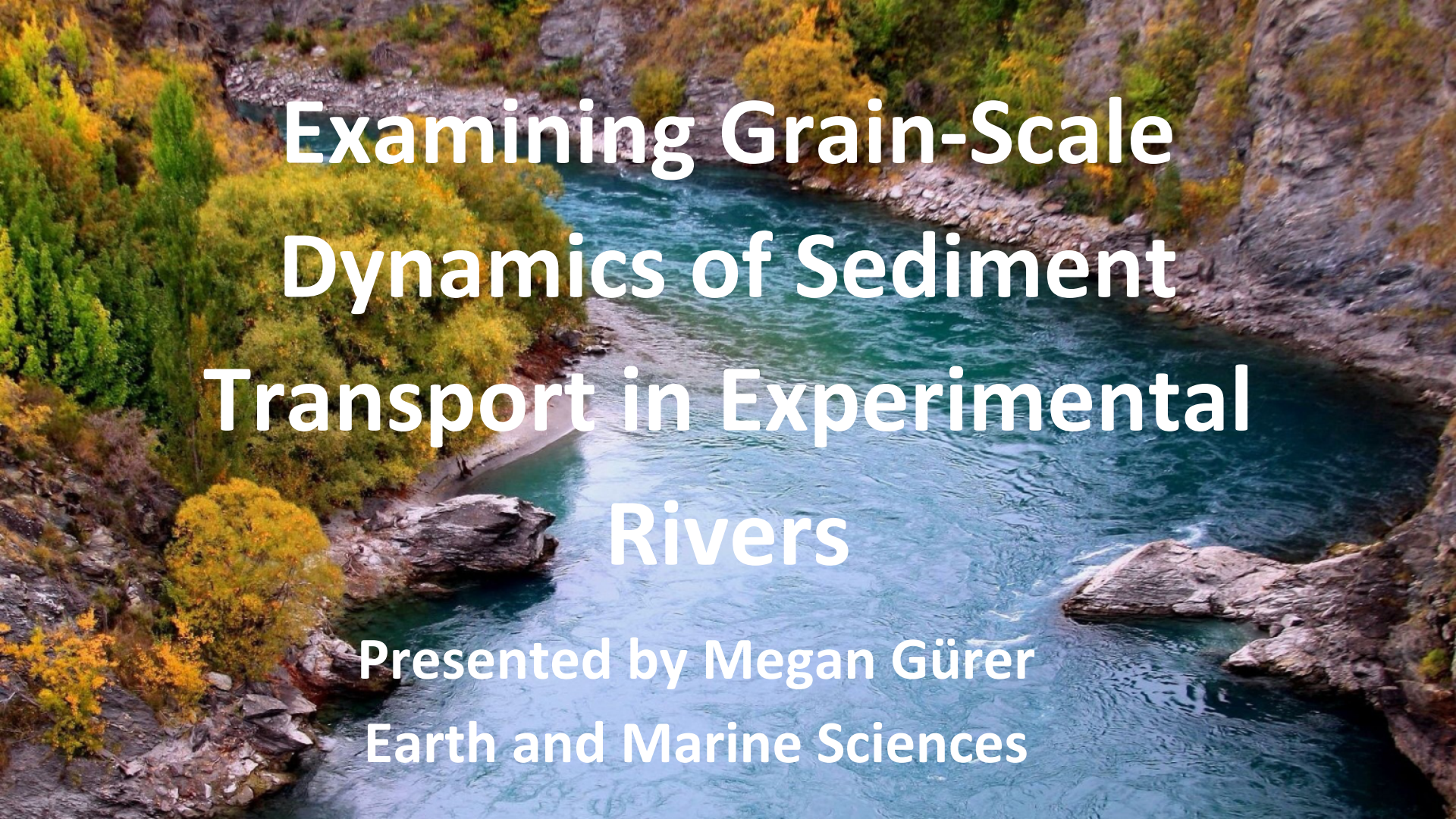


Examining Grain-Scale Dynamics of Sediment Transport in Experimental Rivers

Presented by Megan Gürer
Earth and Marine Sciences

Introduction:

