2014 burgos
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XVII World UISPP Congress
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Session A25e
Dynamics of human and cultural dispersals during the Neolithic transition in Europe: Complex Systems and Prehistory

Early Neolithic in Iberia. Testing the hypothesis of an African entrance

Authors: Isern, Neus (neus.isern@udg.edu); Fort, Joaquim; Carvalho, António Faustino; Gibaja, Juan F.; Ibañez, Juan José

~ Authors

- **Neus Isern**
  Departament de Prehistòria, Universitat Autònoma de Barcelona (UAB), Bellaterra, Spain
- **Joaquim Fort**
  Complex Systems Lab and Physics Department, University of Girona, Girona, Spain
- **António Faustino Carvalho**
  Departamento de Artes e Humanidades, Universidade do Algarve, Faro, Portugal
- **Juan F. Gibaja**
  Departamento de Arqueología y Antropología, CSIC-IMF, Barcelona, Spain
- **Juan José Ibañez**
  Departamento de Arqueología y Antropología, CSIC-IMF, Barcelona, Spain

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Universitat de Girona

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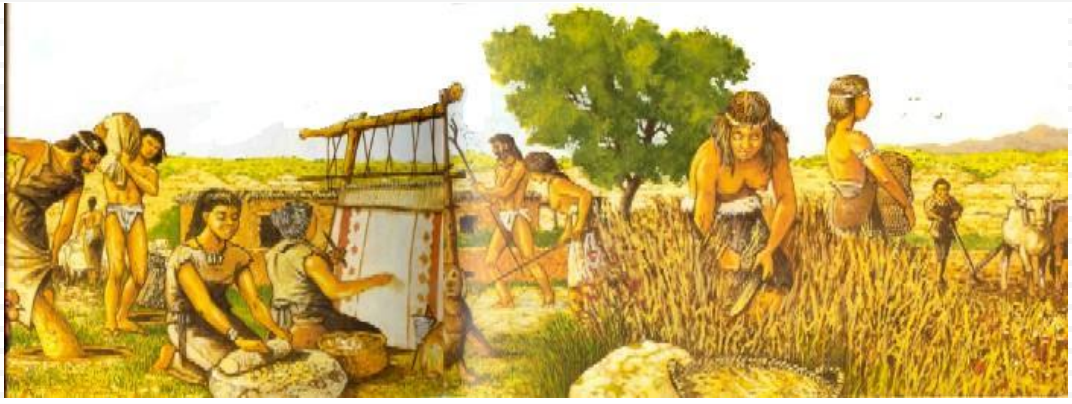
SimulPast

