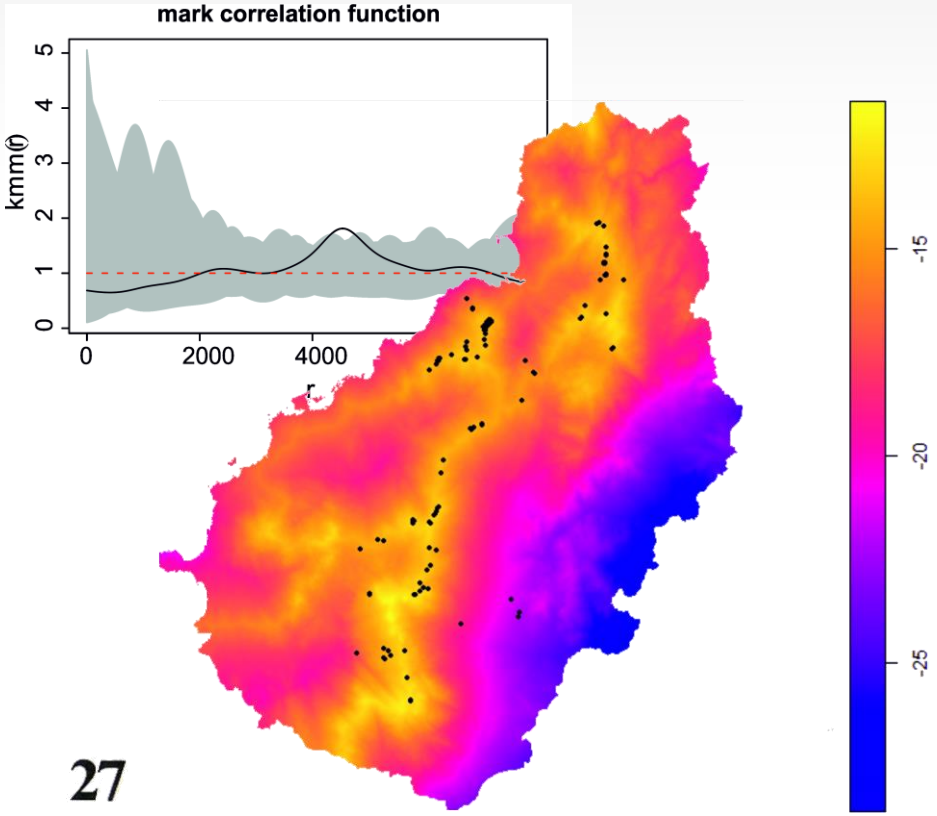
Modern spatial statistics move us beyond environmental determinism

A ‘provocation’ for

SCOTLAND'S ROCK ART PROJECT

Mark Lake
UCL Institute of Archaeology



27

Postscript—GIS, environmental determinism and archaeology: a parallel text

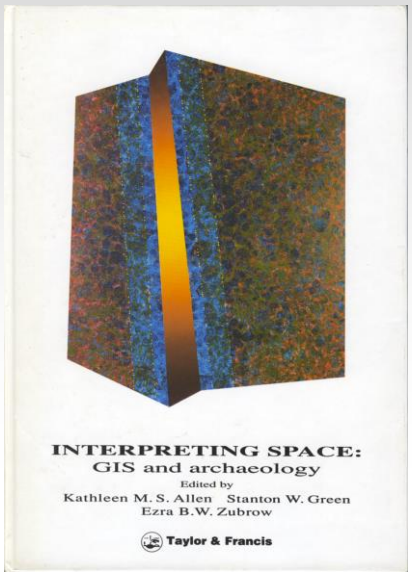
V. Gaffney and M. van Leusen

Agenda

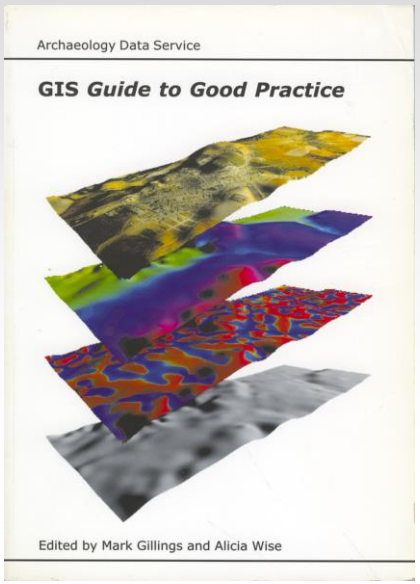
- GIS-based landscape archaeology and environmental determinism
- Modern spatial statistics
- The case of Galician megaliths

GIS-based landscape archaeology

- **Rapid deployment c.1990+**
- Textbook subject 2002+
- Anxiety about environmental determinism by 1993
- The rush to visibility analysis



1990



1990

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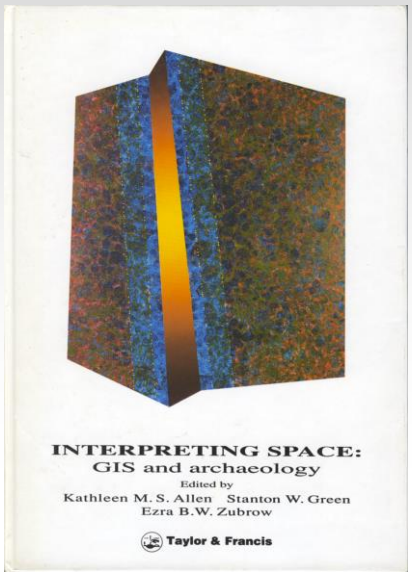
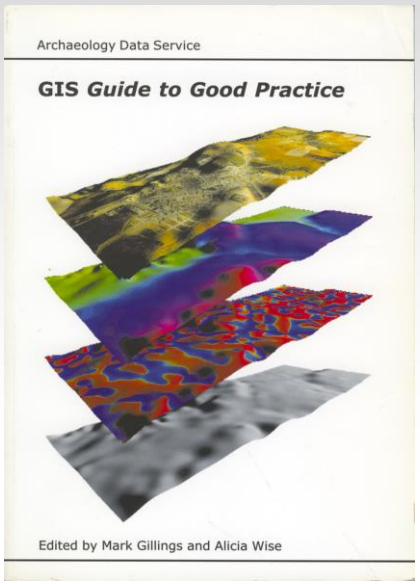
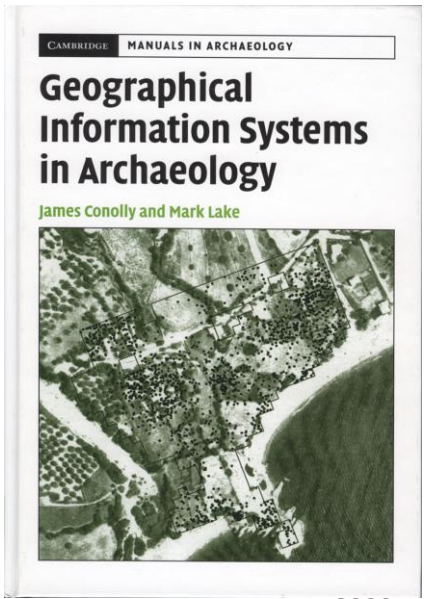


