

Agricultural Adaptations in Response to Environmental Stress in the Tropics



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Motivation

- Maize is a major staple crop for modern populations, but the dynamics of the transition to maize farming remains unknown.
- Maize was domesticated ~9000 years ago in the tropics of Mexico, and by 4000 years ago, it contributed over 70% of protein in Mesoamerican diets.¹
- This archaeological project investigates the early Mesoamerican maize farmers in Belize, placing these developments in shifting environmental and climatic context.

Context

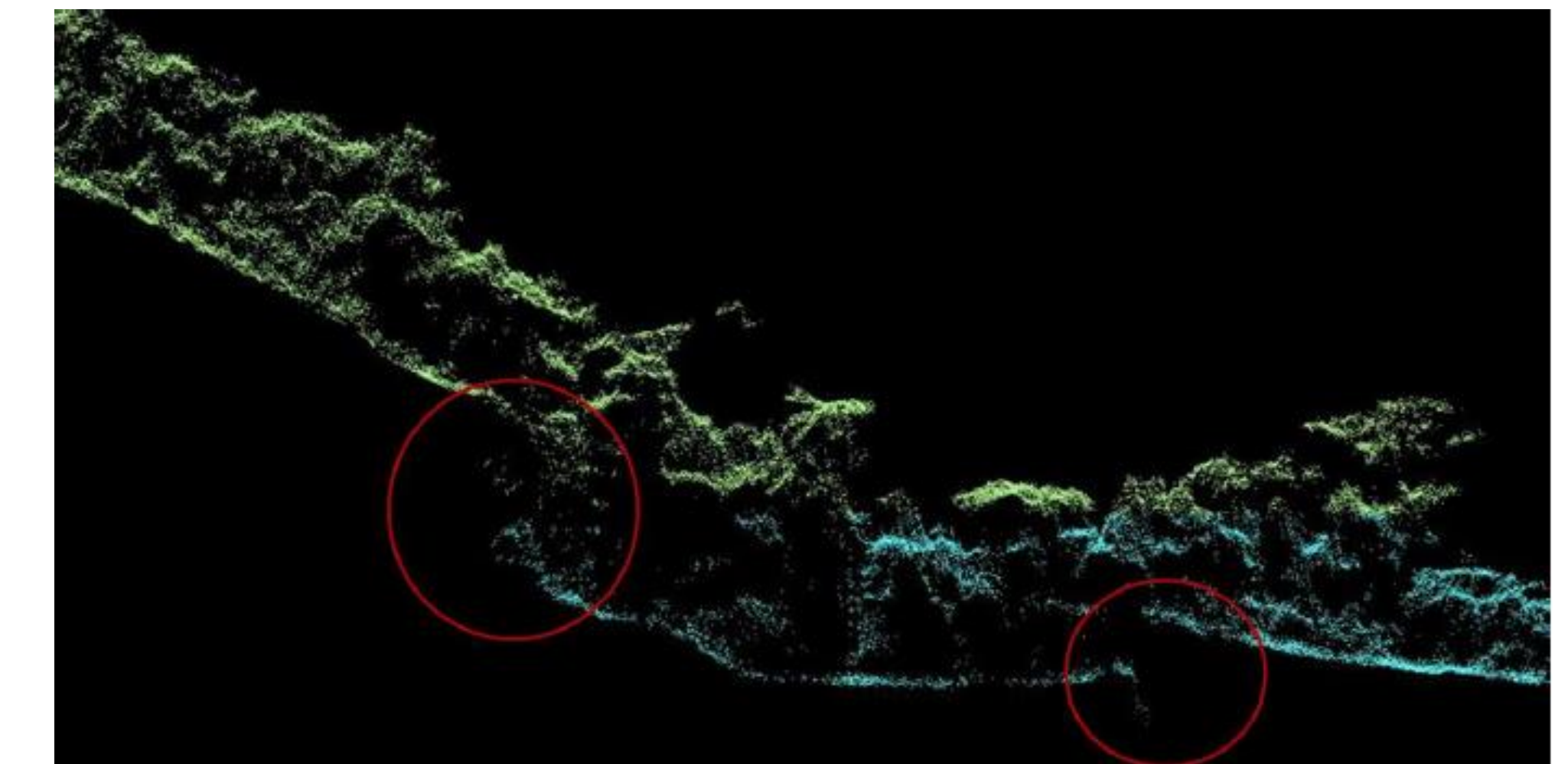
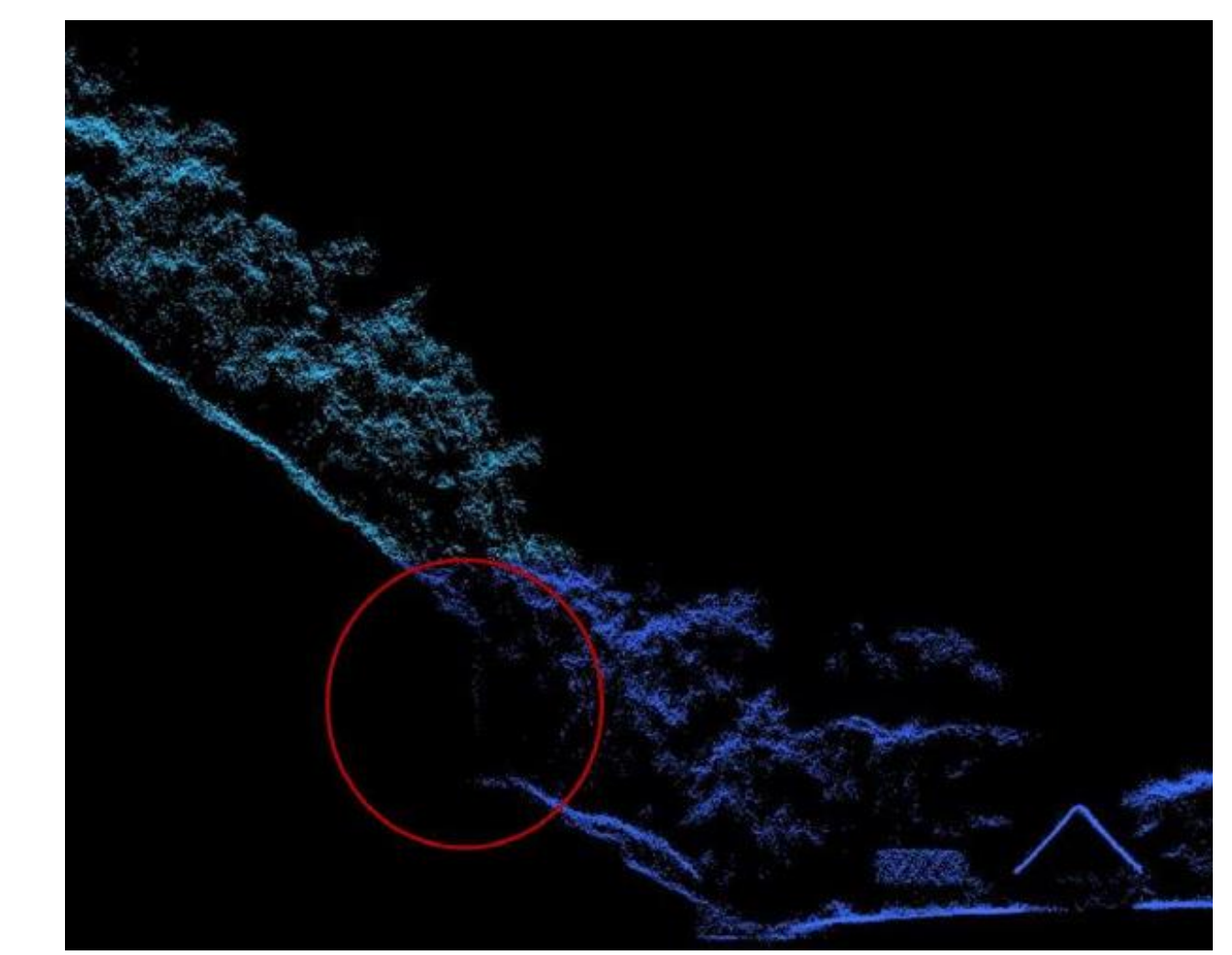
- The Maya lowlands of western Belize is an ideal case study to investigate the origins of agriculture because of an occupational sequence spanning over 10,000 years.
- Limited data suggests that maize farming intensified during the Late Archaic (3500-1000 BC), when worldwide environmental evidence document a global drying trend.²
- The best evidence for Late Archaic sites comes from rockshelters, but systematic survey and excavation has not yet been undertaken. This project will fill this gap.