~ Overview

- Introduction
- Database analysis
- Computational model
- Conclusions

Introduction

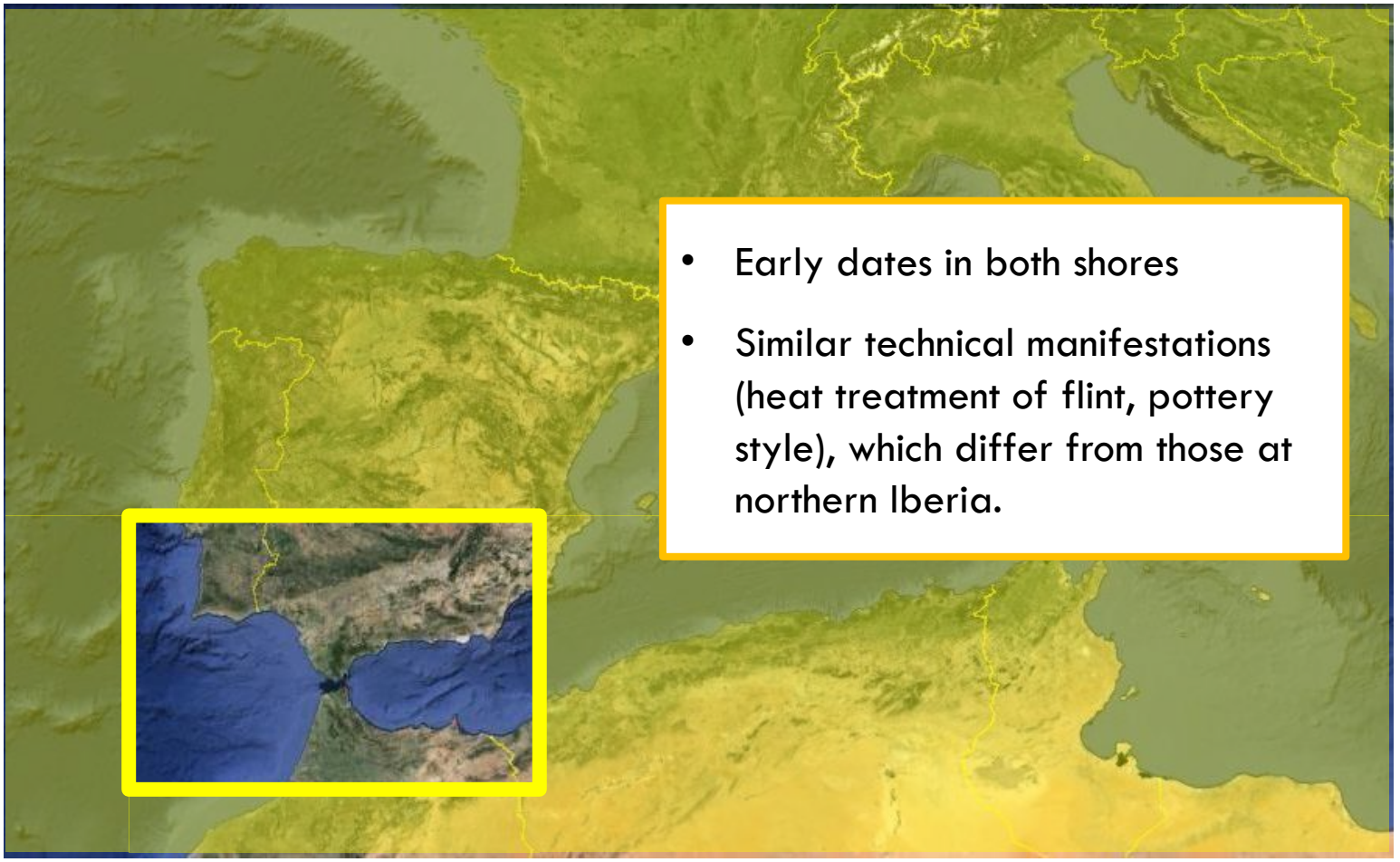
