



**Research Strategy Summit
Stirling, November 2016**

Inter-disciplinarity and Collaborative Research

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Arts & Humanities
Research Council



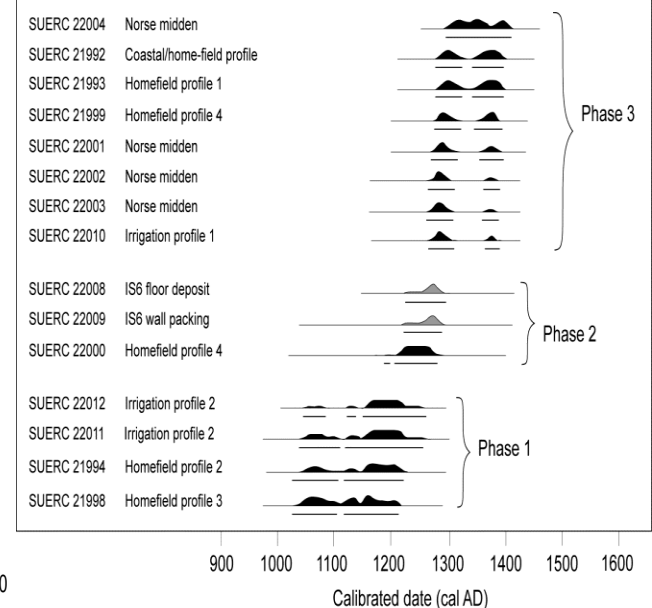
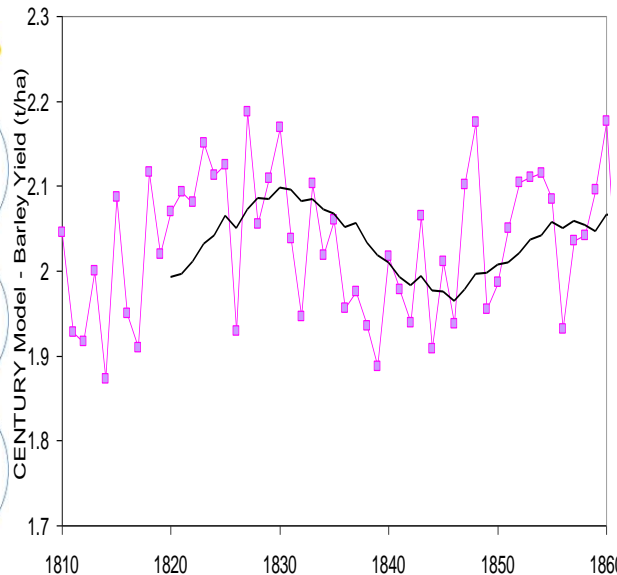
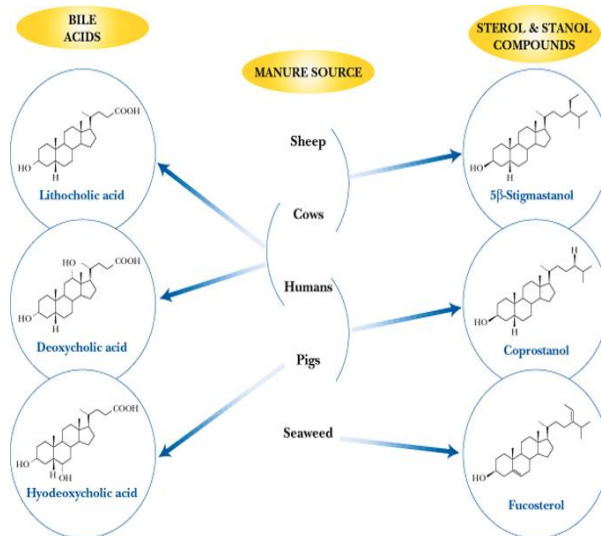
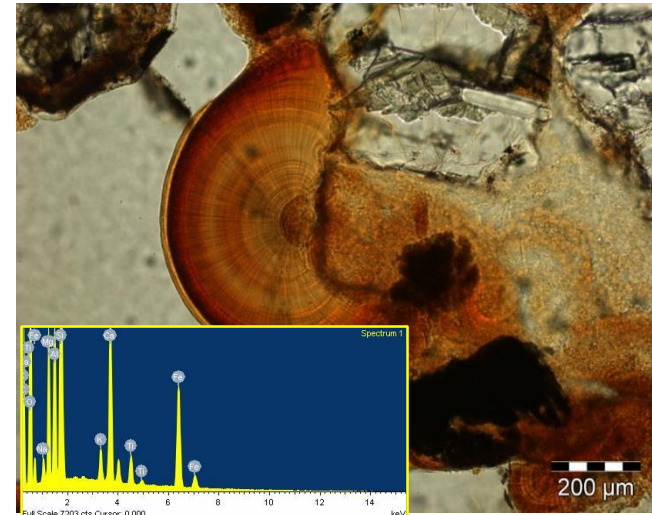
United Nations
Educational, Scientific and
Cultural Organization

UNIVERSITY *of*
STIRLING



Geoarchaeology

Reading soils, sediments and rock as records of the past



.....applied to issues of historic landscape change



South Asia region - Contested meanings - historical landscape consciousness



North Atlantic region – Pristine space to cultural place – sustainability and resilience

Characterising Inter-disciplinary research

- **Issues and questions focused**
 - Complex, ‘whole’ systems
 - Significant scale
- **Integrated team**
 - Critical mass and synergy
 - Expertise and skills
 - Contrasting models of management
 - Communication – internet
 - Academically committed
- **Common ‘systems language’**
 - Landscape systems
 - Integrated design
 - Field-based systematic observation
 - Experimental
 - Intervention
- **Integrative modeling tools**
 - Big data
 - Modeling tools
 - Cyber-infrastructure
- **Outcomes**
 - Thoroughly contextualised
 - Novel
 - Controversial and challenging

Heritage

Exogenous factors

Climate challenges

Short-term environmental
shocks

Armed conflict

Sustainable Futures

Sustainable and resilient
livelihoods

Reduce poverty and
inequality

Reduce conflict and
promote peace

Heritage

Challenging Historical Consciousness in Landscapes of Conflict

The Anuradhapura hinterland Sri Lanka

Ancient capital of Sri Lanka 300 BC - AD 1017

Sinhalese civilisation (sacred and secular)

Outstanding Universal Value

(ii) important interchange of human values...

(iii) bear a unique...testimony to a cultural tradition
or to a civilization....

(vi) directly or tangibly associated with events or
living traditions, with ideas....