Project Description

1. Summer 2021: Lidar (light detection and ranging) spatial analysis identified four types of sites to investigate: rock shelters, caves/sinkholes, depressions, and open-air camps.
2. Summer 2022: Fieldwork will focus on survey and excavation of a sample of sites identified by lidar analyses. Artifacts and soil samples will be collected.
3. Fall 2022-Spring 2023: Analyses in the Pitt Paleoecology and Isotope Geochemistry will include radiocarbon dating items for excavation and identification of plant remains from soil samples.



Archaeology in tropical environments is key to understanding the origins of agriculture, the most important evolutionary 'tipping point' in human prehistory, and its links to climate change.



Examples of rockshelter (top) and larger sinkhole with potential cave entrances (bottom) as shown by lidar.

Project Deliverables

- Academic outputs: New archaeological data will be reported by the end of the 1-year funding period in a progress report. Presentations are also planned for at least two academic conferences.
- Training Opportunities: A central aim of this project is to train from the US and Belize in survey, excavation, and lab methods.
- Public Communication: Public lectures at local events will disseminate findings and engage with Belizeans on archeology in the region.
- Future Goals: Data from this study will be used to obtain follow-on funding from the NSF Archaeology program with a larger, multi-disciplinary team of researchers. At least three peer-reviewed publications are anticipated.

Potential Impact

Climate change is accelerating. Mitigating its impacts on agricultural economies, especially in the tropics where nearly half of the Earth's human population lives, is one of the most pressing issues of our time.³ The results from this project will provide insight into how farmers exploited the rich natural biodiversity of tropical ecosystems, but also adapted to climate stress through agriculture.

References

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2. Booth, R.K., et al., 2005. The Holocene. doi: 10.1191/0959683605hl825ft
3. Roberts, P., et al., 2021. Proceedings of the National Academy of Sciences. doi: 10.1073/pnas.2109243118