Motivation and aims



Neolithic arrival in Iberia

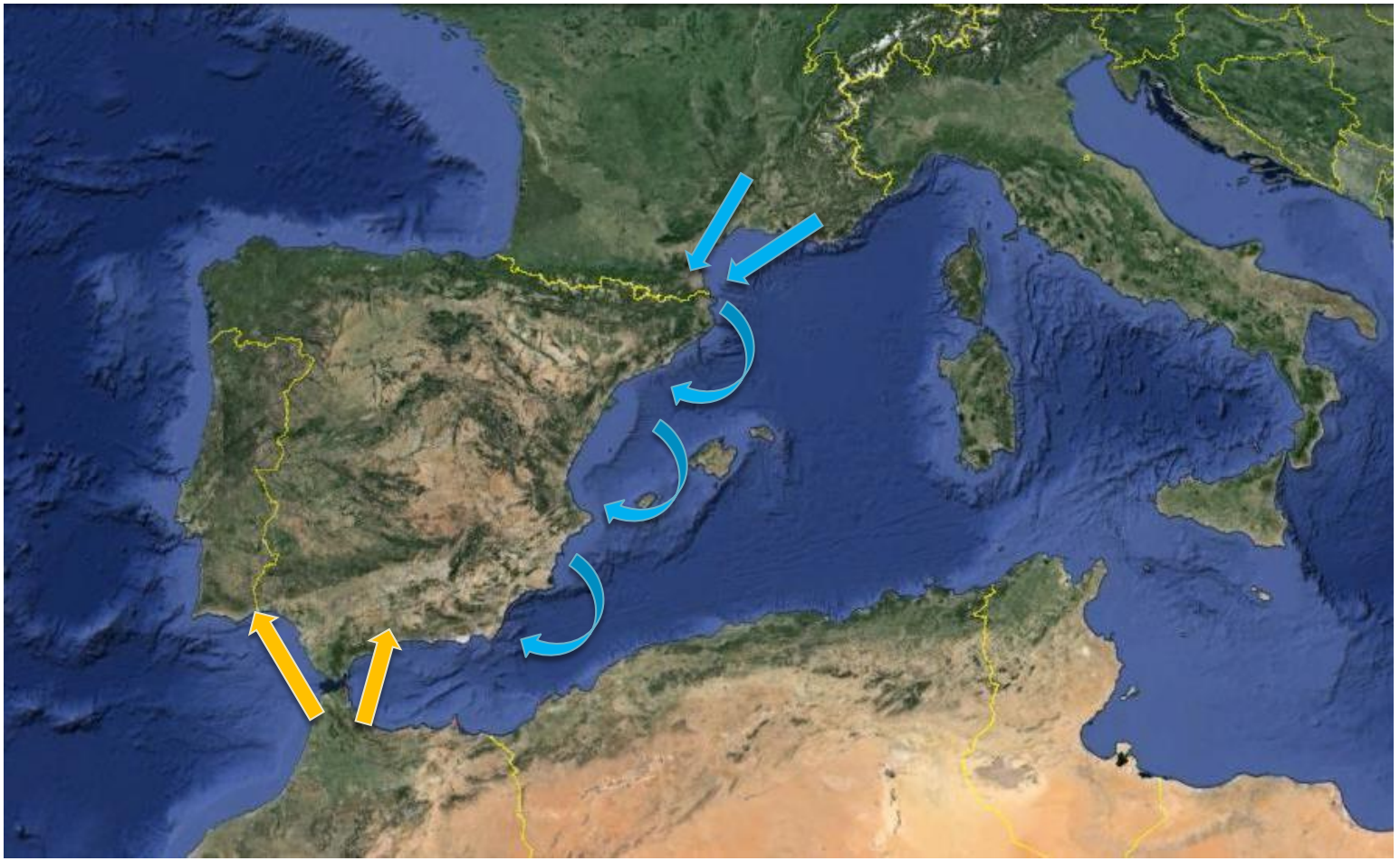
Pioneer colonization (J. Zilhão)