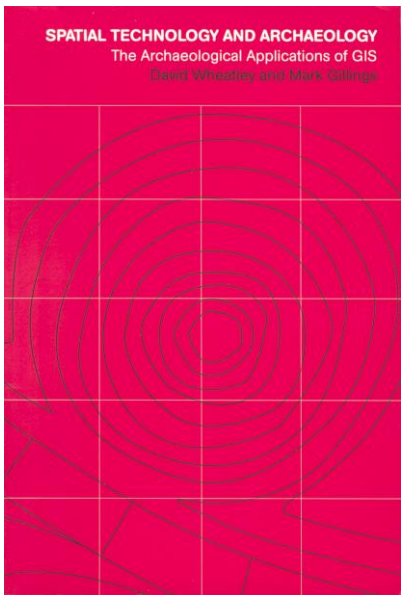
1990



1990



2006



2002

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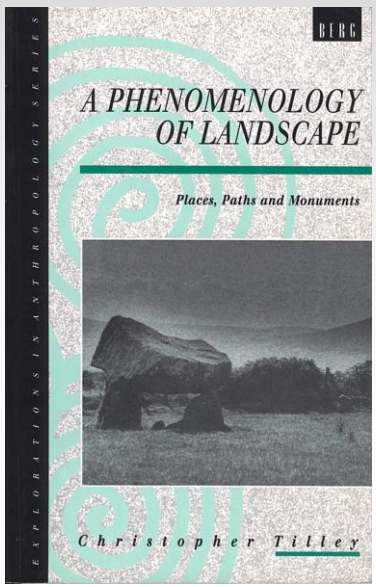
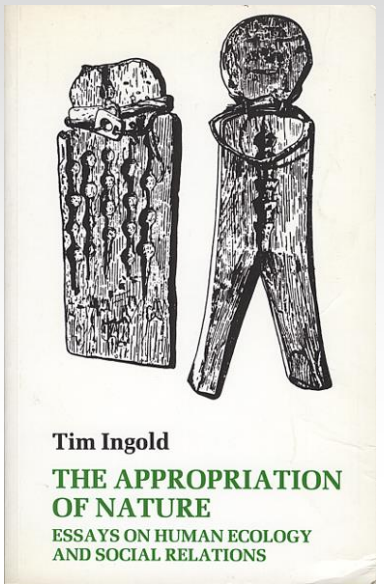
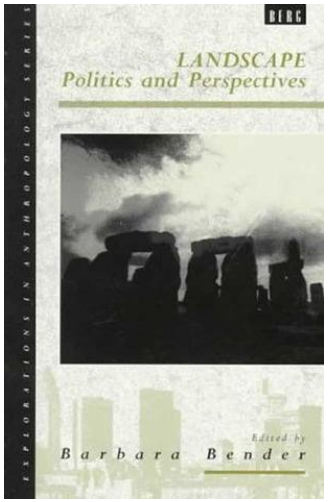
1994



1986





"The means by which we characteristically represent place ... the Geographical Information System, are all distinctively specular ... All attempt to lay the world bare, like Elliot's 'patient etherised upon a table', or like the corpse under the pathologist's knife" Thomas 1993

GIS-based landscape archaeology

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13 Going over old ground: GIS, archaeological theory and the act of perception

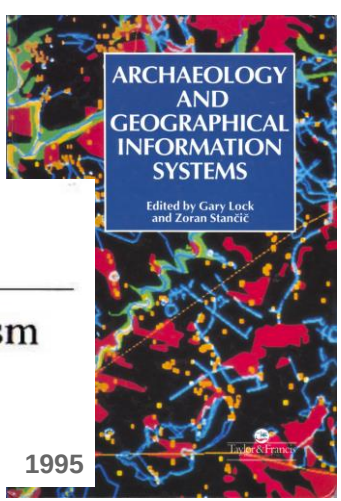
David Wheatley 1993

GIS applications in archaeology are now characterised by a largely hidden agenda ... a functionalist approach to archaeological explanation ... [and] have consistently avoided study areas where rituality or subjectivity are a significant aspect of the archaeological record

27

Postscript—GIS, environmental determinism and archaeology: a parallel text

V. Gaffney and M. van Leusen



1995

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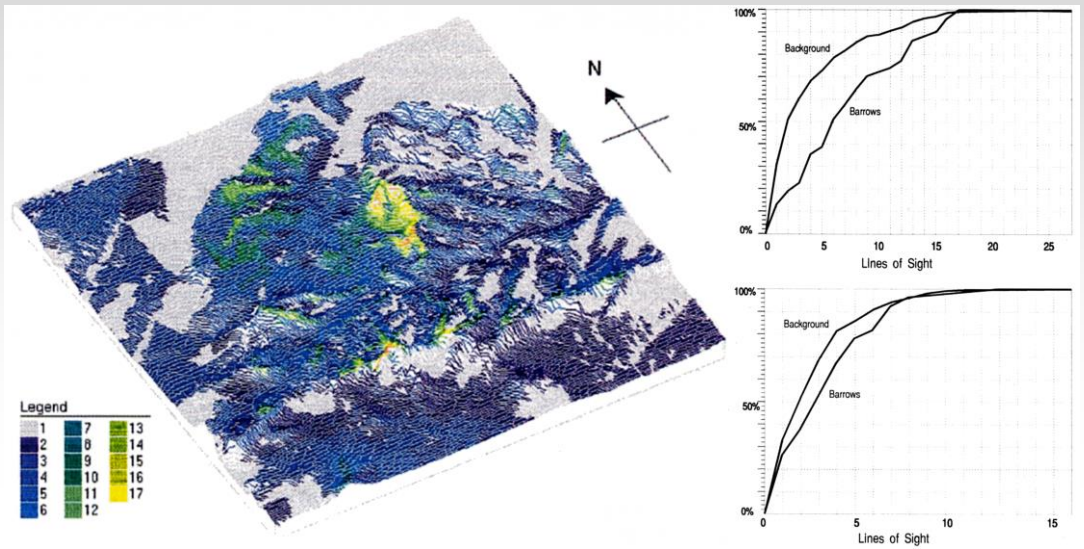
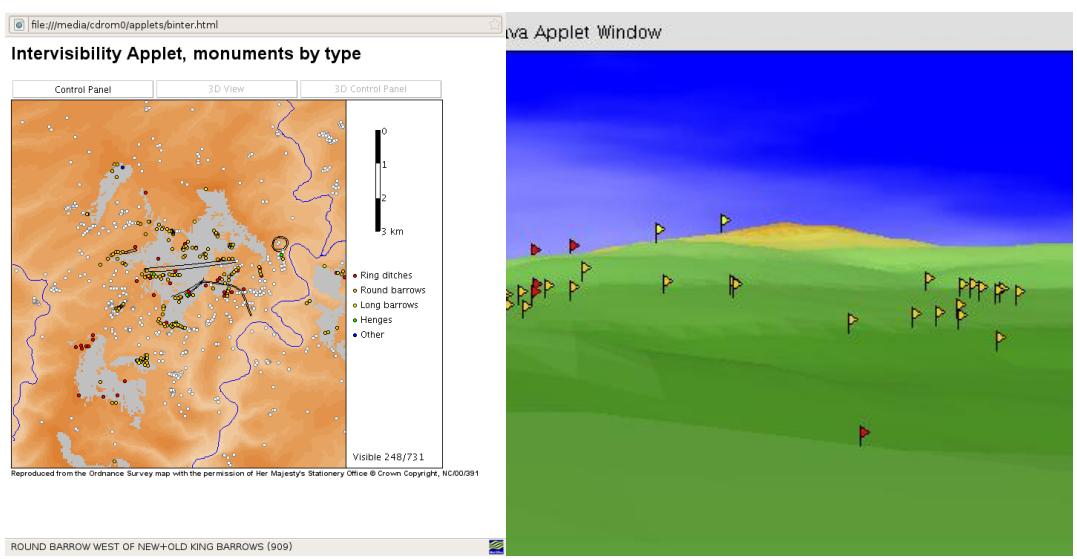