UNESCO Inscribed 1982



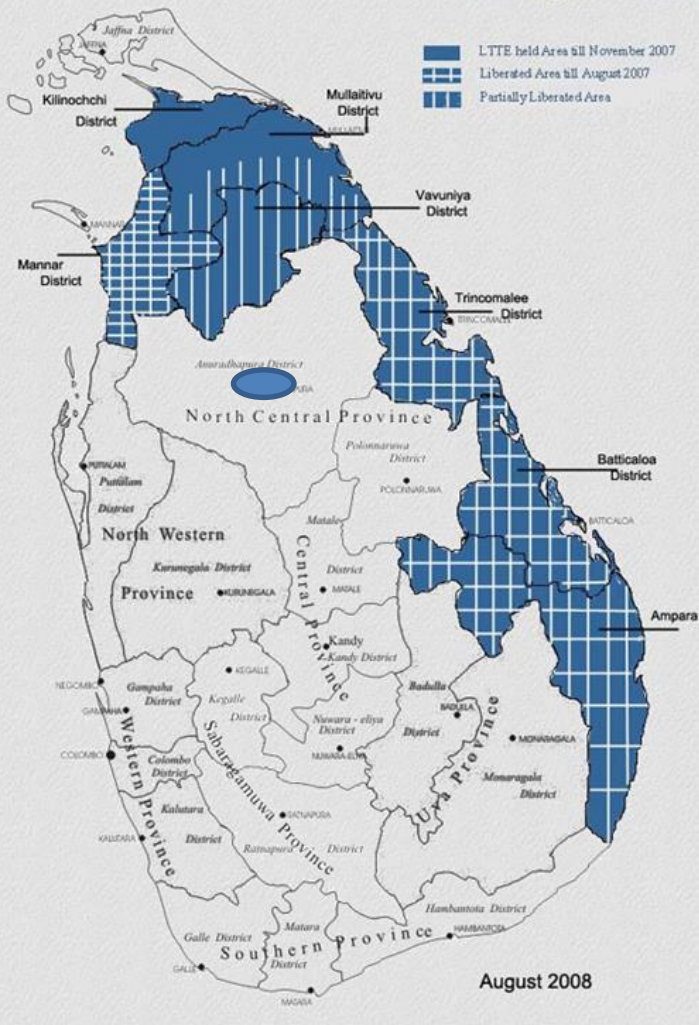
Anuradhapura, Sri Lanka: 14th May 1985



Sri Lanka Conflict Map

Institute for
Conflict Management

South Asia
Terrorism Portal



**‘Two nation’ state created by British colonial rule
Sinhalese and Tamil**

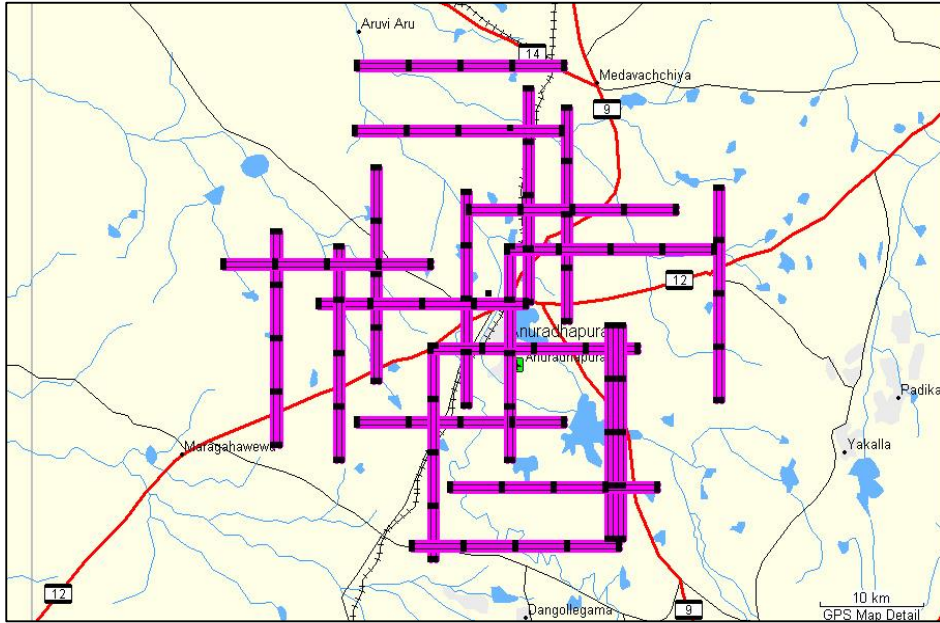
**First Tamil Tiger incursions outside a Tamil
majority area**

146 killed

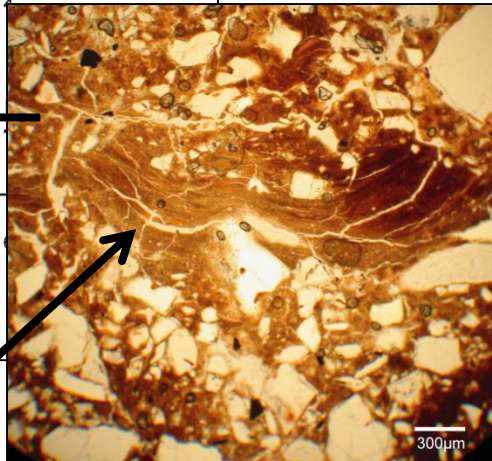
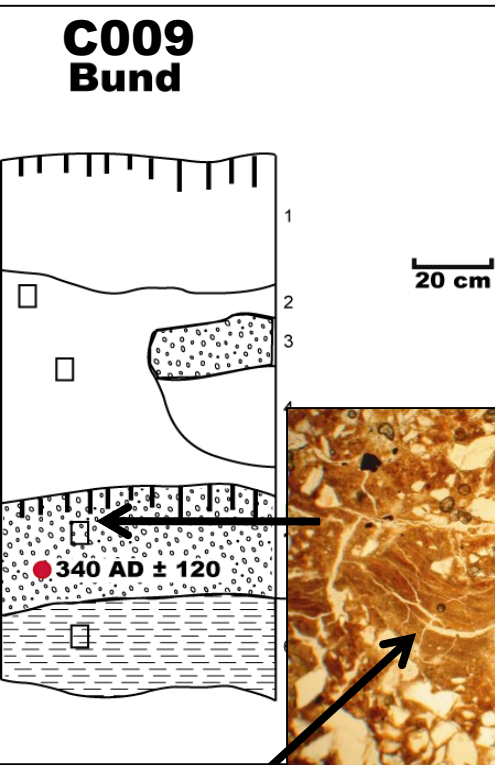
**Acceleration of massacres and war effort by
both sides**