Southern Iberia & North Morocco



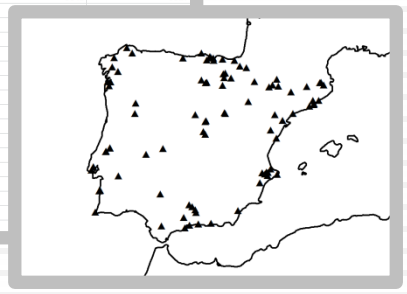
African entrance

Dual Neolithic entrance

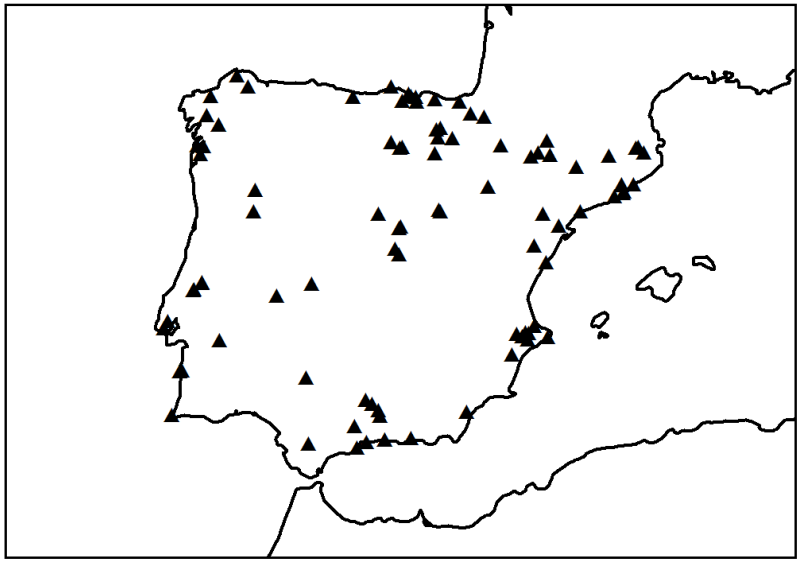


Database analysis

	A	B	C	D	E	F	G	H	I	J	K	L
1	Early Neolithic database for the Iberian Peninsula											
2	Id	Site name	Country	Latitude	Longitude	MeanCalBP (Calib)	UncalBP	SD	LowerCalBP (Calib)	UpperCalBP (Calib)	LowerCalBP-2s (Calib)	UpperCalBP-2s (Calib)
3	1	Gándara, A	Spain	42,0969	-8,6744	6228	5412	44	6195	6279	6021	6299
4	2	Abauntz	Spain	43,0194	-1,6860	6628	5820	40	6562	6673	6503	6730
5	3	Aizpea	Spain	42,9431	-1,3278	7306	6370	70	7253	7416	7171	7423
6	4	Algar do Picoto	Portugal	39,5167	-8,6000	6723	5904	36	6673	6772	6645	6827
7	5	Almonda	Portugal	39,4970	-8,6165	7364	6445	45	7324	7422		
8	6	Arenaza	Spain	43,2577	-3,1002	6895	6040	75	6788	6989		
9	7	Arenillas	Spain	43,4038	-3,3123	6373	5580	80	6296	6437		
10	8	Atxoste	Spain	42,7533	-2,4686	7117	6220	60	7020	7244		
11	9	Bajondillo	Spain	36,6248	-4,4949	7173	6234	30	7030	7248		
12	10	Barranquet	Spain	38,9197	-0,1953	7427	6510	50	7332	7478		
13	11	Barruecos	Spain	39,4676	-6,5648	6943	6080	40	6888	6999		
14	12	Bauma Serrat del Pont	Spain	42,2253	2,5720	7375	6470	40	7328	7428		
15	13	Botiqueria Moros	Spain	41,0546	0,1008	7168	6240	50	7029	7252		
16	14	Buraco da Pala	Portugal	41,4777	-7,2084	6685	5860	30	6656	6726		
17	15	C Colon/Novelda	Spain	38,3831	-0,7692	7326	6390	40	7269	7414		
18	16	Caldeirão	Portugal	39,6393	-8,4267	7261	6330	80	7166	7412		
19	17	Can Bellsolà	Spain	41,5457	2,1478	7165	6250	80	7024	7262		
20	18	Can Roqueta	Spain	41,5374	2,1328	7337	6400	50	7274	7415		
21	19	Can Sadurní	Spain	41,3257	1,9323	7367	6450	40	7327	7423		
22	20	Can Xammar	Spain	41,5375	2,4453	7208	6270	40	7170	7249		