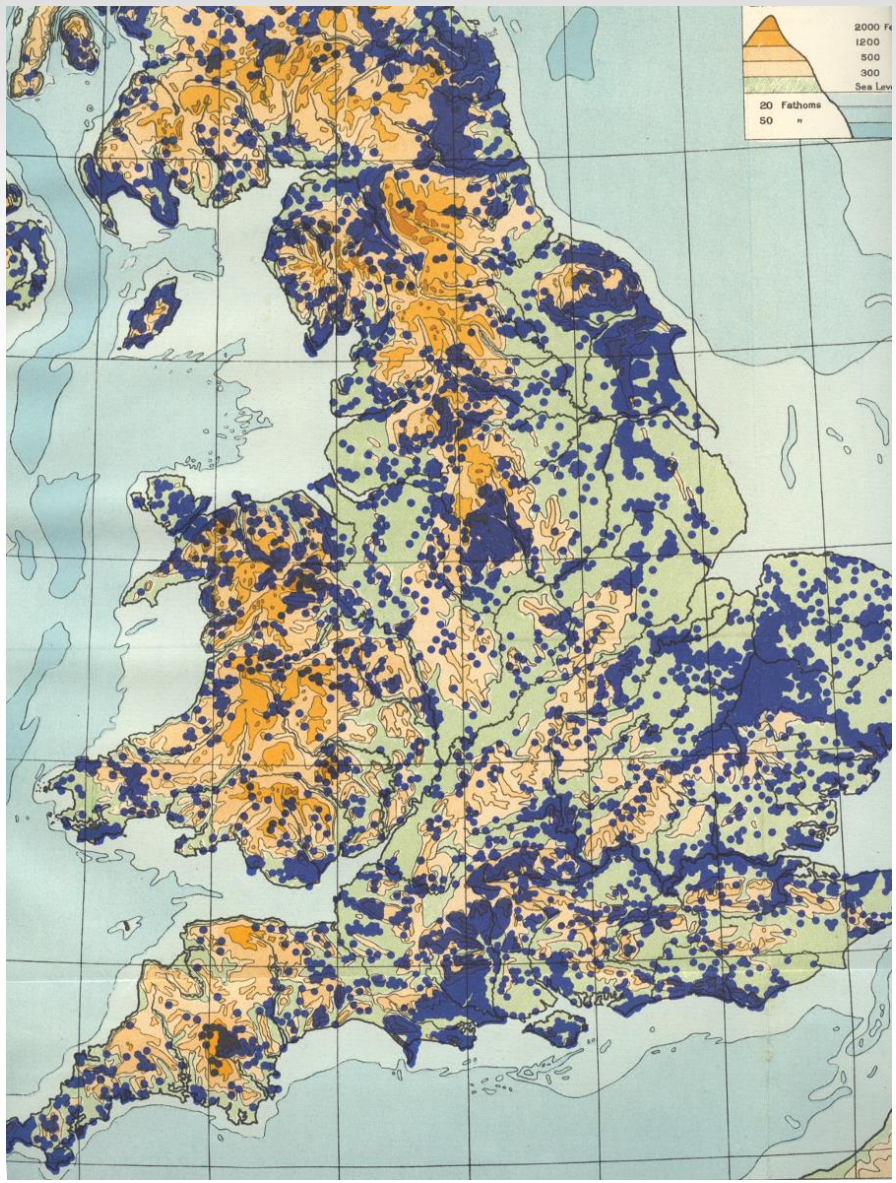
Wheatley 1995. Cumulative Viewshed Analysis: A GIS-Based Method for Investigating Intervisibility, and its Archaeological Application



Exon, Gaffney, Woodward, Yorston 2000. Stonehenge Landscapes: Journeys Through Real-and-Imagined Worlds

Modern spatial statistics

- **Distribution modelling 17/18C +**
- Point pattern analysis c2010+
  - First order effects
  - Second order effects
  - Inhomogeneity



Fox, 1932, The Personality of Britain

Modern spatial statistics

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Distributions:

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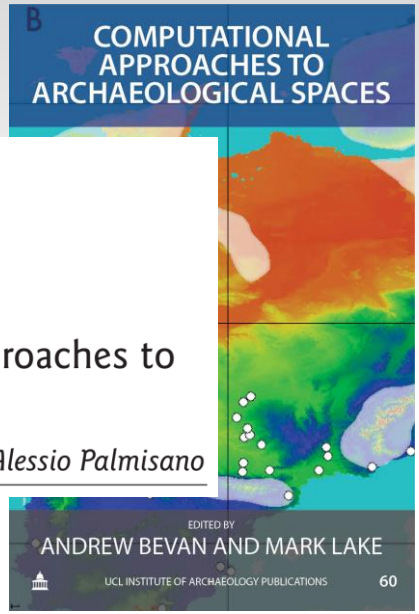
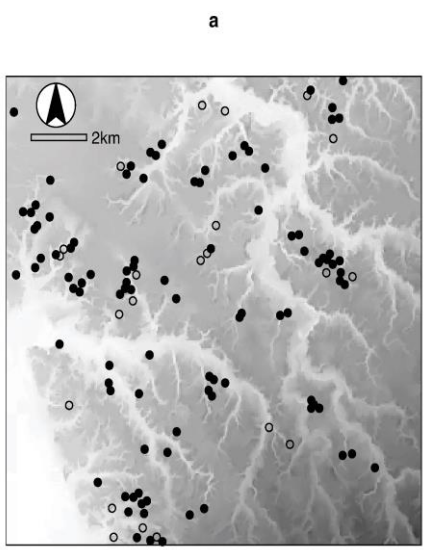
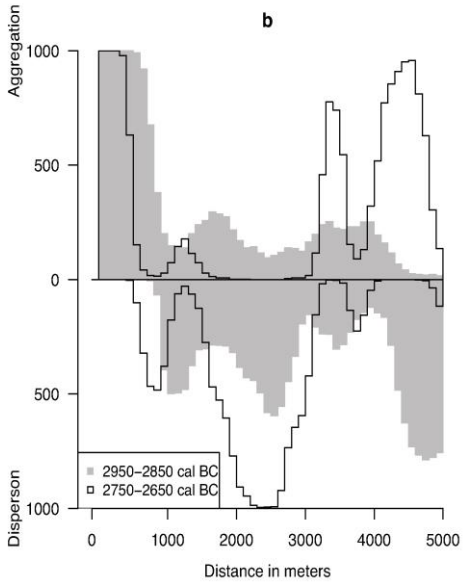