**Anuradhapura, a city and hinterland to be
defended**

Anuradhapura hinterland Historic landscape survey findings

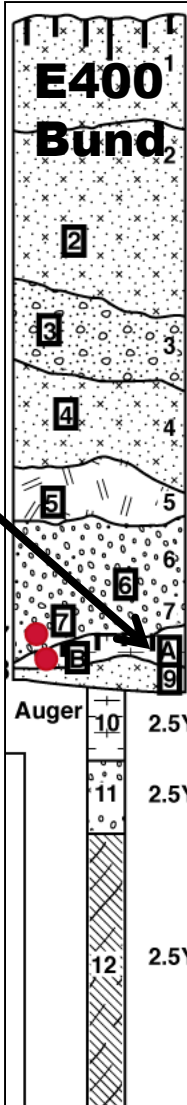
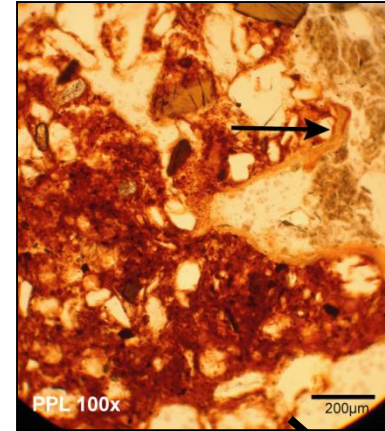


Water management infrastructure: Soil Micromorphology - Occupation, water management intensity, cultivation, abandonment

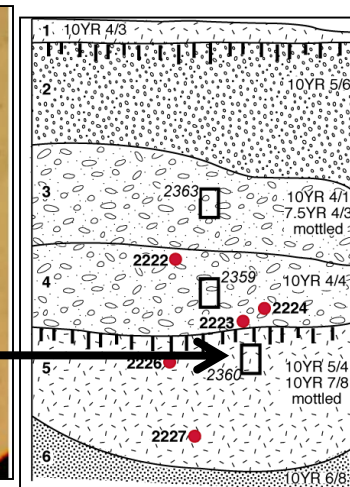
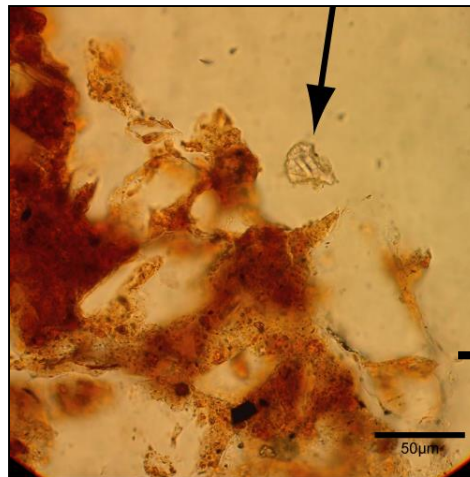


C009: Laminated very dusty and limpid clay feature documents cycles of disturbance/cultivation and soil formation, respectively

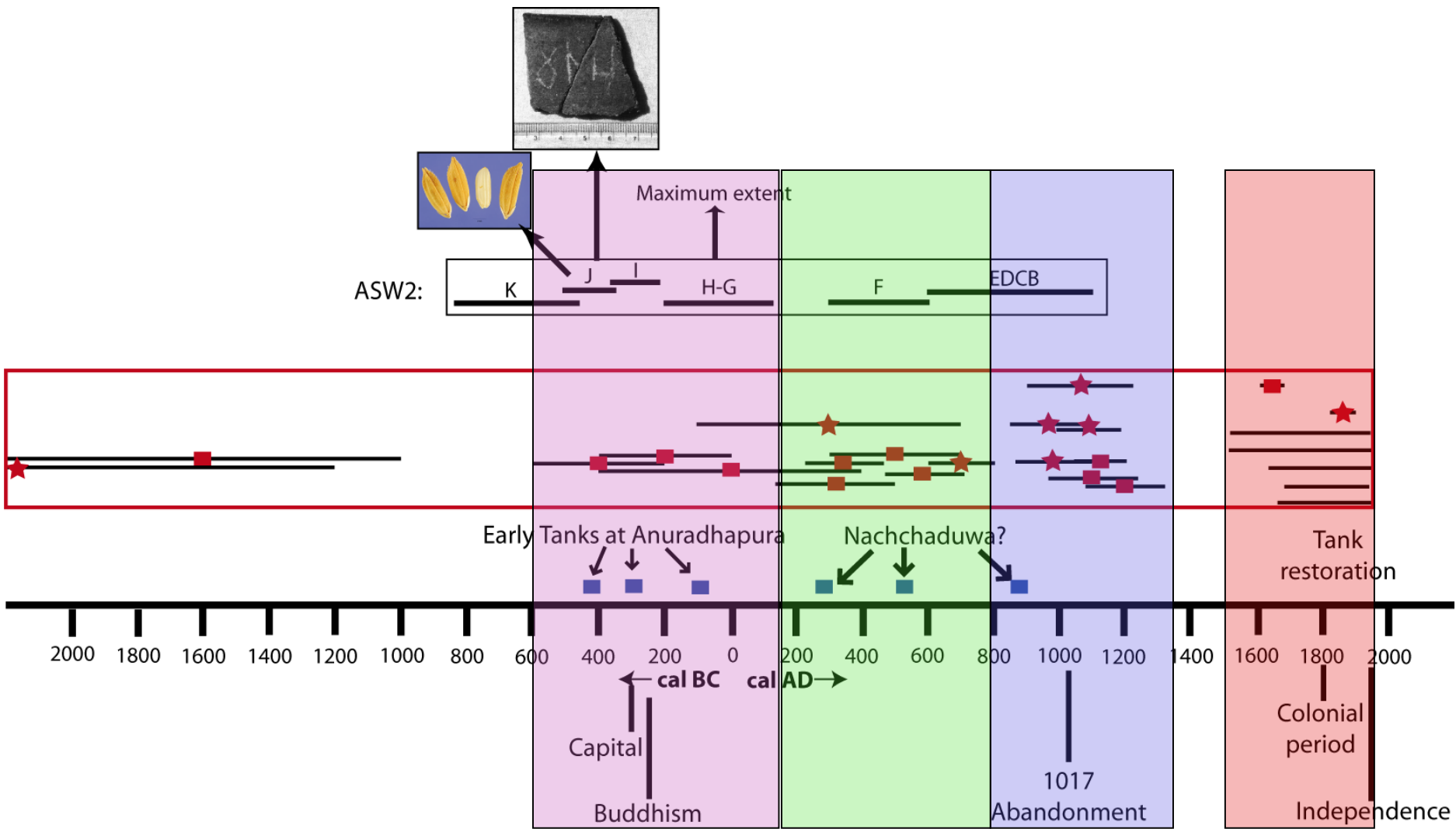
E400: Ceramics with differing anorthic clay coatings (example to right) document multiple contemporary or successive occupations prior to bund construction