Early Neolithic database



- 93 Early Neolithic dates
- 14C dates on short-lived species (plants or animals)
  - Avoiding dates:
    - on bulk samples of charcoal or burnt bones
    - on shells (reservoir effect)

	A	B	C	D	E	F	G	H	I	J	K	L
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7	5	Almonda	Portugal	39,4970	-8,6165	7364	6445	45	7324	7422	7277	7429
8	6	Arenaza	Spain	43,2577	-3,1002	6895	6040	75	6788	6989	6728	7157
9	7	Arenillas	Spain	43,4038	-3,3123	6373	5580	80	6296	6437	6211	6553
10	8	Atxoste	Spain	42,7533	-2,4686	7117	6220	60	7020	7244	6970	7264
11	9	Bajondillo	Spain	36,6248	-4,4949	7173	6234	30	7030	7248	7021	7253
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13	11	Barruecos	Spain	39,4676	-6,5648	6943	6080	40	6888	6999	6796	7155
14	12	Bauma Serrat del Pont	Spain	42,2253	2,5720	7375	6470	40	7328	7428	7291	7458
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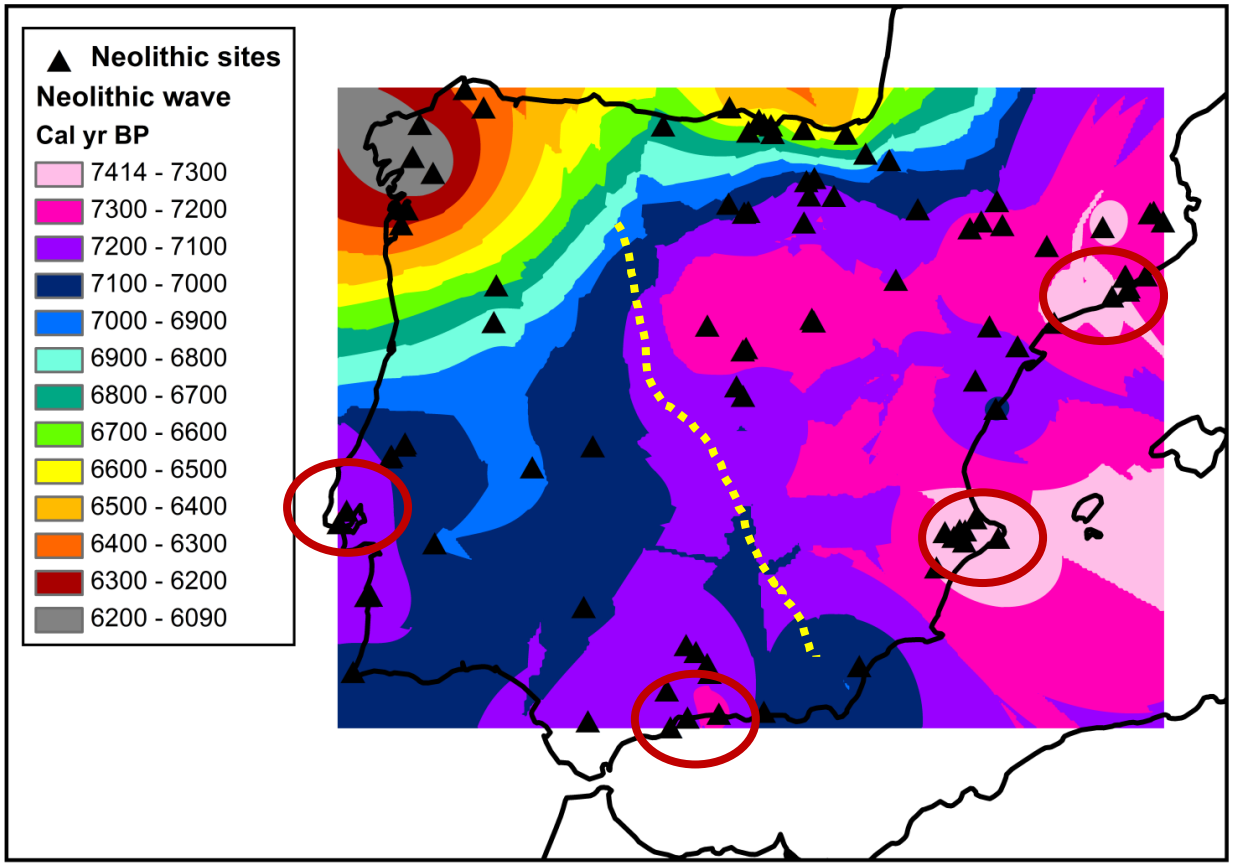
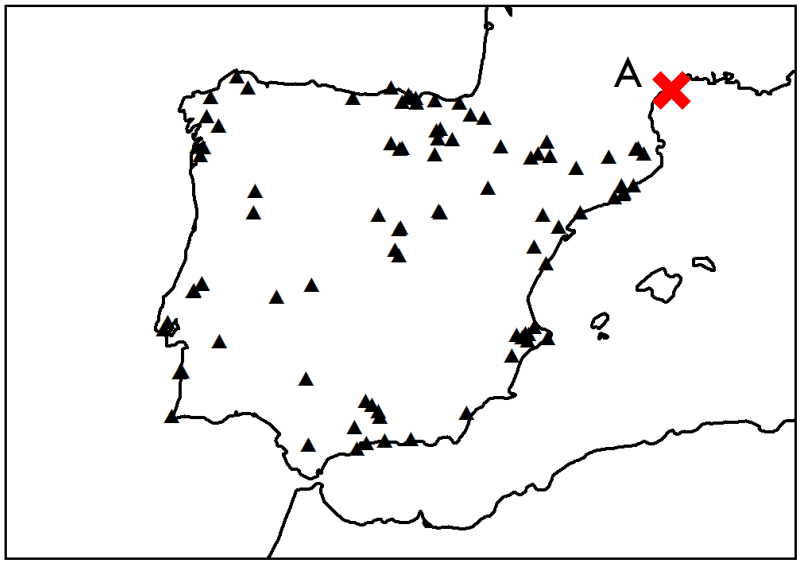
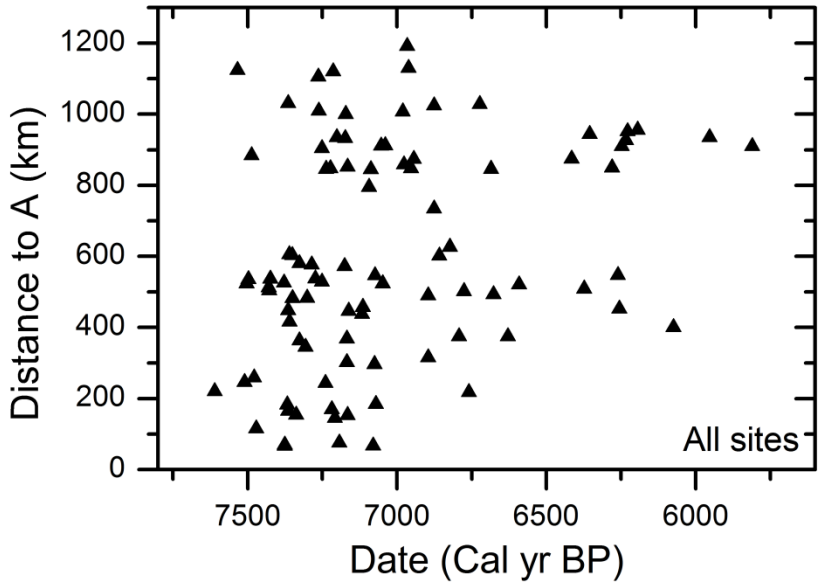
Visual analysis: interpolation



- Early arrival regions at the coasts surrounded by later dates
- Inland & northward expansion
- East-west differential behavior