2 Intensities, Interactions, and Uncertainties: Some New Approaches to Archaeological Distributions

Andrew Bevan, Enrico Crema, Xiuzhen Li and Alessio Palmisano

2013





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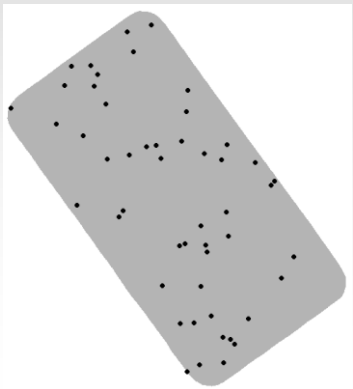
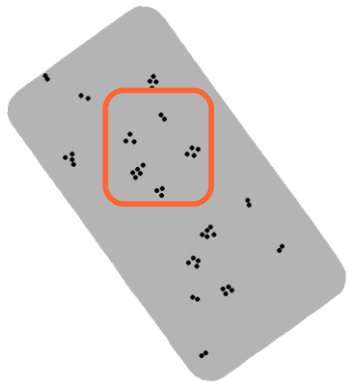
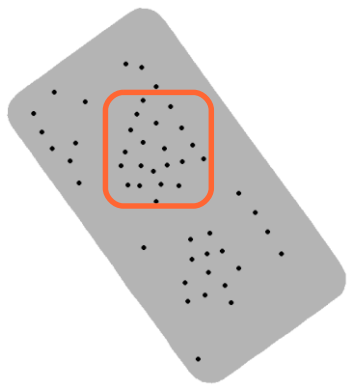


Complete spatial randomness



Clustered
Events attract



Dispersed
Events repel

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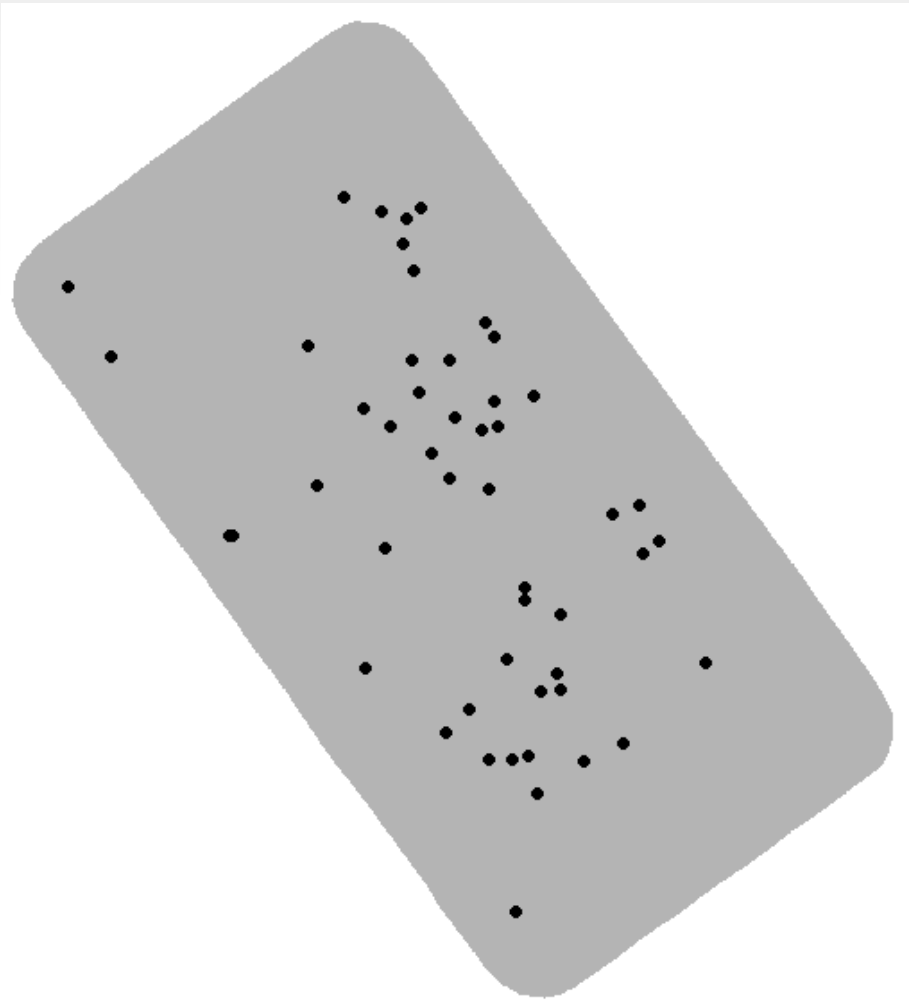

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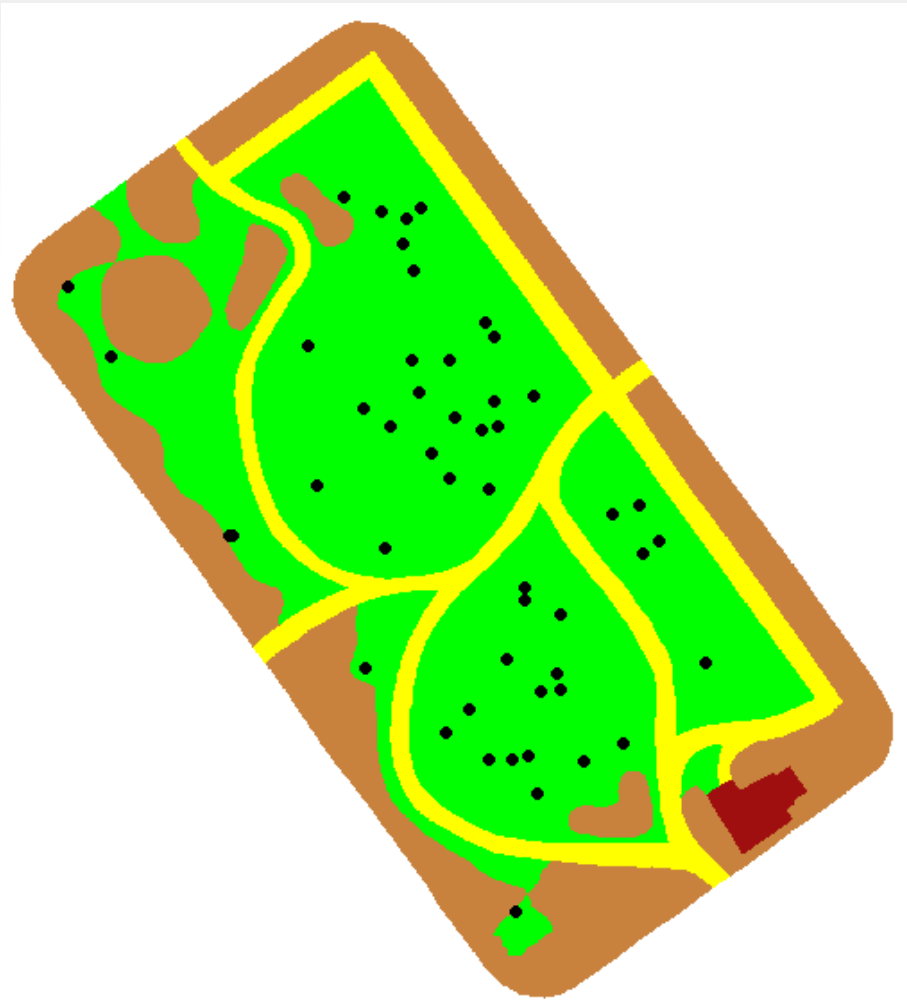
First order effects
Environmental constraints /opportunities