Z021a: Cuneiform bulliform phytoliths points to irrigation and possible rice cultivation **Z021a Bund**



Identifying change: OSL and ceramics dating



Mesolithic	Transition	Iron Age	Early Historic	Middle Historic
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United Nations
Educational, Scientific and
Cultural Organization



JAPAN
Official Development Assistance

Supported by
Japanese Funds-in-Trust
to UNESCO



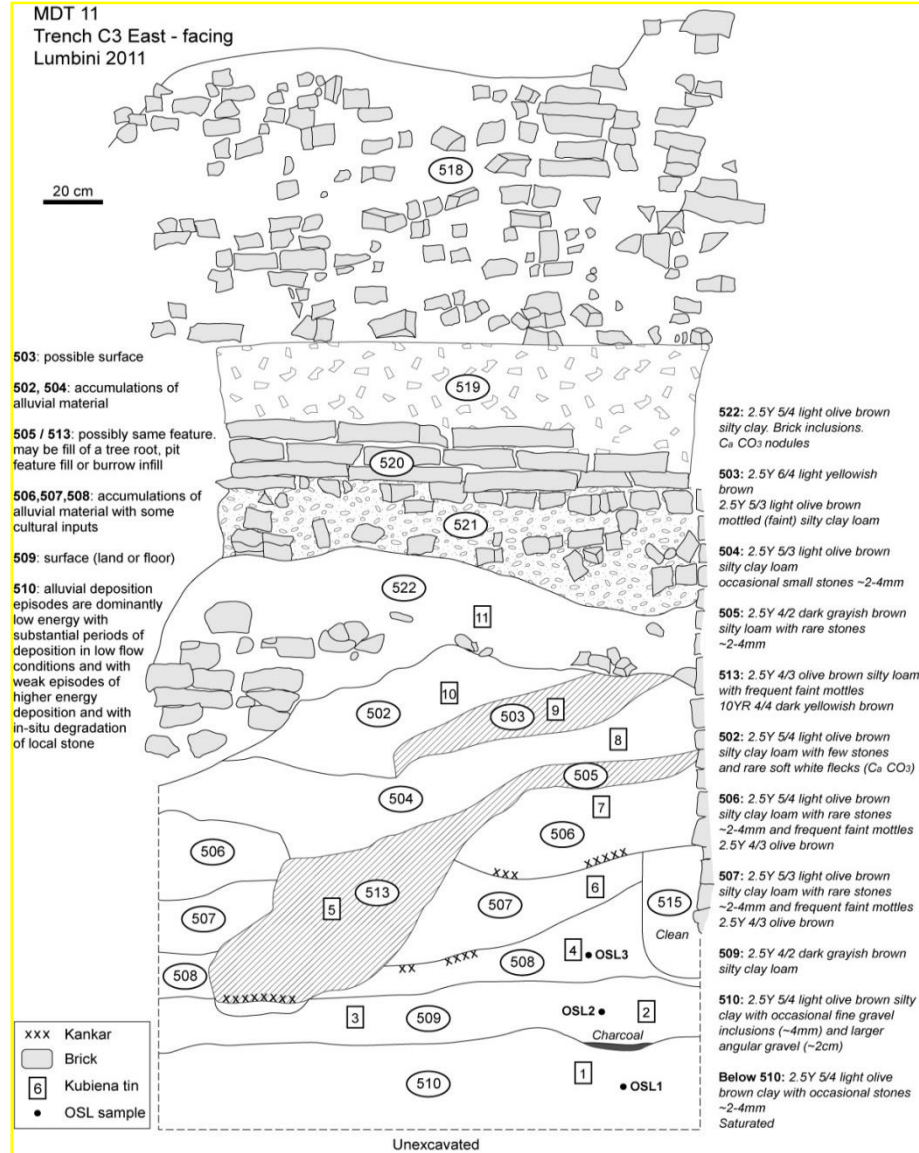
Natal Landscape of the Buddha

The earliest Buddhist shrine:

Site formation at the Lumbini UNESCO World Heritage Site

Reading the Soil: Stratigraphy

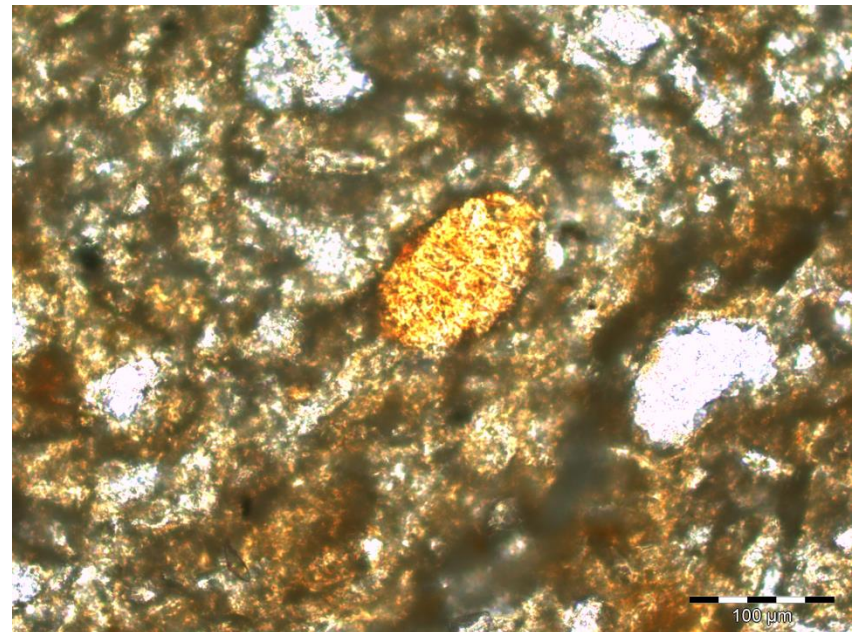
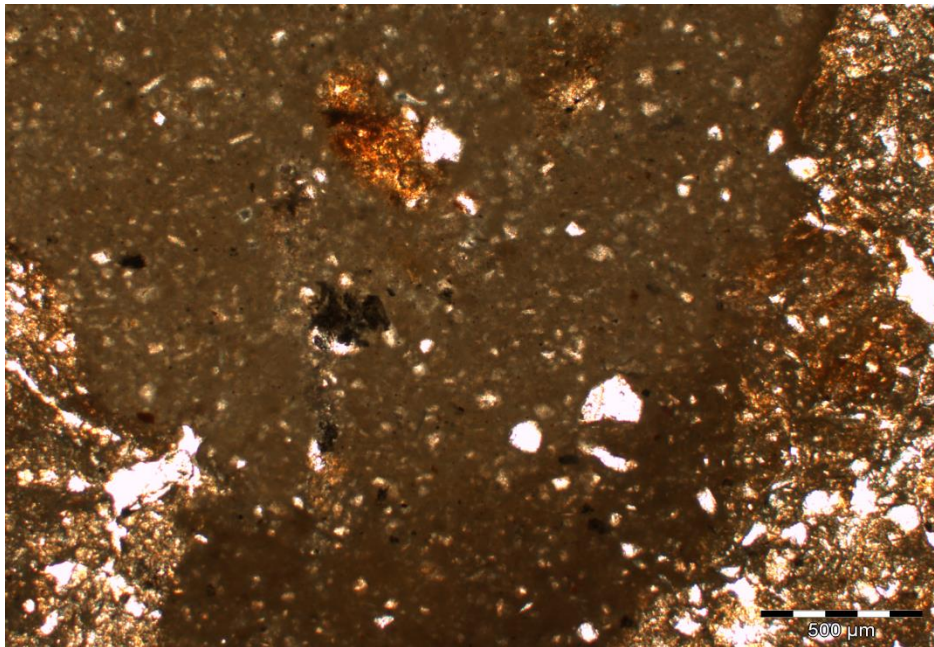
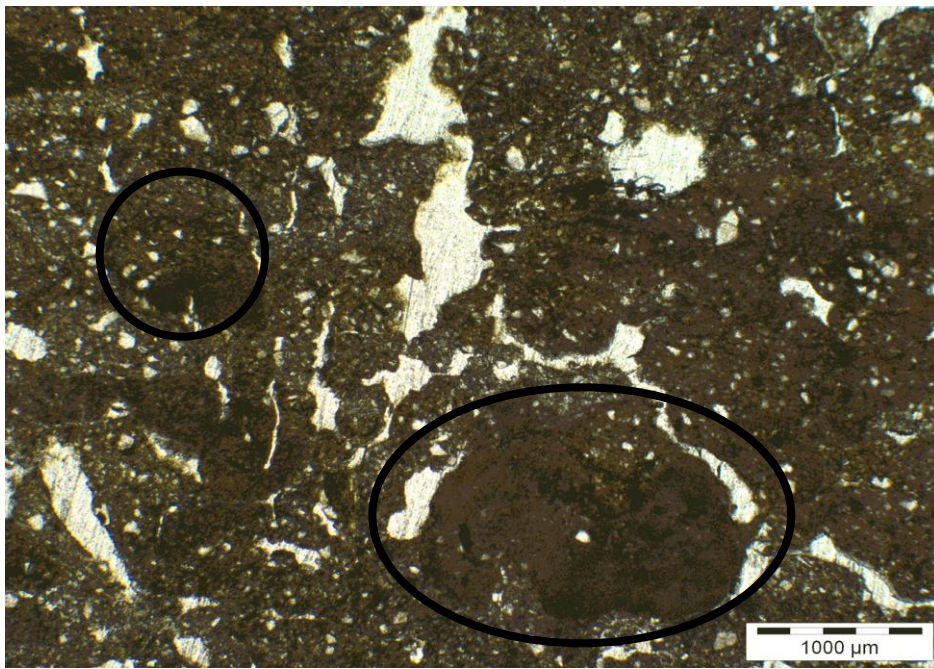
Maya Devi Temple



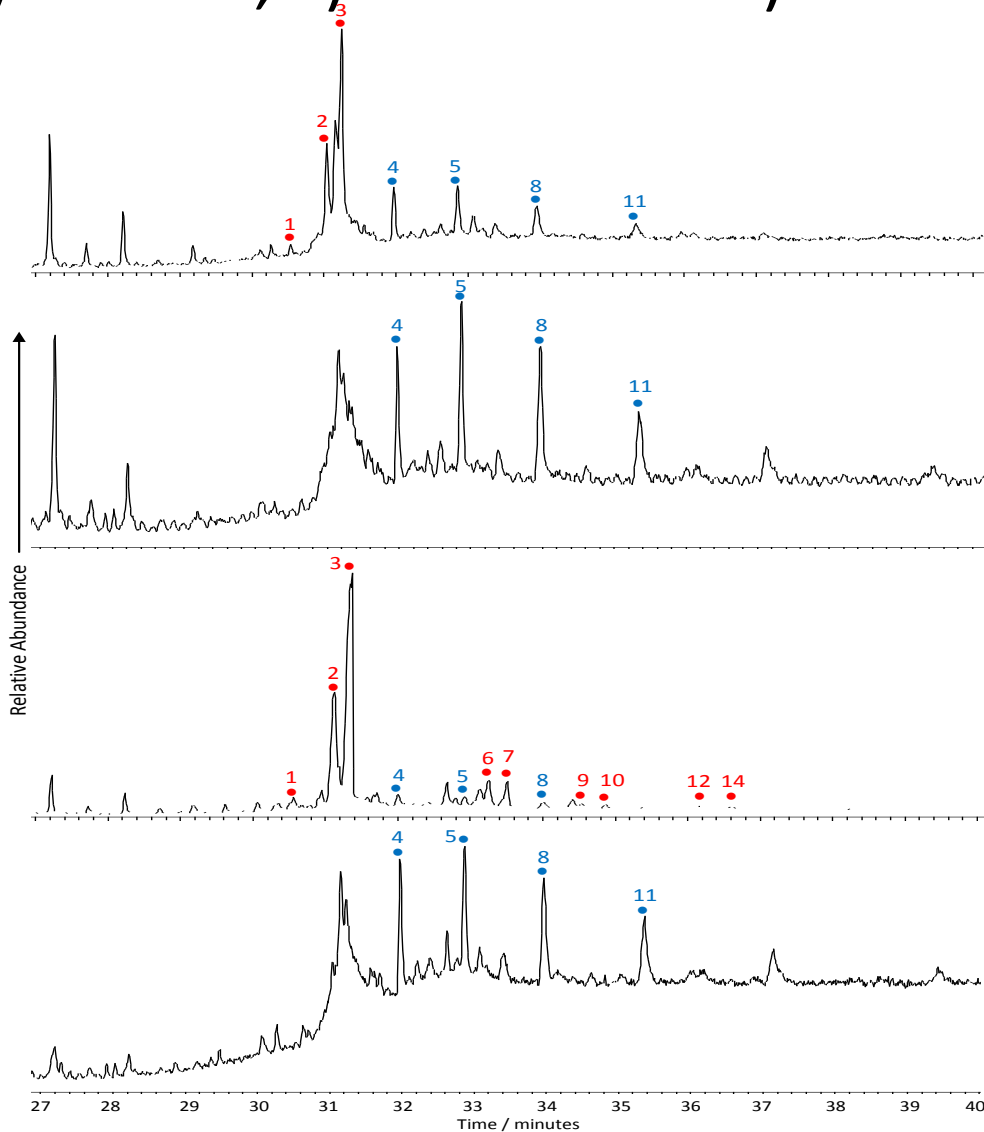
Early Temple Activity

MDT C5

MDT C5, context 506: Clay domains, tempered; Ca-Fe fragments. Indicates collapsed clay based structures with wash.



