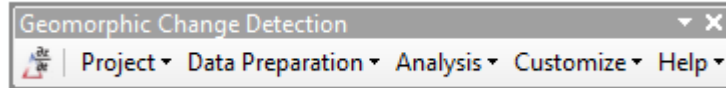


# GEOMORPHIC CHANGE DETECTION

## RECAP OF DAY 2 & PREVIEW OF DAY 3

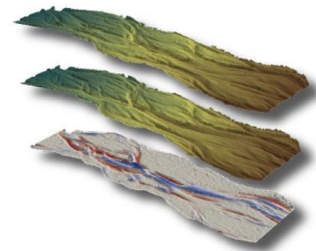


# MAIN TAKE HOMES FROM DAY 2

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- Change detection is only possible when signal is greater than noise
- Now we have a few methods for estimating noise, but we need to think more about error modelling. We'll see that:
  - Start Simple & Conservative
  - Invest more in error estimation if you think there is a real signal that is being threshold out
- The methods do not guarantee that you will be able to distinguish your signal from noise

DoD = DEM of Difference =



# DAYS 2

## Day 2 – Error Modelling & Uncertainty Accounting to Support Change Detection

- 9:00 – 9:15 – Q & A – Questions and Review from Day 1
- 9:15 – 9:45 – I. GCD Thresholding Alternatives
  - Exercise: GCD Thresholding + Sensitivity Analysis
- 9:45 – 10:15 – J. Approaches to Estimating Errors
  - Exercises w/ Grand Canyon:
    - Spatially Uniform
    - Spatially Variable - Multi-Method
    - Spatially Variable - User Defined

10:15 -10:30 - Break

- 10:30 – 11:00 – K. Statistical Methods for Error Modelling from High Resolution Data
  - Exercise: Running ToPCAT for Statistical Models
- 11:00 – 12:00 – L. Ground-Based LiDaR & SFM Survey of Flume
  - Demo: Survey Flume with TLS & SFM

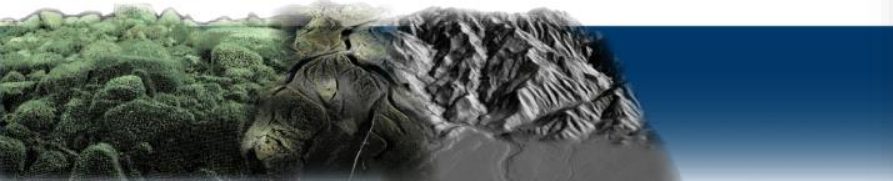
12:00 – 1:00 – Lunch

- 1:00 – 1:45 – M. Using ToPCAT & GCD for Roughness Estimation & Surface Construction
  - Exercise: Using GCD to decimate and derive roughness (Flume Example)
- 1:45 – 2:30 – N. Introduction to Fuzzy Error Modelling
  - Exercise: Running your first FIS (using Feshie)
- 2:30 – 3:30 – O. FIS Error Modelling in CHaMP & BitBucket Repository
  - Exercise: Build CHaMP FIS for Bridge Creek (3 different methods)