Modern spatial statistics

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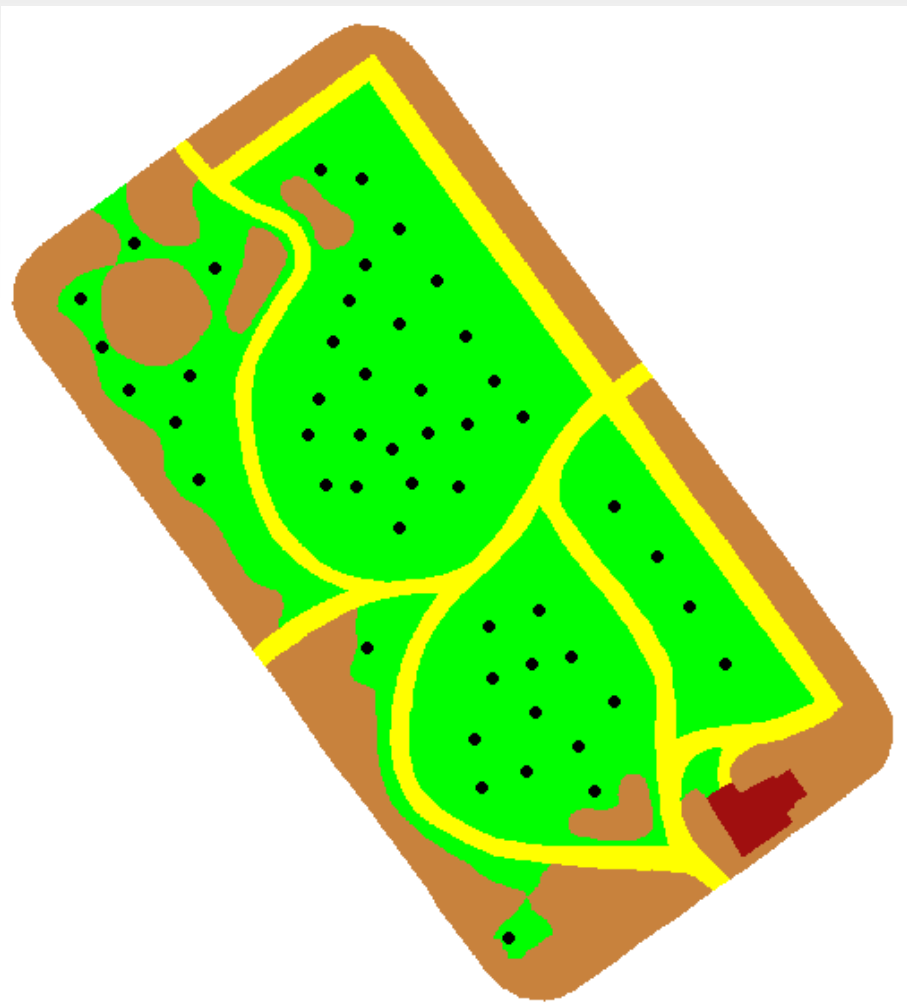
Second order effects
Social - repulsion



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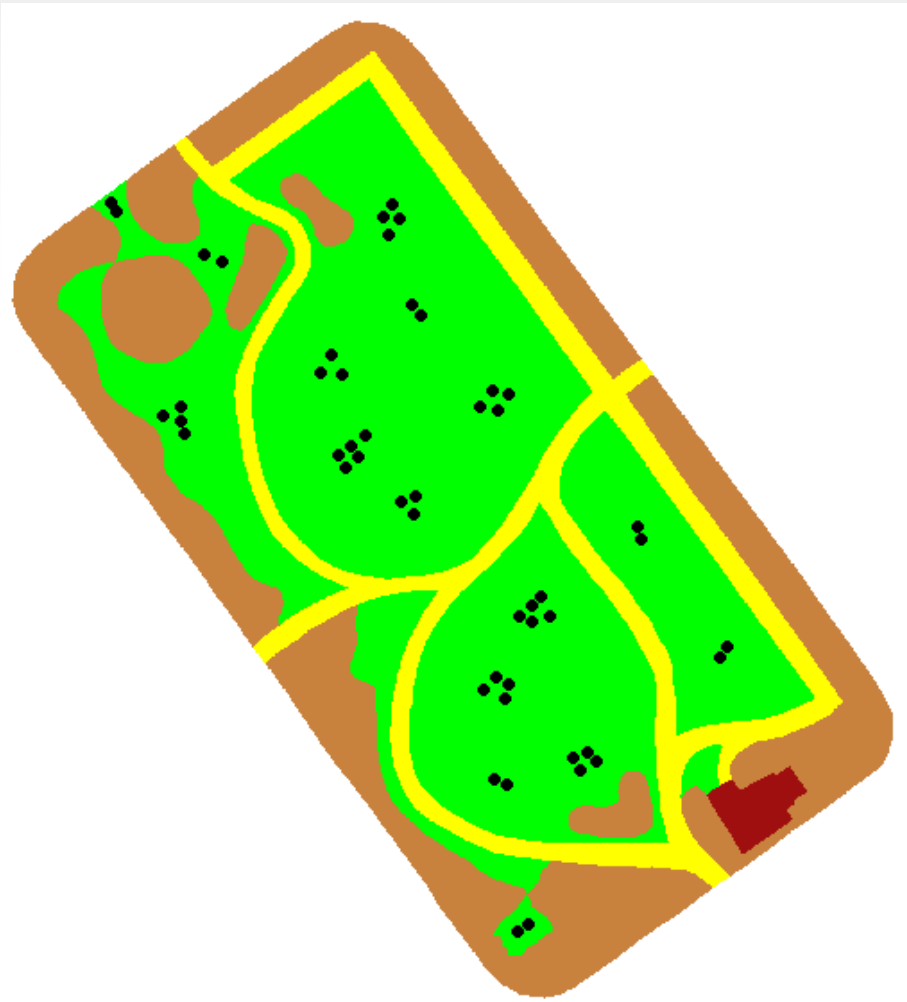
Second order effects
Social - attraction