- Rivers help shape the landscape
- Sediment is only transported less than 10% of the time

Introduction:

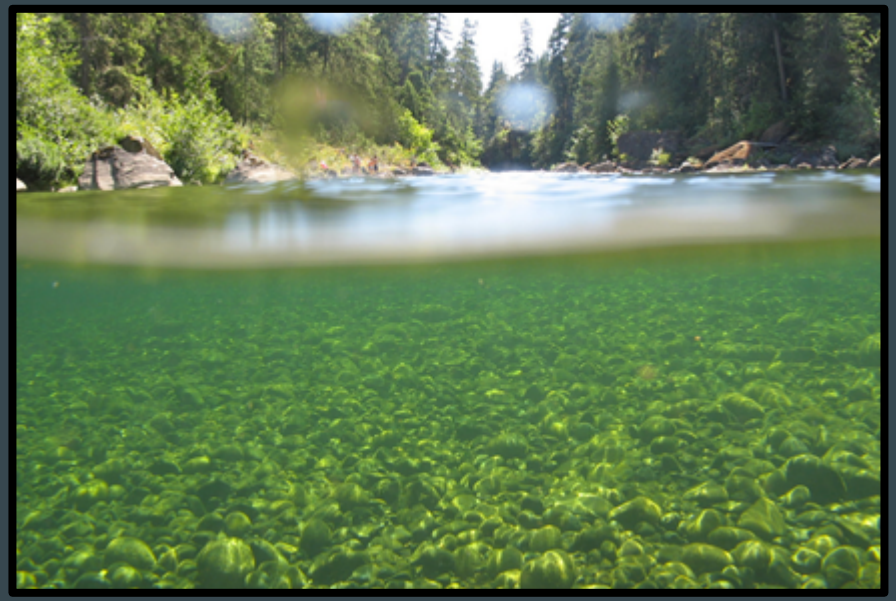
- Bedload: when large grains roll or slide along the bottom of a riverbed
- For a grain to move: promoting force > opposing force

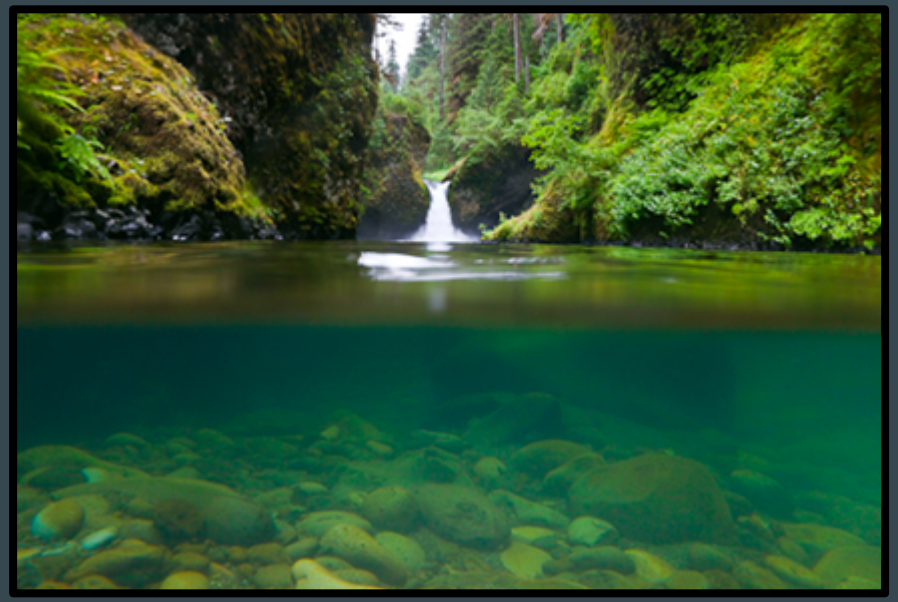
Real World Applications

- Affects health of river ecosystems
- Erosion rates and construction
- Examining ancient bedload structures

