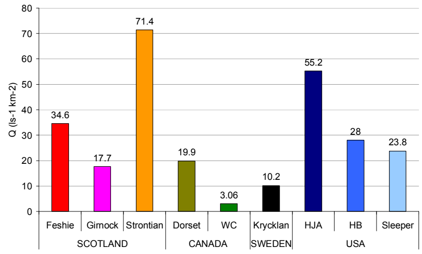
Mean annual air temp.



Mean annual precip.



Mean annual discharge



Workshop I objectives (break out groups)

1. How do hydrological regimes differ in different catchments / different regions? Which indices describe this best?

2. Which indices / descriptors of hydrological regimes can we use for inter-site comparison? Which surrogates can be used to capture complex processes and give first approximation of processes?

3. What aspects of climate are main drivers of hydrological regimes in these different regions? (*rainfall?; energy balance?; snowmelt?...etc*)?
   Which directional changes of these main drivers in response to changing temperature can we identify in the different regions?

4. Can we develop guidelines for predicting change based on variability? What are experiences with stakeholders and knowledge transfer?

⇨ Probably unanswerable – but lets use as discussion basis

Planned outcomes workshop I

- Presentation of core sites
- Learning from Canadian experience (climatic drivers)
- Breakout group sessions:
  - (i) scrutinise research findings and clarify extent to which the workshop research objective can be answered;
  - (ii) clarify associated future short- and long-term research priorities.
- Scientific briefing: “state of the art” scientific review
- AGU poster

Thanks!

Thanks to the Leverhulme Trust.

Thanks to all:
For coming here!

For your input!

For helping to organise!

For supporting the budget!