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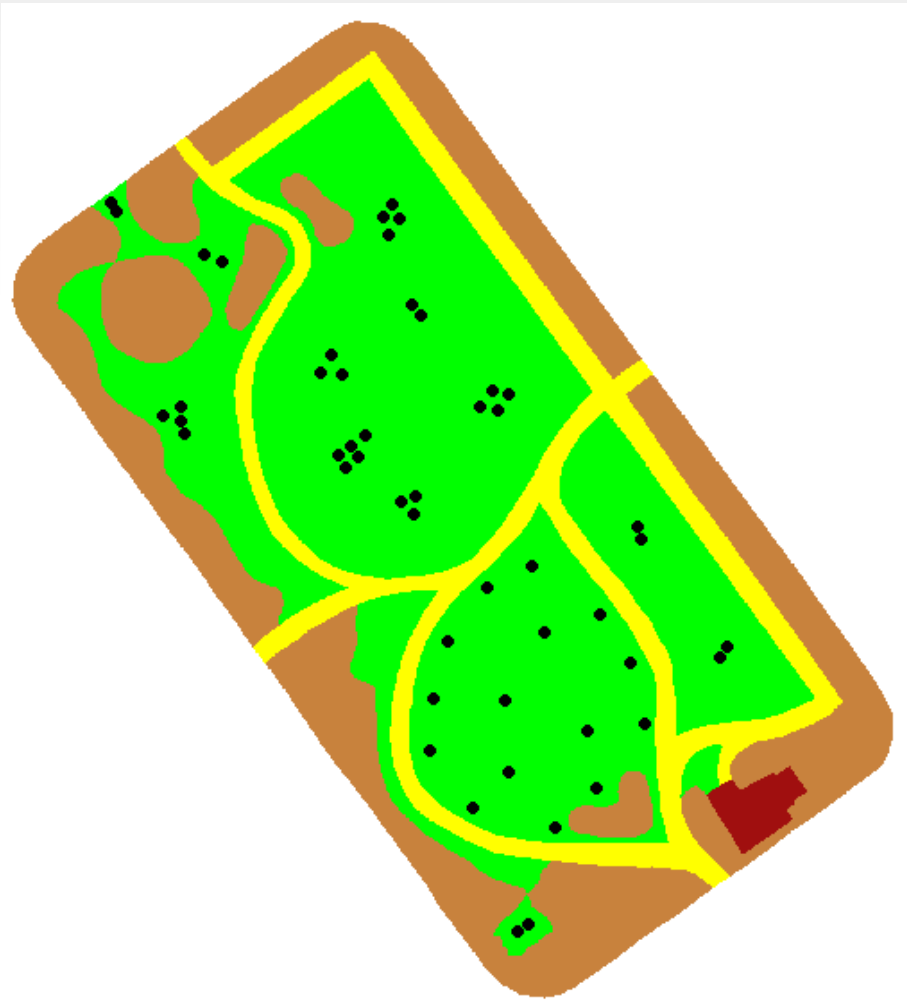
Second order effects
Social - repulsion and attraction



The case of Galician megaliths

https://doi.org/10.1016/j.jas.2019.05.004

- Galician megalithic mounds
- First order effects (environment)
- Second order effects (social organisation)
- Spatial hierarchy

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The spatial structure of Galician megalithic landscapes (NW iberia): A case study from the Monte Penide region

Miguel Carrero-Pazos[a,*], Andrew Bevan[b], Mark W. Lake[b]

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[b] Institute of Archaeology. University College London, 31-34 Gordon Square, London, WC1H 0PY, UK

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Keywords:
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Logistic regression
Territoriality
Watersheds
Altitude
Hierarchy

ABSTRACT

It is well known that Neolithic megalithic landscapes are the result of complex locational logics governing where communities chose to site their funerary monuments. These logics in turn respond to broader environmental and cultural affordances, and the relationship between these has been a major topic in the megalithic archaeological literature for the last few decades. Thanks to new approaches in spatial statistical modelling, there is now considerable opportunity to revisit traditional megalithic locational concepts from a more systematic point of view, not least in Galician studies (NW Iberian Peninsula). In the paper that follows, we apply such a modelling approach to a large set of megalithic monuments located in the south of Galicia (Monte Penide and surroundings) with a view to exploring locational choices, spatial hierarchy and territoriality in these funerary landscapes. The results indicate that the distribution of megalithic mounds in this region reflects a preference for locations with particular environmental properties, while at a more local scale the spacing of these mounds seems to reflect some kind of social partitioning of the landscape. Via spatial cluster analysis and a further novel method for testing site hierarchy, we conclude that the mound sites within nine different mound clusters exhibits a non-random hierarchical structure, with a larger mound per group and smaller ones around that, and with what appears to be a preference for the large monument to be at or near the meeting point of several watersheds and upland ridge-routes.

1. Introduction

Megalithic tombs are a common social and funerary feature of Atlantic European landscapes during the Neolithic, involving the construction of large-scale stone monuments, typically but not exclusively collective graves covered by a mound (Laporte, Scarre, 2011). Many explanations for the rise of megalithism and for the meaning of particular sets of megaliths have been offered by archaeologists in the past (Schultz Paulsen, 2017), with an emphasis generally placed on their multiple rather than singular roles in society, and their likely symbolic marking of communally-shared resource landscapes belonging to segmentary groups (e.g. Sure, 1970; Fleming, 1973; Chapman, 1981; Tilley, 1996; Sherratt, 1990, 1995). Such investigations therefore highlight the importance of megalithic monuments not only as a funerary monuments but also as visible, public landmarks for living communities (Renfrew 1976, 1984; Delibes de Castro, 1991). Their potential territorial significance has been approached from different perspectives, including theoretical landscape archaeology (e.g. Criado Boado, Villoch Vázquez, 2000; Criado Boado, 2017), historical

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0305-4403/

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The case of Galician megaliths

- **Galician megalithic mounds**
- First order effects (environment)
- Second order effects (social organisation)
- Spatial hierarchy

Mamoa do rei B

Santa Marina (similar topography)

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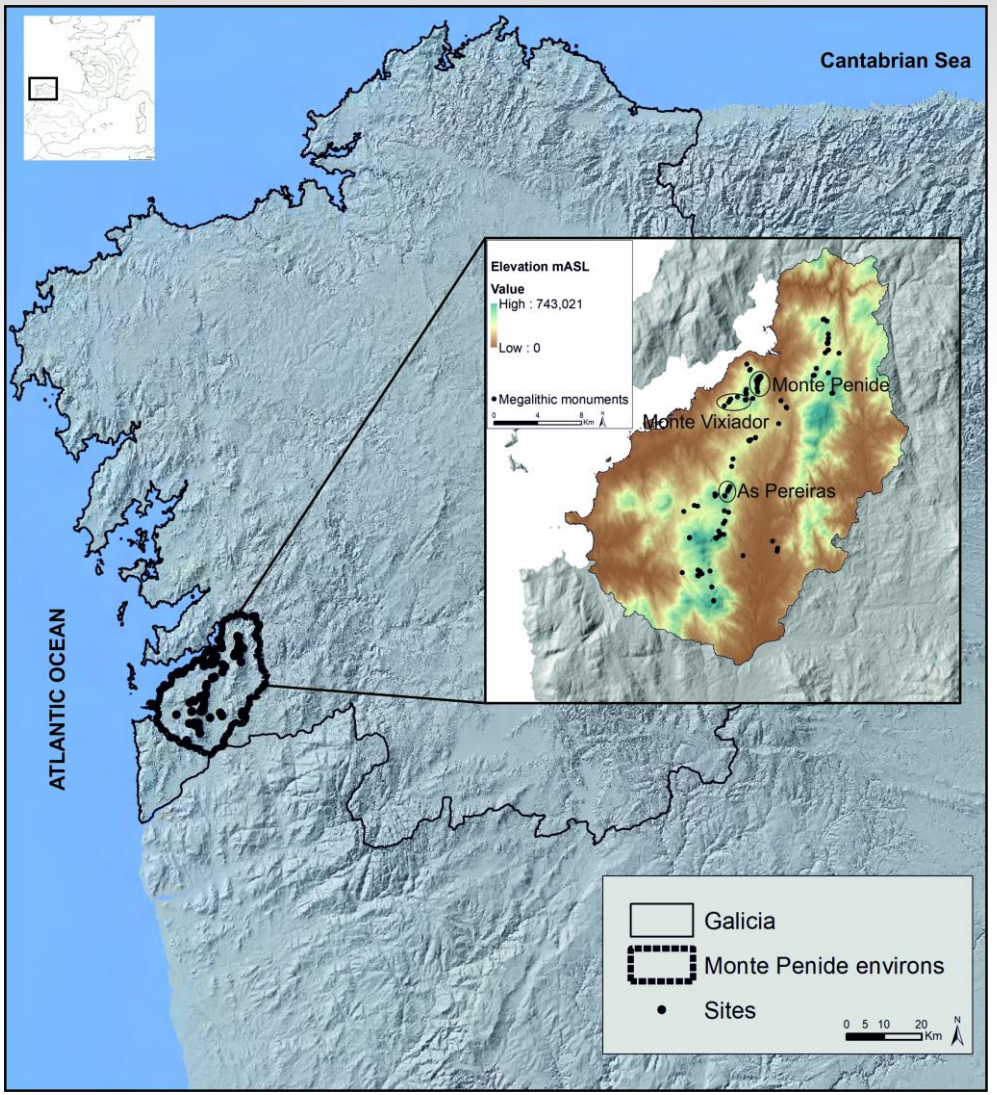