Partial mass chromatograms: triterpene methyl ethers (blue) and wax esters (red) fractions for the soils a) MDT L3, b) LVM L1, c) LPC L1 and d) LMS L3.



The earliest Buddhist tree shrine (from ca 550 BC) set in a village landscape



The Economic Potential of Lumbini



Annual Number of Buddhist Pilgrims to South Asia:

2012	5,000,000
2020	20,000,000

Annual Number of Lumbini Visitors

2000	17,000
2011	800,000
2020	2,000,000

Average Time Spent at Lumbini:

Sacred Garden	29.8 minutes
Maya Devi Temple	6.5 minutes
Asokan Pillar	2.7 minutes
Sacred Pond	2.8 minutes
Tree	4.9 minutes

'What makes a community resilient (or not)?'

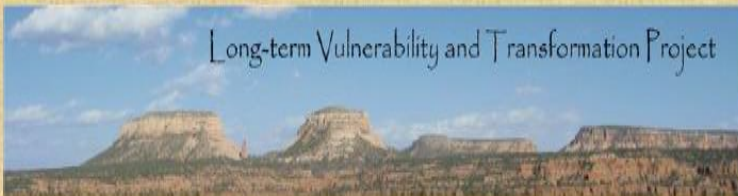
SW Desert Millennial Scale Cases



- Mimbres (Mogollon)
- Mesa Verde (Anasazi)
- Hohokam
- Zuni
- Salinas



Long-term Vulnerability and Transformation Project



North Atlantic Millennial Scale Cases

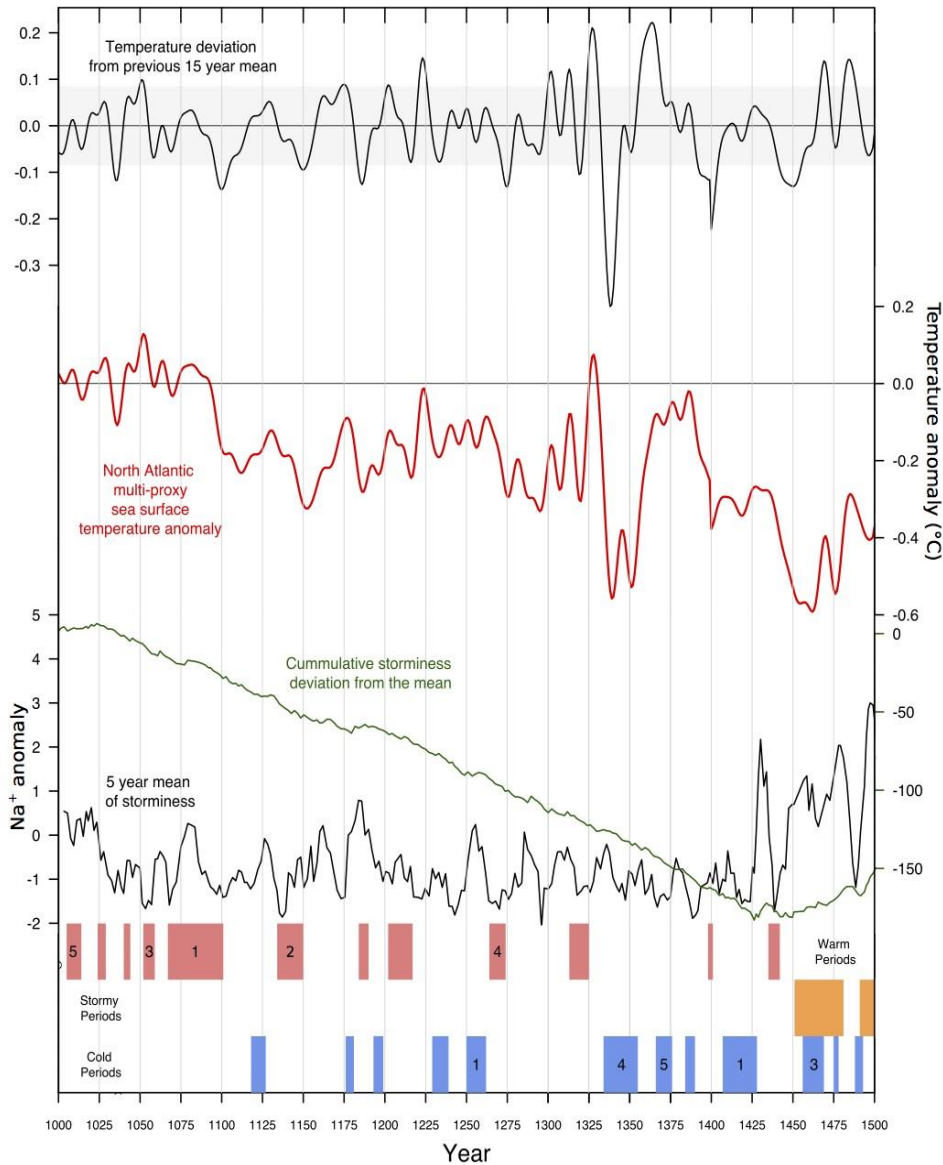


- Faeroes
- NW Scotland
- Iceland
- Greenland



NABO
North Atlantic Biocultural Organisation

Climate Challenges and Vulnerabilities,



Regions	Cases	Initiation date of challenge (CE)	Kind of shock
US Southwest	Zuni	1133	Extreme dry
	Salinas	1335	Extreme dry
North Atlantic	Mimbres 1	1127	Extreme dry
	Mimbres 2	1273	Extreme dry
	Hohokam 1	1338	Extreme dry
	Hohokam 2	1436	Extreme dry
	Greenland 1	1257	Extreme cold
	Greenland 2	ca. 1310	Regime change to colder system with increasing sea ice extent
	Greenland 3	ca. 1421	Regime change to stormier system, Extreme cold
	Iceland 1	1257	Extreme cold shock
	Iceland 2	ca. 1310	Regime change to colder system with appearance of sea ice
	Iceland 3	1640	Extreme cold and greatest extent of sea ice
	Faroes	1257	Extreme cold