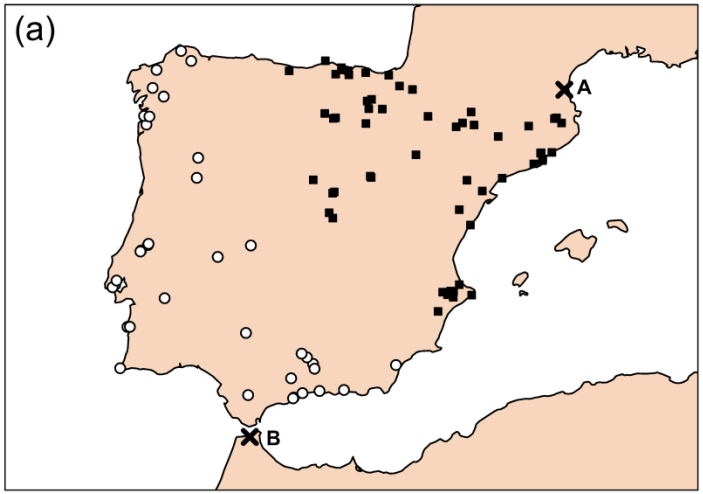
Space-time trends

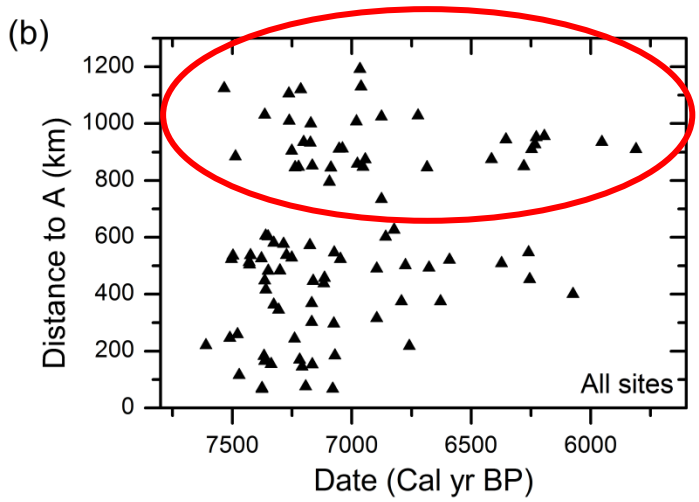


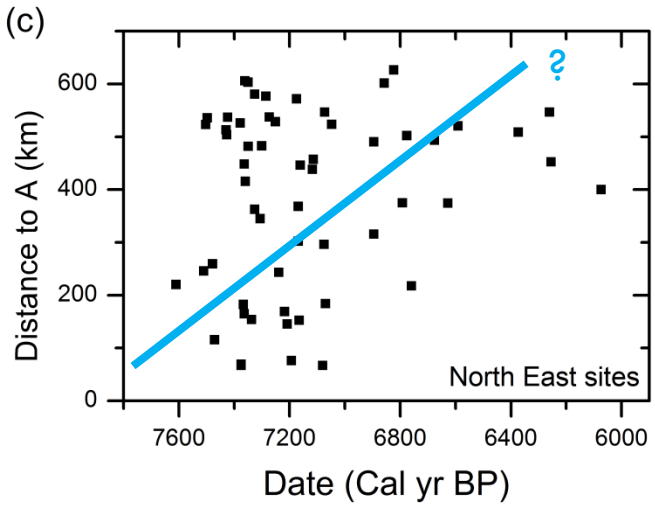


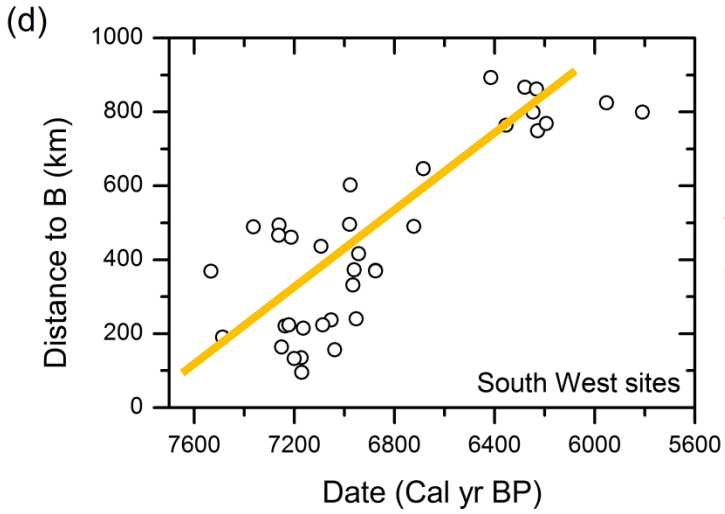
- No trends are observed
- Multiple sources?