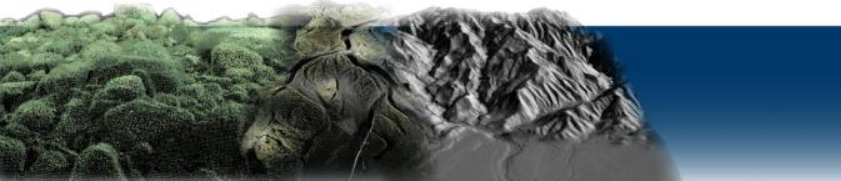
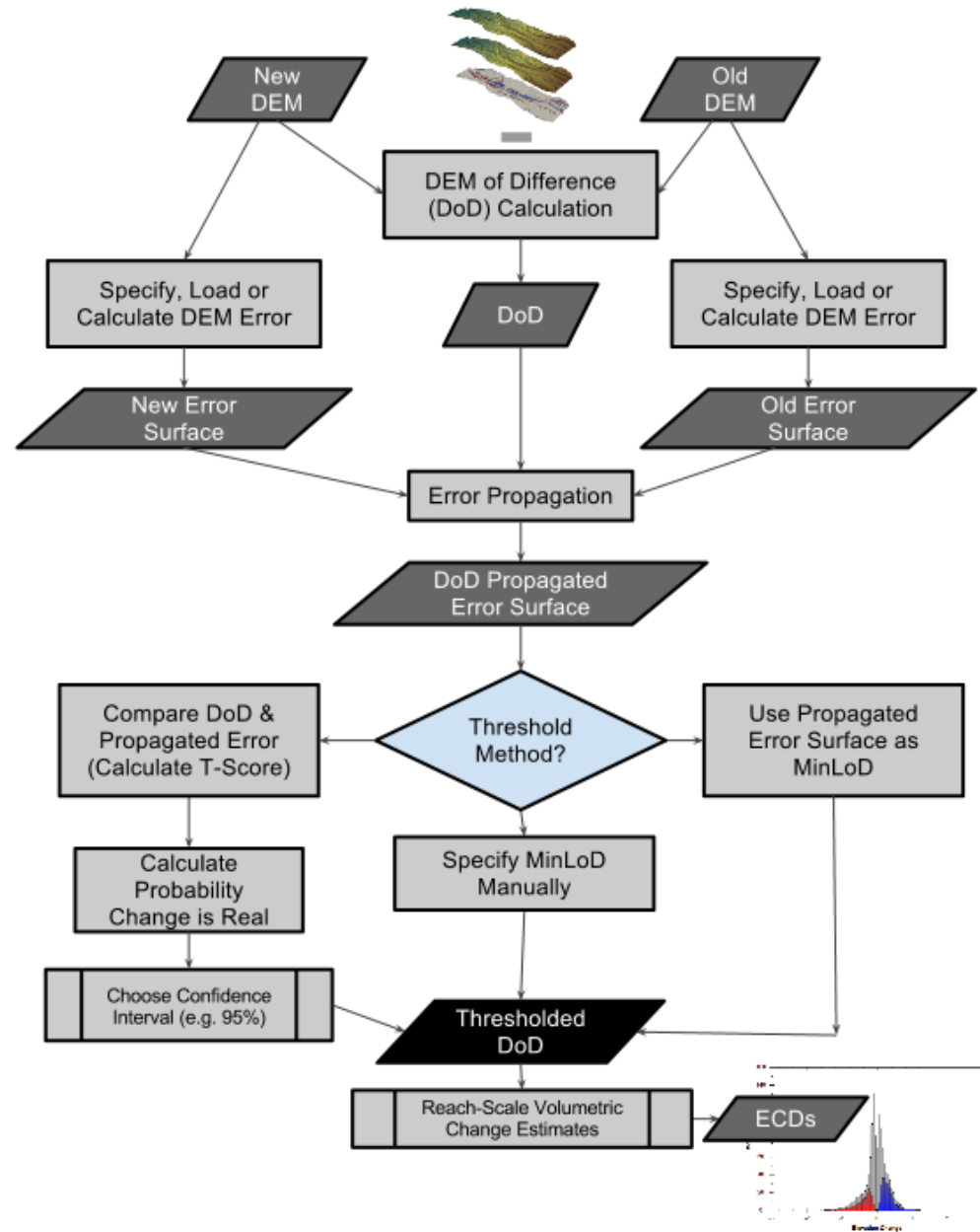
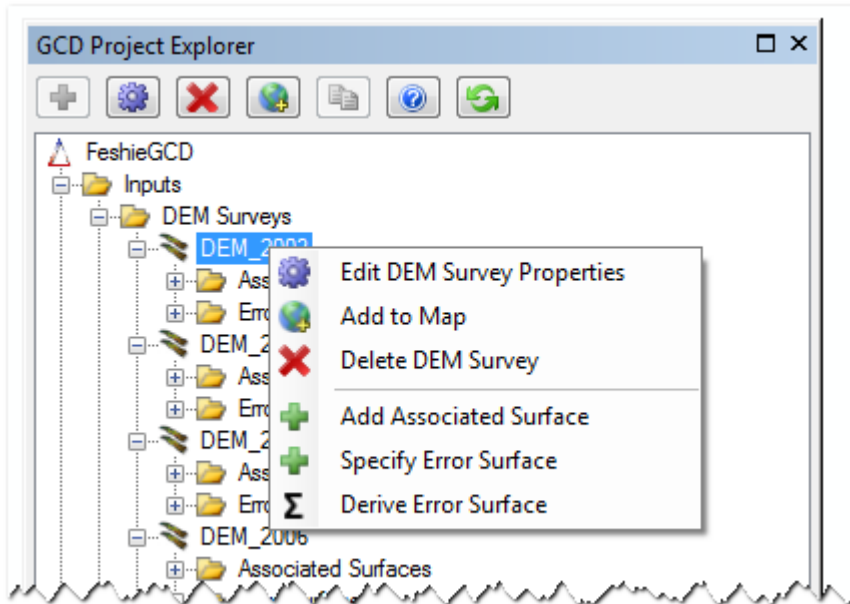
3:30 – 3:45 – Break