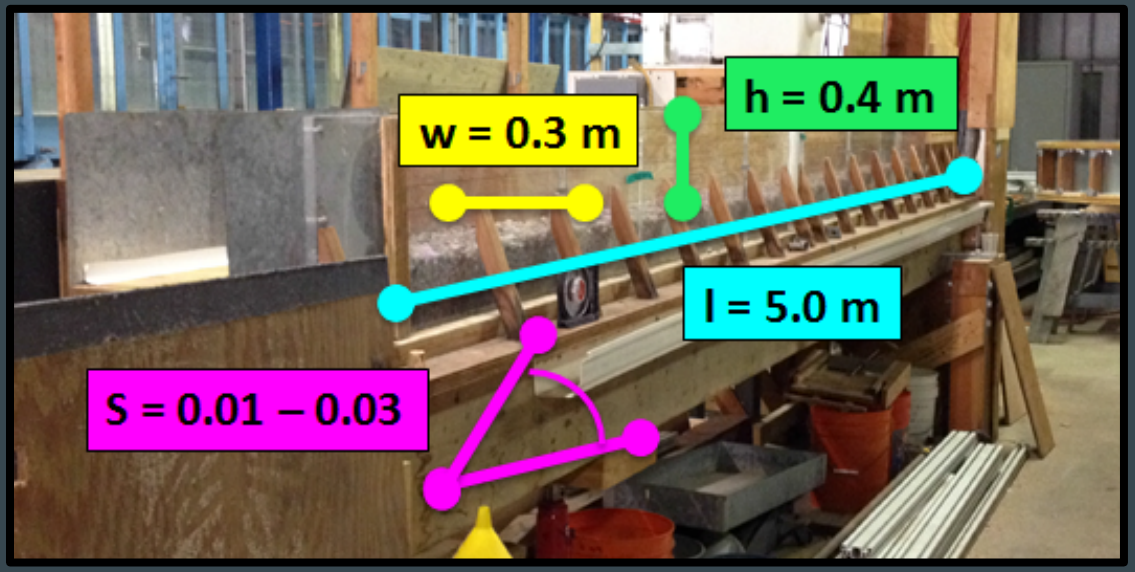
Areas of Focus

Main Question: How will low flow periods affect riverbed structure when no transport occurs?





Experimental Set-Up:



Experimental Set-Up

- Initial: before water runs over riverbed
- Conditioning: subthreshold velocity, no sediment is transported
- Transport: over threshold velocity, sediment is transported moves.

Initial

Conditioning

Transport

Flume Running Movies:

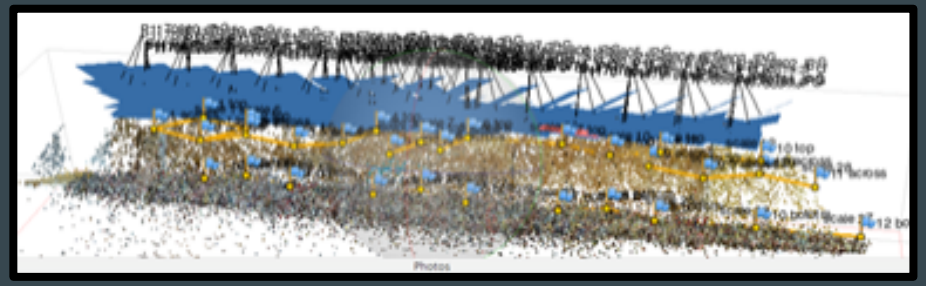
Water Flow Direction

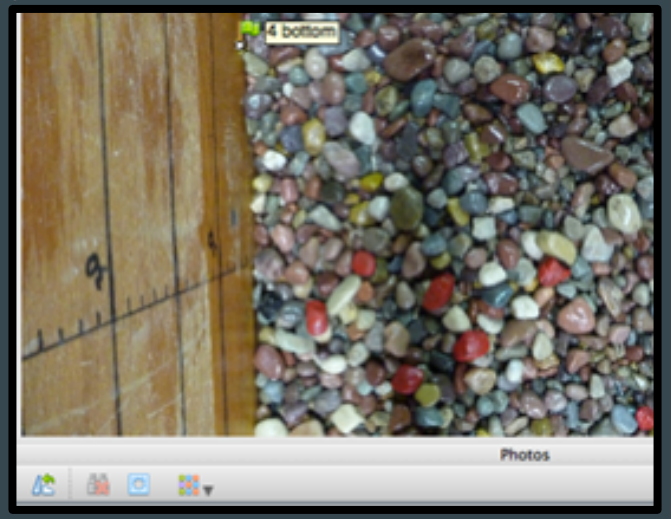
Conditioning-Low Flow

Transport-High Flow

Data Analysis: Protrusion

- Using Agisoft we made high resolution 3D models of flume bed each for initial, conditioned, and transport phases.
- Future project: calculate grain protrusion, overall slope of the bed, mean elevation and standard deviation of the riverbed





Data Analysis: Imbrication

- Measured long axes and orientations of grains in GS photos to measure imbrication, used ImageJ, Matlab, and Adobe photoshop.

Imbrication Prep:

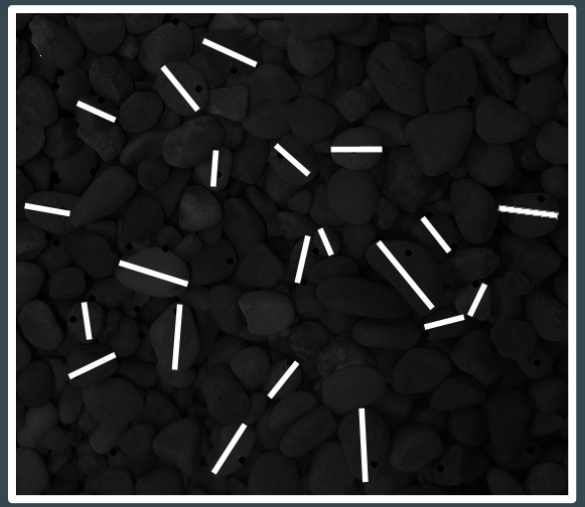
1) ImageJ: converted photos to 8-bit images
2) Matlab: wrote script to choose 100 grains at random to measure

Data Analysis: Imbrication

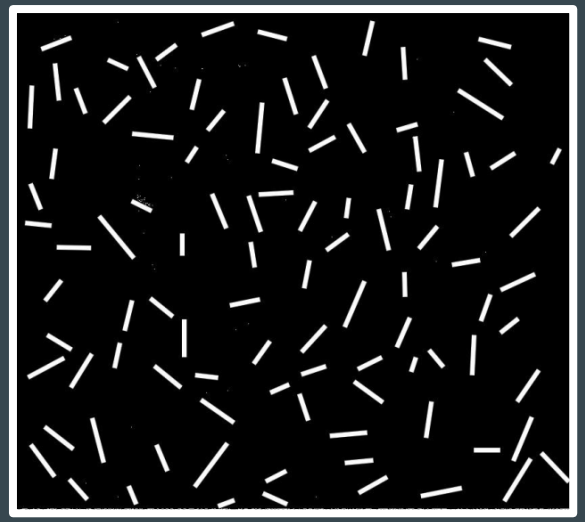
- Imbrication Analysis:

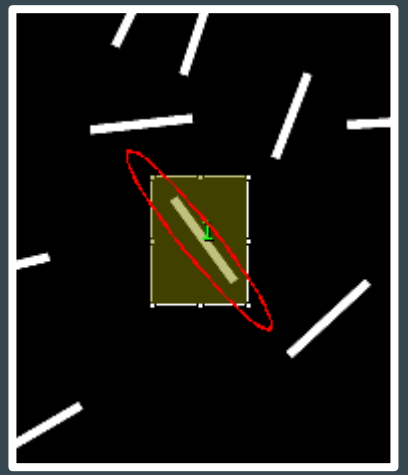
3) Photoshop: long axis measurements for 100 grains

4) ImageJ: used again to measure grain orientations, compiled into an excel spreadsheet to be analyzed.



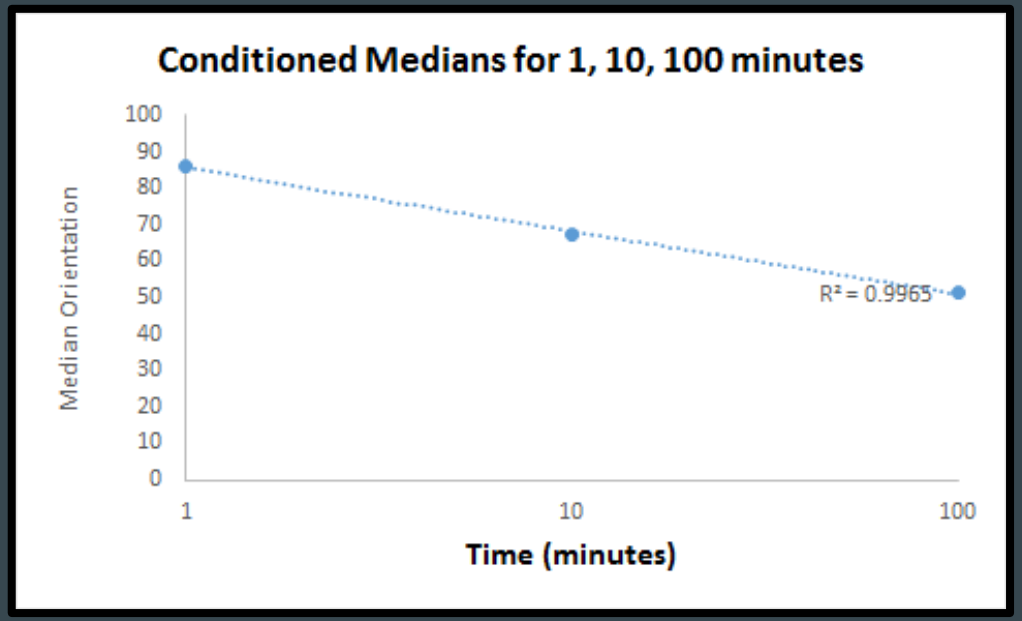
→

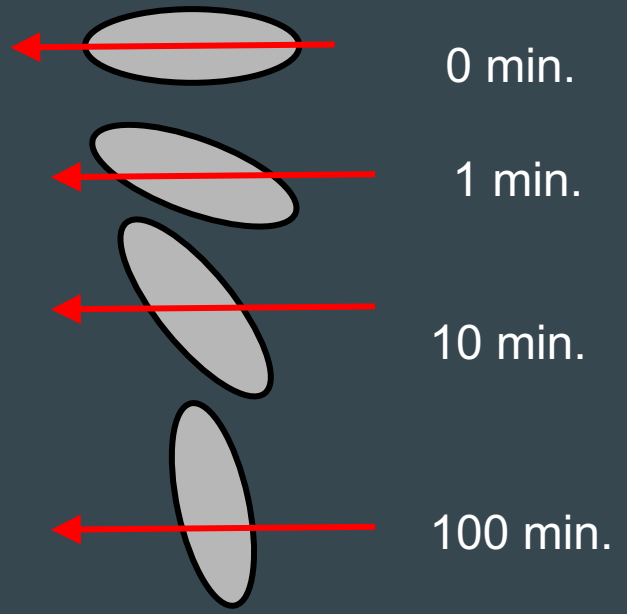




Data Analysis: Statistics

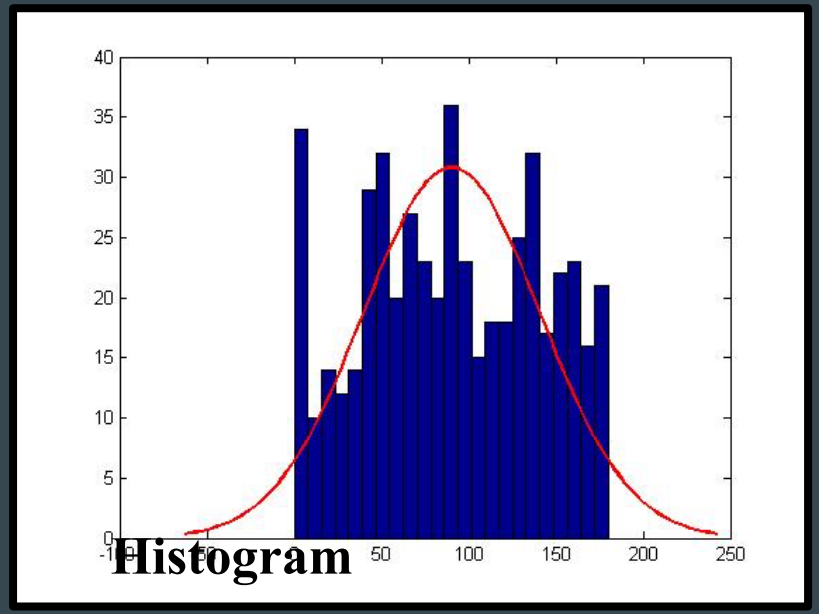
- Calculated median, standard deviation and percentage of grains between 45-135°