Space-time trends



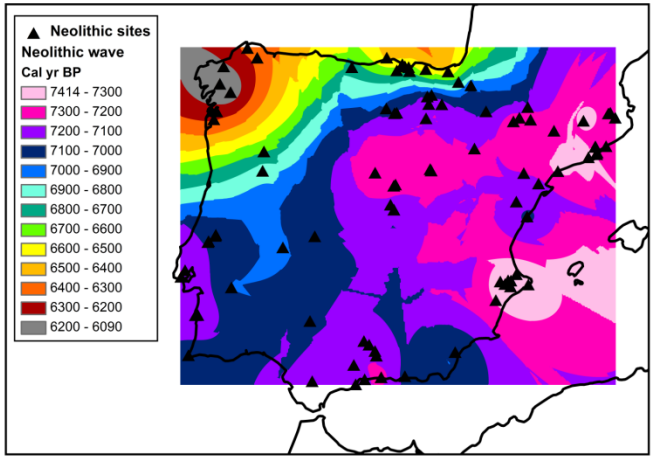




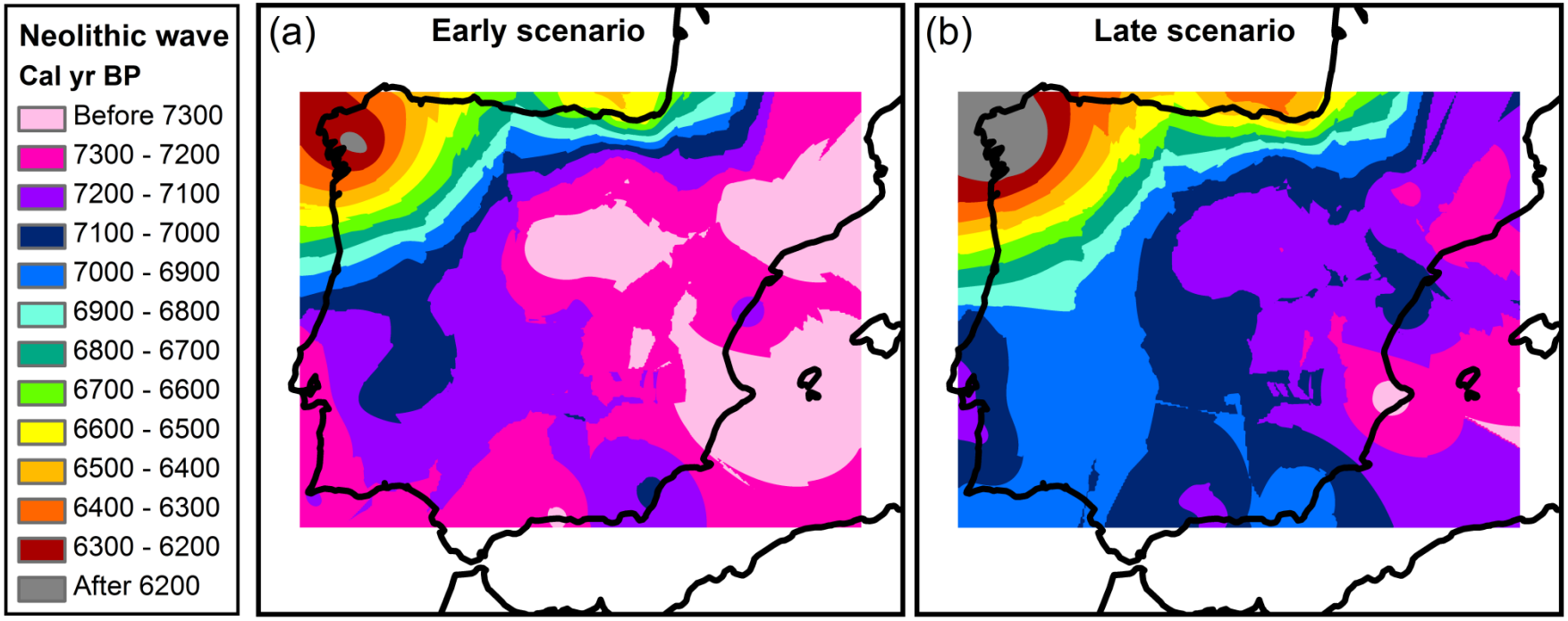


- Clear trend
- Expansion from the south

Calibration range



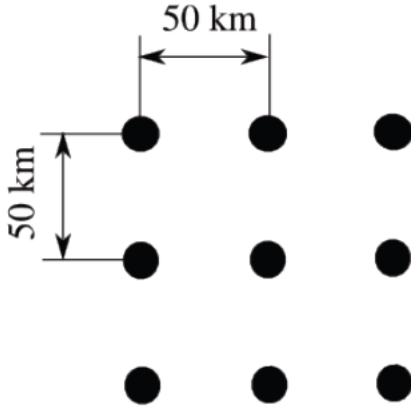
- Mean values or the extremes of the calibration range yield fundamentally the same behavior (shifted in time)



Computational model

Reproduction-dispersal scheme

- Demic model with a reproduction-dispersal scheme
  - Adaptation of a program originally designed to model the Neolithic expansion in the whole of Europe (*Fort, Pujol & Vander Linden, American Antiquity, 2012*)
  - Origin of the spread at the Near East
  - Grid of 50km x 50km



- <u>At every time interval (generation)</u>
  1. **Reproduction process**

     Individuals (t+T) = R_0 Individuals (t)