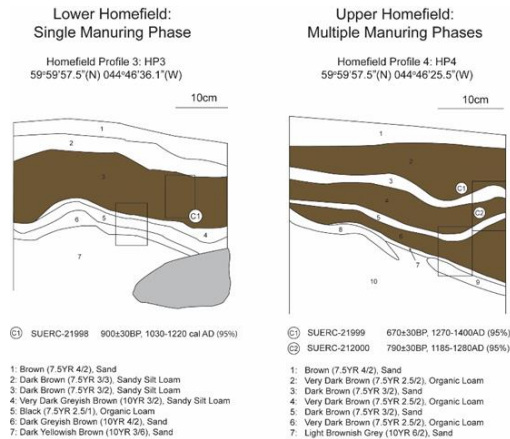
Geoarchaeology's of the North Atlantic region

Completed experiments in community resilience's

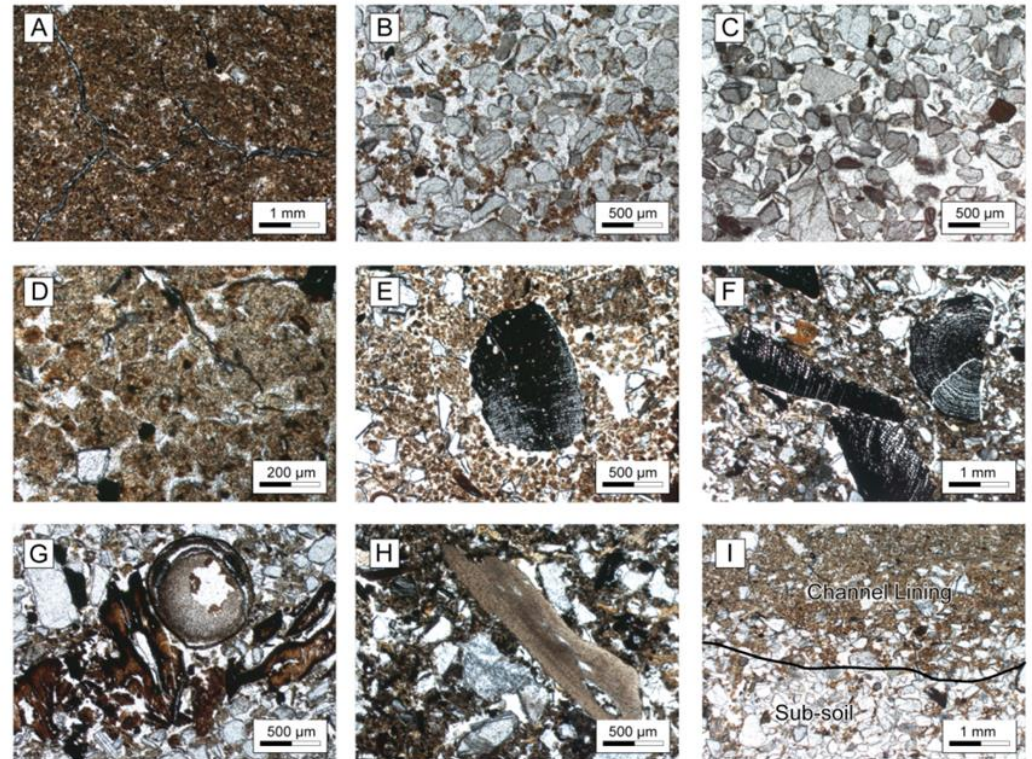
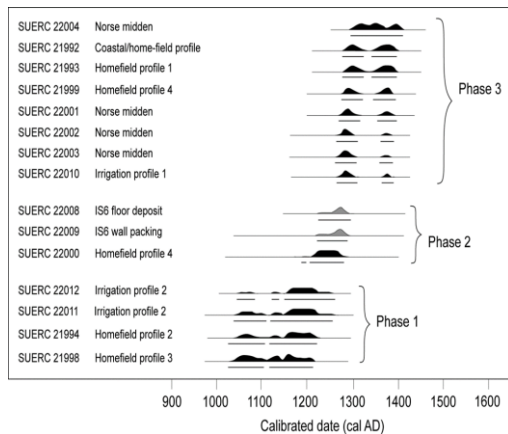
Soils as a record of how and why communities manage resources for the long-term future



Sandhaven, Greenland. Norse settlement landscapes



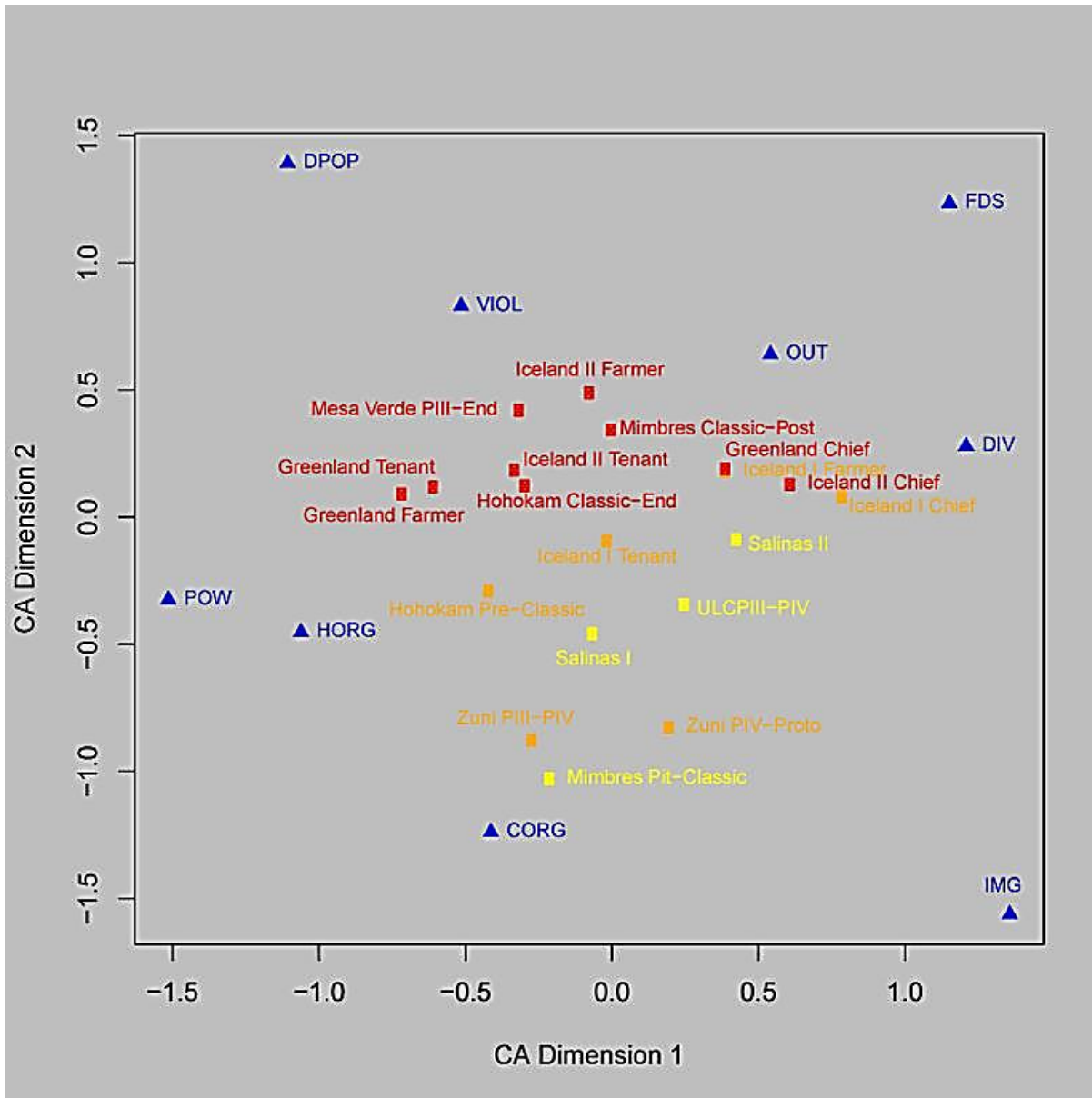
Sandhaven, Greenland. Norse homefield stratigraphies. Brown horizons are culturally created soils to enhance productivity.