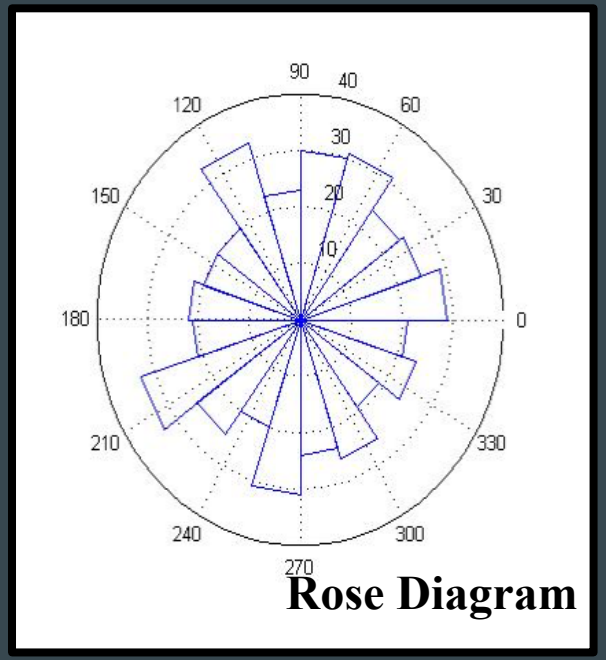




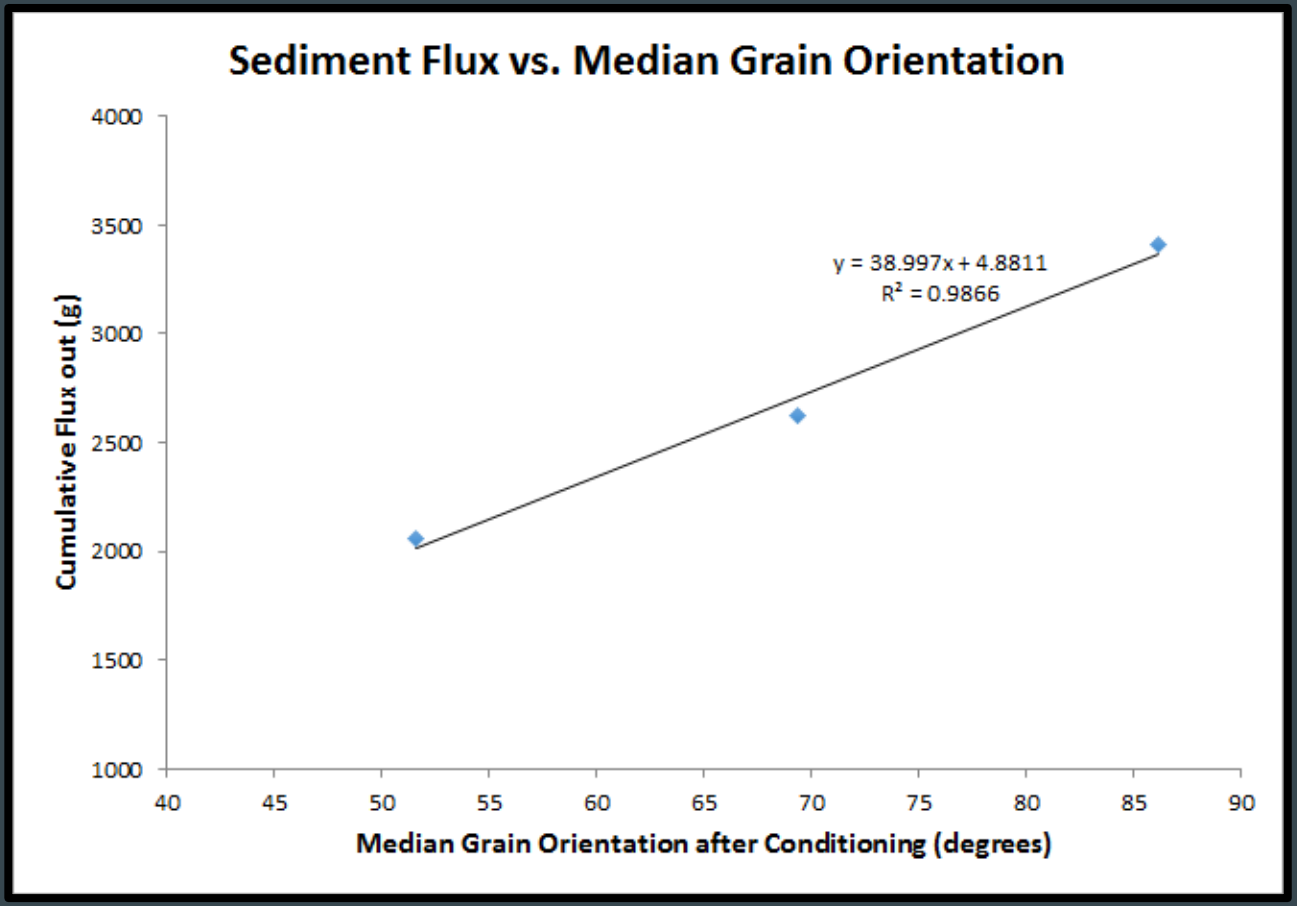
Data Analysis: Orientation

- Measured orientation using rose diagrams and histograms
- 90∘ are downstream
- 0 or 180∘ are cross-stream





Data Analysis: Statistics



Correlation between median angles and the amount of sediment that moves with time

Conclusions

- Grains reorient themselves differently in high and low flow periods:
- Low flow: grain's' long axis faces perpendicular to the flow (cross stream)
- High flow: grains' long axes face parallel to the flow (downstream)
- Presenting poster with findings from this project at the 2016 American Geophysical Union Fall Meeting!

Thank you!