121 sites in 620 sq km study area
(over 7000 in Galicia as a whole)

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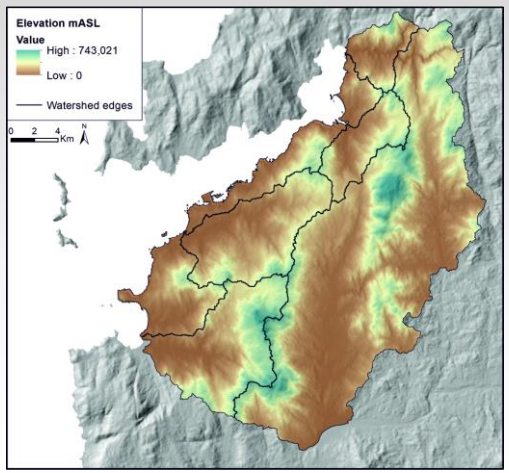

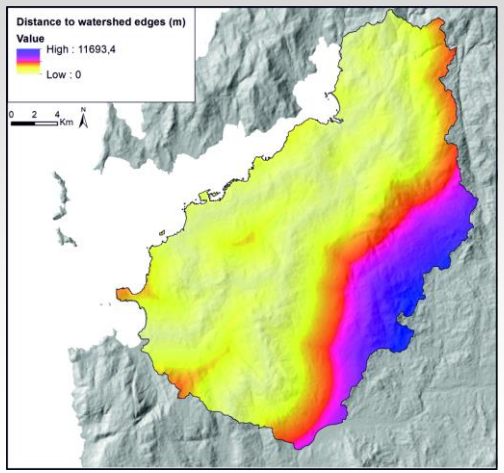

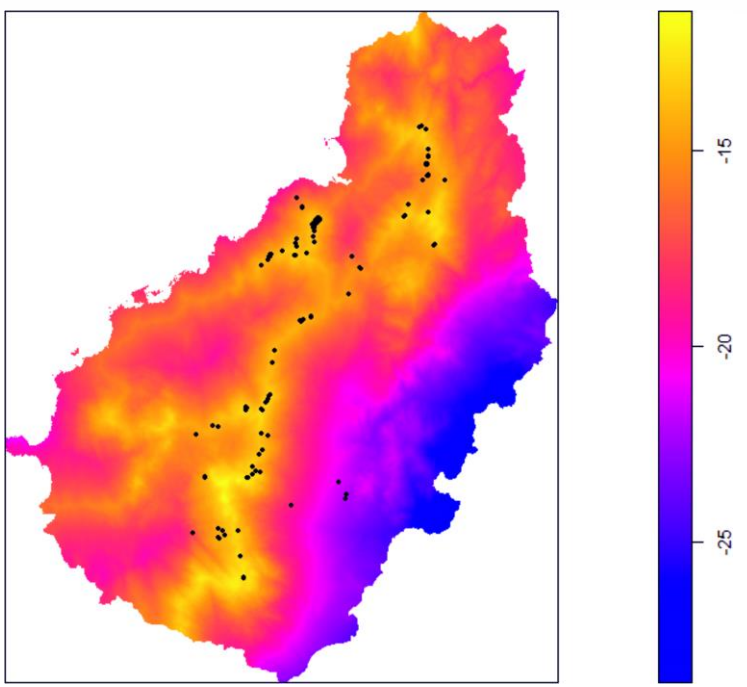

Multiple regression model of influence of elevation and distance to watershed

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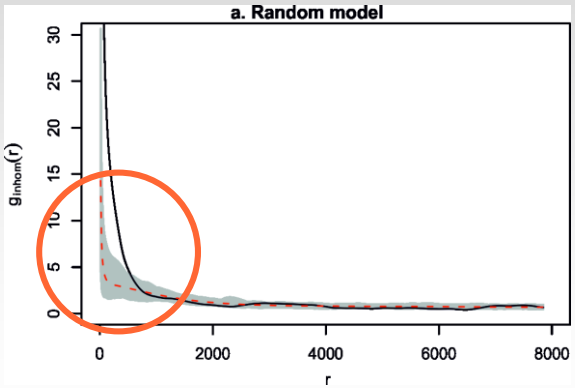
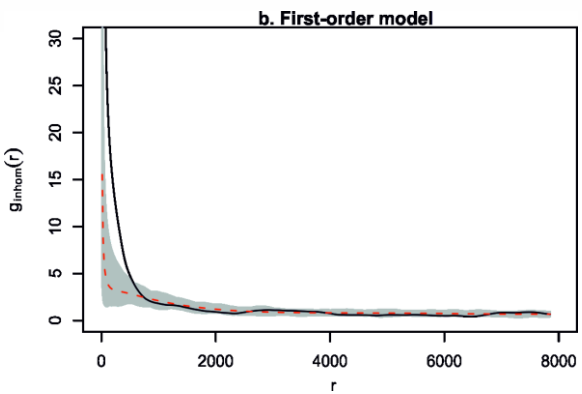
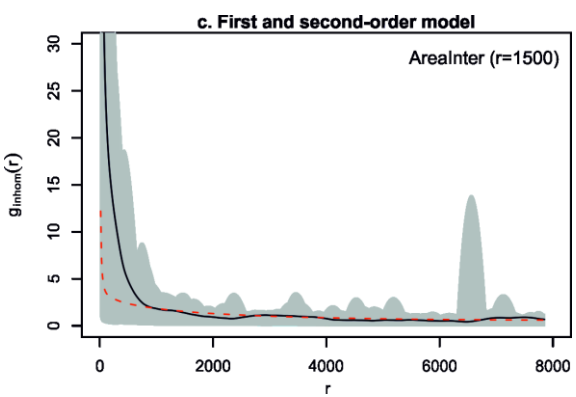


Megaliths are clustered — we already know that!



Megaliths are still clustered if we control for environment — interesting!