Sandhaven, Greenland. Field system management expressed in thin section micromorphology

Sandhaven, Greenland. Field system phased radiocarbon chronologies

Barycentric Correspondence Analysis



DPOP – Depopulation

VIOL – Violence

HORG – Household org.

CORG – Community org.

FDS – Food stress

DIV – Diversity of networks

IMG – Immigration

POW – Dist. of power

OUT – Connections to outside world

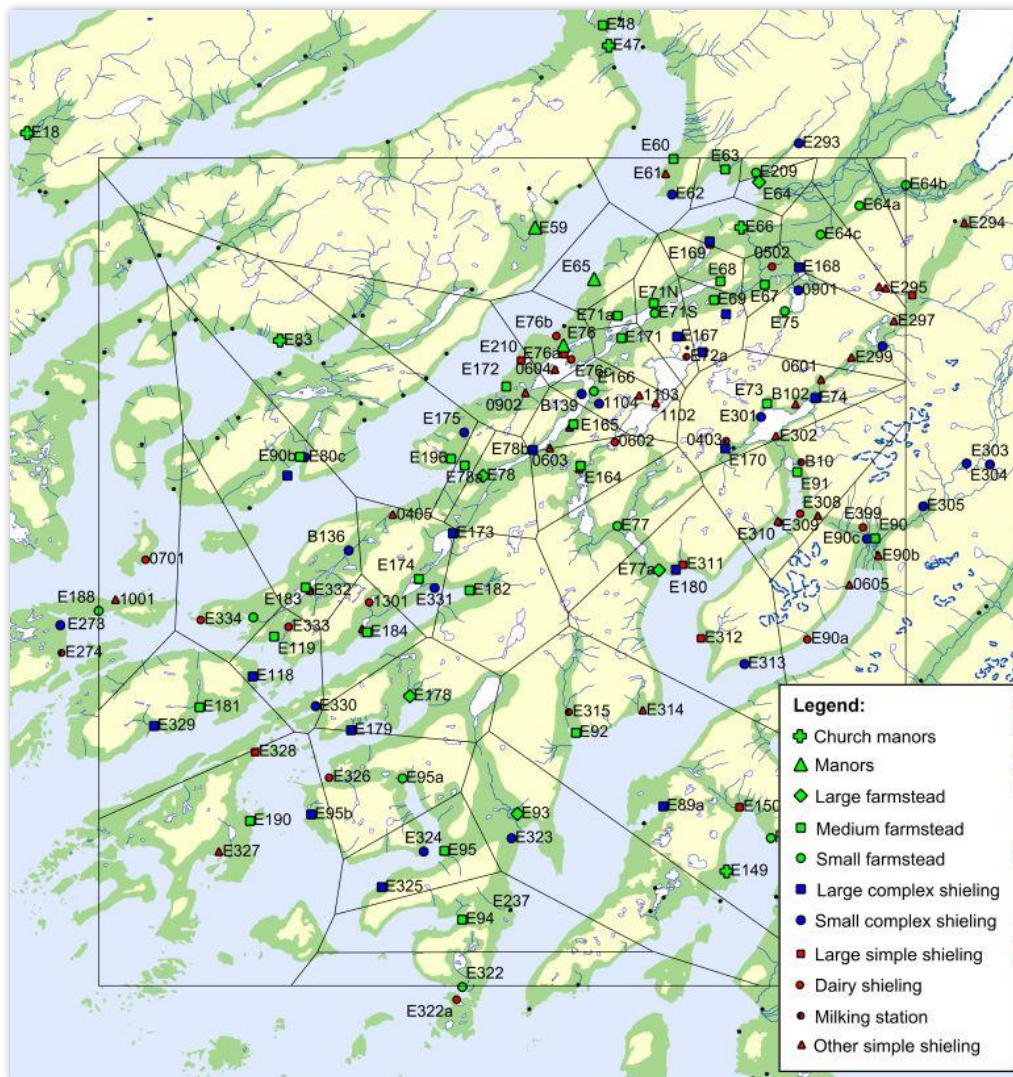
‘What makes a community resilient (or not)?’

The ‘certain’ evidence from Historical case studies

Food stress and associated resources

Diversity of networks, including connections to the outside world

Distribution of power – distributed power



Outcomes:

Thoroughly contextualized, Novel, Controversial and challenging



Social construction and deconstruction of a 'theocracy'

- Theocratic and secular v. Buddhist landscapes
- 'Western' interpretations of landscapes
- Monitoring of foreign archaeologists proposed.

The New York Times
NYTIMES.COM

India and Nepal in Not-Very Enlightened Spat Over Buddha's Childhood Home

<http://mobile.nytimes.com/2016/06/02/world/asia/nepal-india-buddha-kapilavastu.html?smid=tw-nytimes&smtyp=cur&referrer=https://t.co/JEDNY7mVis>

Science
AAAS

Why did Greenland's Vikings Disappear?

<http://www.sciencemag.org/news/2016/11/why-did-greenland-s-vikings-disappear>