- 3:45 – 4:30 – P. Building your own FIS Error Models
  - Exercise: Building your own FIS for TLS flume data
- 4:30 – 4:45 – Q. Self-Paced - Prepping Surveys & Building Error Models for Change Detection
  - Exercise - Apply FIS from P to flume example data
- 4:45 – 5:00 – R. Recap of Day / Preview of Day 3
  - Exercise - Full Change Detection Example - Bridge Creek

Participants on own for Dinner



# USING THE GCD SOFTWARE...



# BY END OF WORKSHOP

You should understand:

1. GCD techniques and how they are applied to monitoring rivers
2. How to account for unreliability uncertainties in DEMs
3. How to interpret DoDs

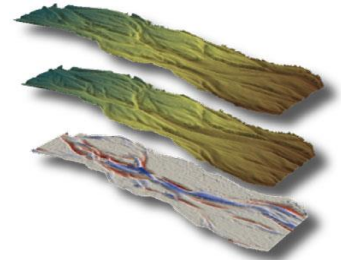
GCD  $\neq$  Glen Canyon Dam  
GCD = Geomorphic  
Change Detection



DoD  $\neq$



DoD = DEM of Difference =



# WORKSHOP LEARNING OUTCOMES

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Partial

• A comprehensive overview of the theory underpinning geomorphic change detection



Partial

• Instill background necessary to design effective repeat topographic monitoring campaigns and distinguish geomorphic changes from noise

- Methods for interpreting and segregating morphological sediment budgets quantitatively in terms of both geomorphic processes and changes in physical habitat



Partial

• Hands-on instruction on use of the [GCD software](#) through group-led and self-paced exercises

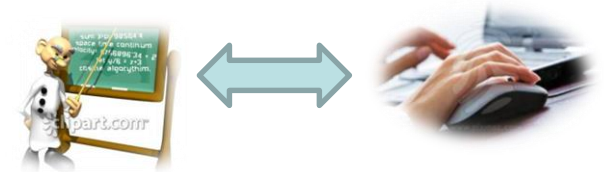
- An opportunity to interact with experts on geomorphic monitoring and the software developers of GCD to help you make better use of your own data



# WORKSHOP BIG PICTURE PLAN

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- A. DAY 1 – Surveying & DEM construction principles to support Change Detection
- B. Day 2 – Change Detection Principles & Error Modelling**
- C. Day 3 – Interpreting the Signal & Applications



# ONE LAST DAY!

- Finally, some geomorphology!

## Day 3 – Application & Interpretations of Change Detection

### Morning to Mid Afternoon - Interpretation of Change Detection

- 9:00 – 9:15 – Q & A – Misconceptions or Problems from Day 1 or 2
- 9:15 – 9:30 – **S.** Spatial Coherence Filter & Bayesian Updating
  - Exercise - Applying to Feshie
- 9:30 – 10:30 – **T.** Advanced GCD Topics  
Demonstrations & Discussion
  - GCD Projects & Folder Structure & Outputs
  - GCD Tricks & Tips
  - GCD Command Line
  - Batch Processing

Break: 10:30 -10:45

- 10:45 – 11:15 – **U.** The Morphological Method & Sediment Budgets from GCD
- 11:15 – 12:30 – **V.** Interpreting Morphodynamic Signatures & GCD Budget Segregation
  - Exercise - Budget Segregation - Geomorphic Interpretation

Lunch: 12:30 - 1:30

- 1:30 – 2:15 – **W.** Other Topics
  - Using Change Detection to Inform Morphodynamic Modeling - Hafen
  - Geomorphic Unit Tool - GUT - Bangen
  - Z-Cloud and Cloud Computing - Bailey
- 2:15 – 2:30 - **X.** Workshop Synthesis

### Late Afternoon - Exercises With Your Own Data

Participants are encouraged to bring their own repeat topographic datasets, and instructors will be on hand to help you load that data into GCD and perform analyses. Those participants lacking their own datasets are welcome to use either CHaMP data or Feshie data we provide.

- 2:30 – 4:30 – **Z.** User Exercises