Theoretical model of megaliths having 'area of influence' fits

(Widom-Rowlinson penetrable sphere model)

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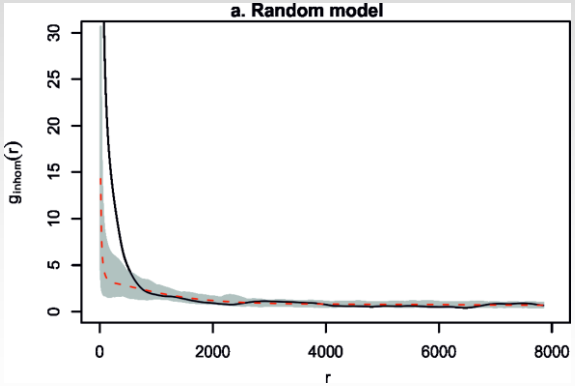

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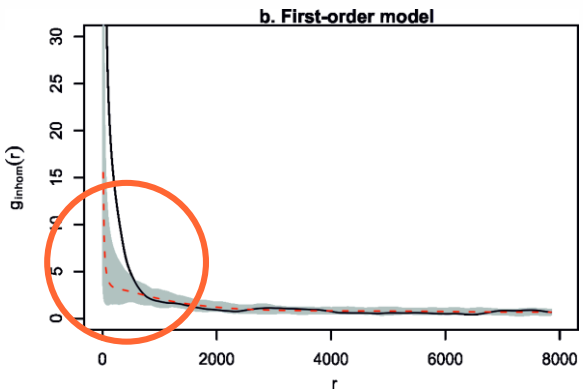

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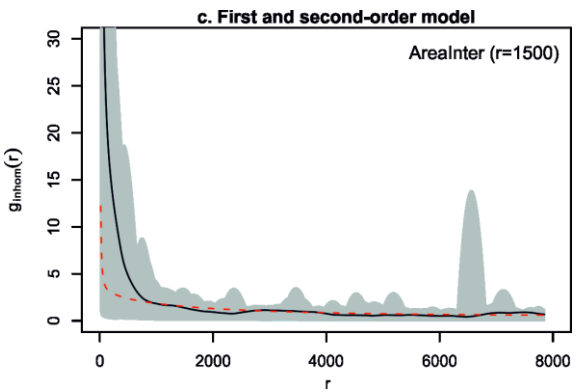

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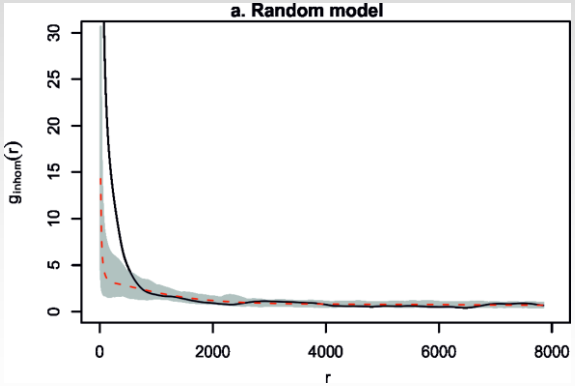

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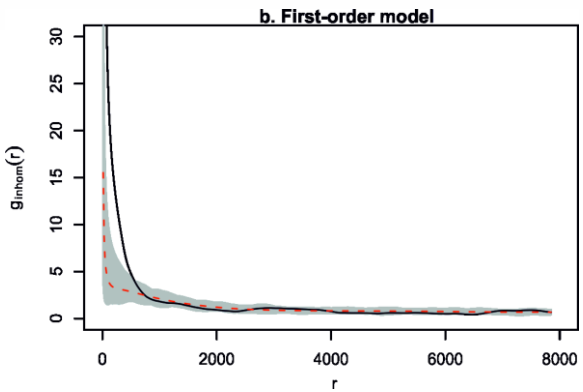

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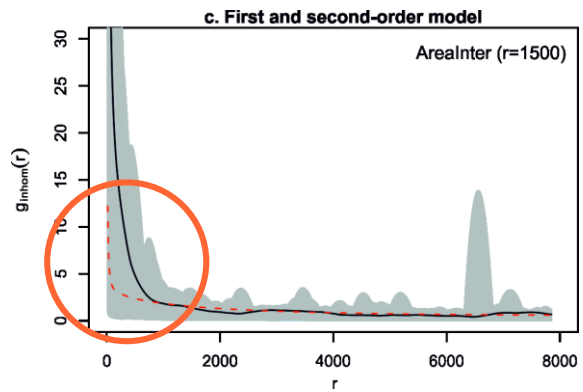

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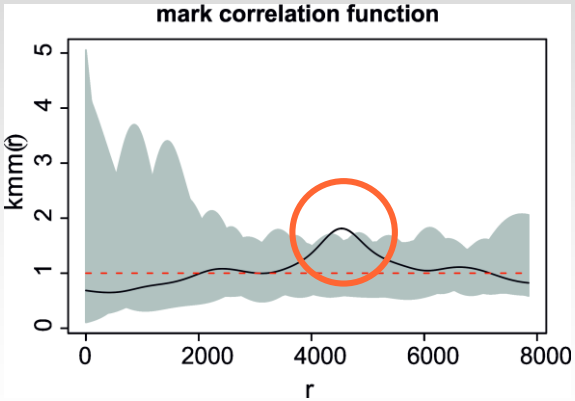
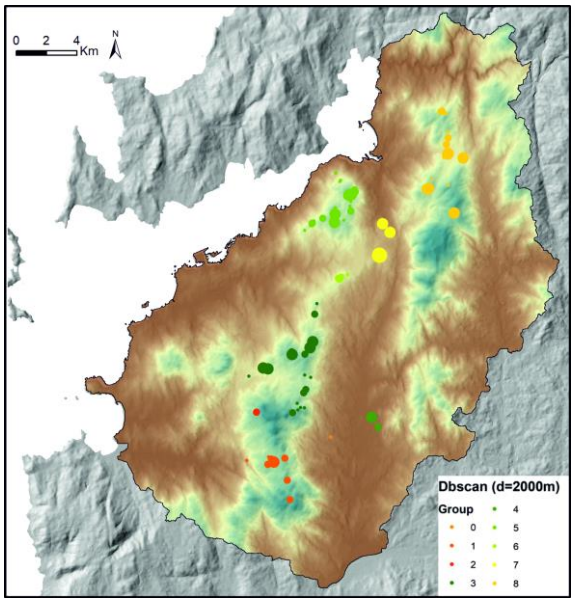


Megaliths of similar size spaced at *c*. 4.5km intervals



Permutation test demonstrated that the largest tombs are distributed across spatial groups in a way that is broadly hierarchical

Points for discussion

- **Modern spatial statistics:**
  - **They facilitate empirical investigation of the interplay of different causes, as opposed to the a priori assertion of primacy according to theoretical preference**
  - **The distribution of megalithic mounds in our example region reflects a preference for locations with particular environmental properties, but at a local scale the spacing of these mounds seems to reflect some kind of social partitioning of the landscape into spatially hierarchical units**
- **But:**
  - **Does this really move us beyond the debate about environmental determinism?**
  - **Does it hinge on a kind of 'residual' logic — the social is whatever is left after controlling for the environment?**
  - **What do we mean by 'environmental determinism anyway' — is this really about cognitivism versus behaviourism?**