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National Regional Sediment Management Program
ERDC-CHL:
Geomorphic Analysis Package Phase II

Description

This research effort is the continuation of the Geomorphic Analysis Package (GAP) tool development. The effort will focus on tool refinement and the development of a new component to aid users in conducting slope and stream power analysis using stage-discharge relationship from long-term stream gaging data and website integration.

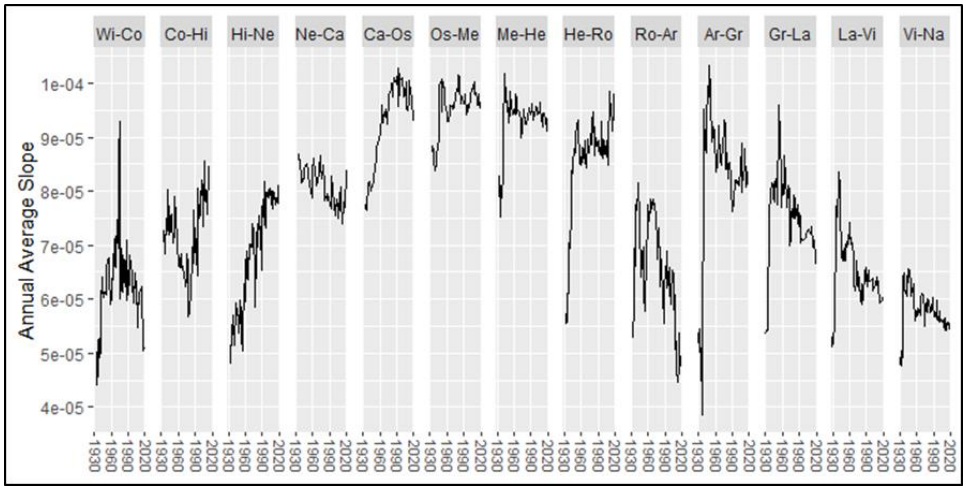

Figure 1: Example of average annual slope record developed for sequential reaches from upstream (left) to downstream (right).

Issue/Challenge To Address

Previous efforts initiated the development of a tool suite for automating common geomorphic analyses often used to assess the historical stability of a river system. The first component of the GAP established the general framework of the tool suite as well as an initial beta tool for performing specific gage analysis. One of the main aspects of the proposed effort is focused on the means of distribution. Currently, the objective is to move the GAP to a web-based platform which would allow users direct access to the tool suite. Also, further tool development will be initiated during this effort in order to expand the utility of the GAP and complement the existing specific gage analysis tool. In addition to specific gage analysis, further analyses can be conducted using stream gaging data in order to characterize the geomorphic behavior of a particular system. Specifically, long term stage-discharge records can be used to assess trends in reach averaged water surface slopes and stream power through time. In most alluvial channels slope acts as a dependent variable that adjusts to accommodate for the water and sediment loads imposed by the catchment. In addition, slope changes can also occur as a direct result of a perturbation to the system such as base-level lowering, channelization or channel realignment by bend cutoffs, and tectonic uplift of the valley floor. Therefore, slope and slope adjustments can often be used to describe and account for channel process-response to disequilibrium. The relationship between slope and discharge can also be used to describe the stream's ability to move sediment through the system, or the stream power of the channel. Stream power is often used to predict or assess the sediment transport capacity of stream and can act as an important descriptor of the capability of an alluvial stream to adjust its morphology through sediment erosion, transport, and deposition processes. The addition of such tools will improve our ability to assess the historical stability of inland systems and develop a better understanding of the movement of sediment from a regional perspective.

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Successes Lessons Learned

The framework of the geomorphic tool package has been developed including the initial tool for conducting specific gage analysis. While this tool has advanced the ability to quickly and effectively assess inland systems based on long-term specific gage records, the addition of complementary tools will improve or refine assessments further allowing for a more complete understanding of the system processes and interactions from a regional perspective. In addition, lessons gained from the previous effort highlighted the need for a web-based portal to house the tool suite. Integrating the GAP onto a web-based platform would improve the ability to distribute or access the developed tools and improve the ability to provide routine maintenance or tool updates for all users. Lessons learned will be compiled during the duration of this study.

Projected Benefits Cost Savings Value Added

The continued development of the GAP would improve the overall efficiency of geomorphic assessments and provide the ability to expand the spatial extents of analysis, allowing for a more complete understanding of the system processes and interactions from a regional perspective. Furthermore, establishing the tool suite on a web-based portal would allow users to access and use the developed tools for their specific projects with minimum effort.

Expected Products

- Slope and Stream Power Beta Tool
- Technical Note (draft within FY21)
- Web Integration

Stakeholders/Users

Beta testing of the tool suite will include ERDC engineers as well as any regional USACE District interested in using such tools for their projects.

Leveraging Opportunities

Development of a suite of tools used for geomorphic assessments of river systems would be beneficial Corps wide. This suite of tools could be coupled with other analysis tools readily available such as Cross Section Viewer (geometric analysis), HEC-SSP (statistical analysis; frequency, duration, etc.) to provide additional resources for users to perform assessments. Incorporating more tools (specific gage, stage-discharge relationships, slope, etc.) to aid in geomorphic assessments will provide the necessary support for users to implement sound regional sediment management techniques throughout all project phases.

Points of Contact

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Participating Partners

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