IAG Webinar North America

March 1 (Wed) 2023, 15:00 UTC (10:00 EST)

Coordinators: Tim Beach & Susan Conway
University of Texas, Austin & University of Nantes

INTERNATIONAL GEOMORPHOLOGY WEEK 2023

15:10–15:30

Catastrophic Lake Breach Floods and the Early Mars Landscape

Tim Goudge, Assistant Professor, Geological Sciences, UT Austin, USA

Two key pieces of evidence for liquid water on the ancient surface of Mars (>3.5 Ga) are: (1) branching river valley networks; and (2) paleolake basins, the majority of which have an outlet canyon that drained the lake. Valley networks are interpreted to form by erosion occurring throughout early Mars history, at least episodically, while paleolake outlet canyons are interpreted to form rapidly due to high-discharge, catastrophic lake breach floods. In this talk I will present an analysis of the global contribution of paleolake outlet canyons to valley erosion on early Mars and discuss implications for broader Martian landscape evolution.

15:30–15:50

The Road to Increased Sediment Yields in the Northeastern Caribbean – Roads as Hydro-geomorphological Features

Dr. Carlos Ramos Scharrón, Associate Professor, Geography & Lozano Long Institute, UT Austin, USA

Erosion is a key concern for the Caribbean because it can diminish soil productivity, damage infrastructure, and threaten human life. Additionally, sediments delivered to streams can degrade water quality and aquatic habitat, reduce reservoir water storage capacity, and threaten coral reefs. Road erosion in both dry and wet tropical areas in the region is a key concern since the 1990s and a much research on this topic has occurred over the past 30 years. In many dry coastal watersheds of the US Virgin Islands and Puerto Rico, surface erosion from unpaved roads, foot or off-road vehicle trails represents the primary sediment source. In wetter settings, like the forested and actively cultivated landscapes of highland Puerto Rico, sediment derives from cropland, but also surface erosion and land sliding largely connected to unpaved farm roads.

15:50–16:10

It takes mussels to move a river? Understanding the contribution of high-density mussel communities to geomorphic change in a large alluvial river

Lisa Davis, Associate Professor, Geography, University of Alabama, USA

Freshwater mussels occur in rivers across physiographic and climatological boundaries. They can live in dense aggregations for up to a century. Mussels could be important biogenic modifiers operating at spatio-temporal scales significant to fluvial geomorphology. This presentation discusses results of a multi-year and multi-phase experiment seeking to ascertain whether mussel biogenic effects are a missing part of the equation needed to better understand geomorphic changes in alluvial rivers. The study system harbors one of the most intact mussel assemblages remaining in North America, providing a unique and waning opportunity to examine how rivers and mussel communities coevolve.

16:10–16:30

Self-protecting landscapes in heterolithic lithology

Arnaud Temme, Professor, Geography and Geospatial Sciences, Kansas State University, USA

I will discuss recent findings from the Flint Hills ecoregion in the US Great Plains that indicate how these landscapes respond to climatic and undercutting triggers. The Flint Hills are composed of nearly horizontally layered sedimentary sequences of limestone and shale, each several meters think. This lets them develop complex hillslopes with series of mini-cliffs separated by slope segments. Using landscape modelling, we find that such hillslopes delay external signals better than landscapes with both thinner and thicker sedimentary layers. Using geochronology, we infer that break-up of cliffs and movement of hard blocks over slope segments occurs during periglacial conditions.

16:30–16:50

Co-producing Research Questions and Solutions to Coastal Erosion in Nunatsiavut, northern Labrador

Emma Harrison, Post-Doctoral Scholar, Oceanography, Dalhousie University in Halifax, Nova Scotia, Canada

Nunatsiavut is the homeland of Labrador Inuit and the first Inuit region in Canada to achieve formal self-governance. Continued access to significant places and cultural practices are local priorities for climate change resilience. Recent increases in coastal erosion threaten many such places in Nunatsiavut. In this community-led research effort, we integrate multi-generational Inuit knowledge with instrumental monitoring of topographic changes, winds, waves, and sea level at Webb's Bay, a site identified as a bellwether of coastal change in the region, to assess bluff stability under potential future geomorphic conditions and inform context-appropriate engineering efforts aimed at decelerating beach loss.

16:50–17:10

Holocene paleo-records reveal pre-conditioning factors for extreme floods

Ray Lombardi, Assistant Professor, University of Memphis, USA

Extreme floods are underrepresented in the instrumented record. Consequently, the drivers of extreme floods are not well understood. Longer paleo-records can offer greater insight into extreme flood response to a changing climate. I will present results from Holocene paleoflood studies along the Tennessee River, USA, and paleoclimate records to identify key flood drivers. Findings suggest drought pre-conditions the watershed for extreme floods by altering runoff response to increased warm season rainfall. This research has implications for improving physically-based flood frequency models and presents a need to improve compound hazard planning in the future climate primed for more frequent hydrologic extremes.

17:10–17:30

Geomorphological and hydrological responses to anthropogenic and climate drivers during the Maya early Anthropocene (Naachtun, Petén, Guatemala).

Cyril Castanet, Associate Professor, Université Paris 8, Laboratoire de Géographie Physique, France

During the Maya early Anthropocene (2000 BCE – 1000 CE) in Mesoamerica, socio-environmental interactions contributed to the rise and decline of the ancient Maya civilisation. At the scale of the exploitation territories of the Maya cities, the temporal variations of geomorphological and hydrological dynamics in response to anthropogenic and climate drivers are still poorly known. This constrains diachronic analyses of socio-ecosystems and, more particularly, of water and soil resources in the exploitation territories. This presentation analyses and presents a regional comparison of the dynamics of one of the most transformed hydrosystems and morpho-sedimentary systems by the societies of the Southern Maya Lowlands, during the second half of the Holocene.

17:30–17:50

Classifying surficial geology and geomorphology with deep learning models applied to multiband rasters

William Odom, U.S. Geological Survey, Reston, VA, USA

Identifying surficial materials and geomorphic features is a critical yet resource-intensive step in creating detailed geologic maps. The recent production of multiple user-friendly deep learning GIS software packages provides a new avenue for generating models that can efficiently map surficial materials and geomorphic features using high-resolution remote sensing data. We present a new workflow that uses convolutional neural networks in conjunction with multiband rasters derived from elevation data to map previously glaciated areas of New York. This presentation explores the advantages, complications, and future applications of this emerging map generation technique.