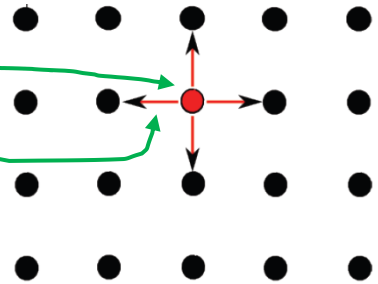
     R_0 = 2.45 [$R_0 = \exp(aT)$, $a=0.028y^{-1}$, $T=32y$]

Sea travel

2. **Dispersion process**

Persistence: $p_0 = 0.38$

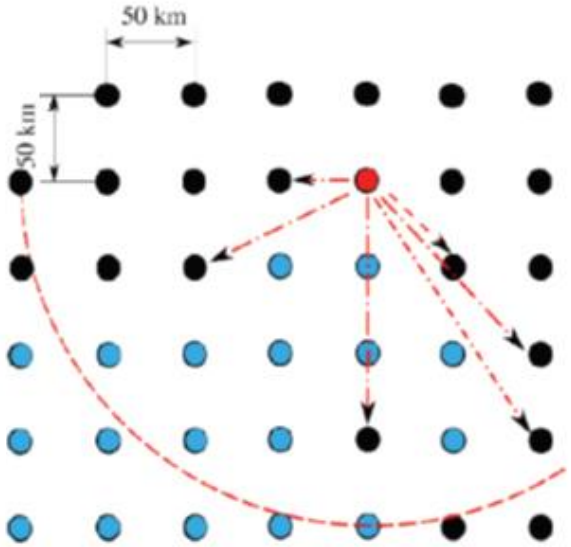
Each nearest neighbor: $(1-p_0)/4$



At coastal nodes → Sea travel

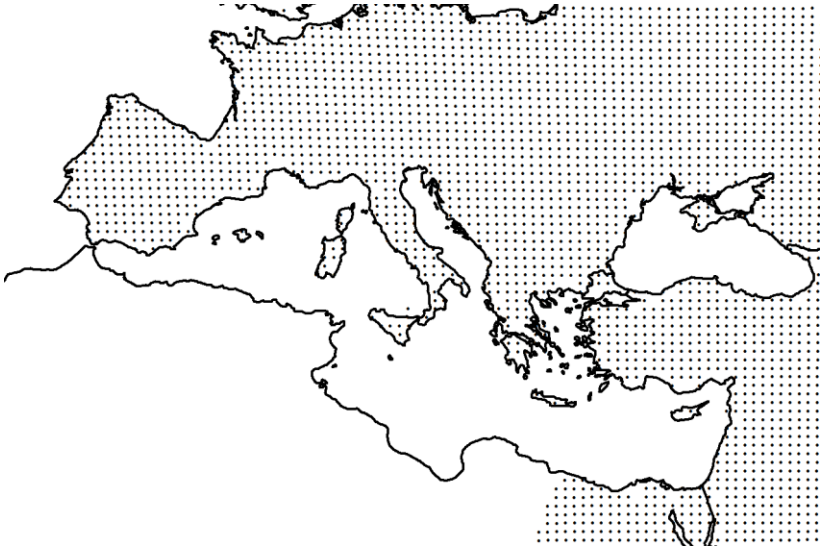
Sea travel range: 200km

(Best for the whole of Europe: 150km. Fort et al, Am Ant 2012)

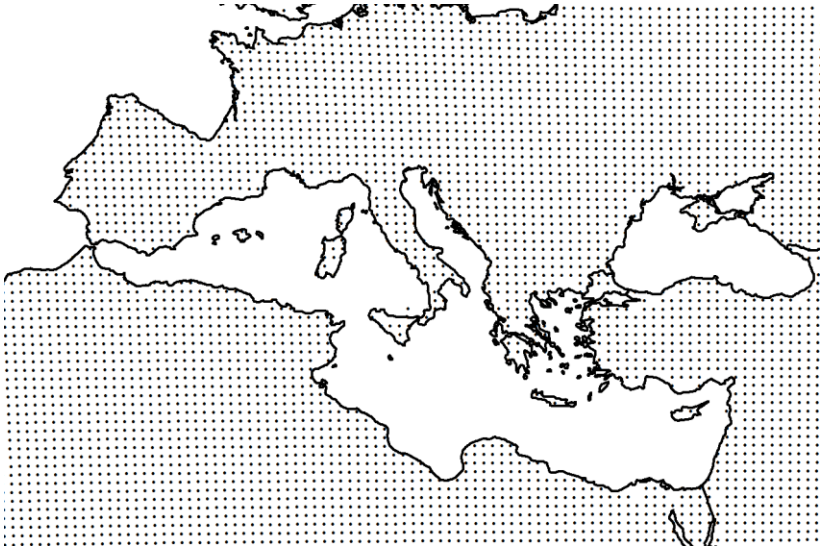


Testing hypothesis

Only European entrance

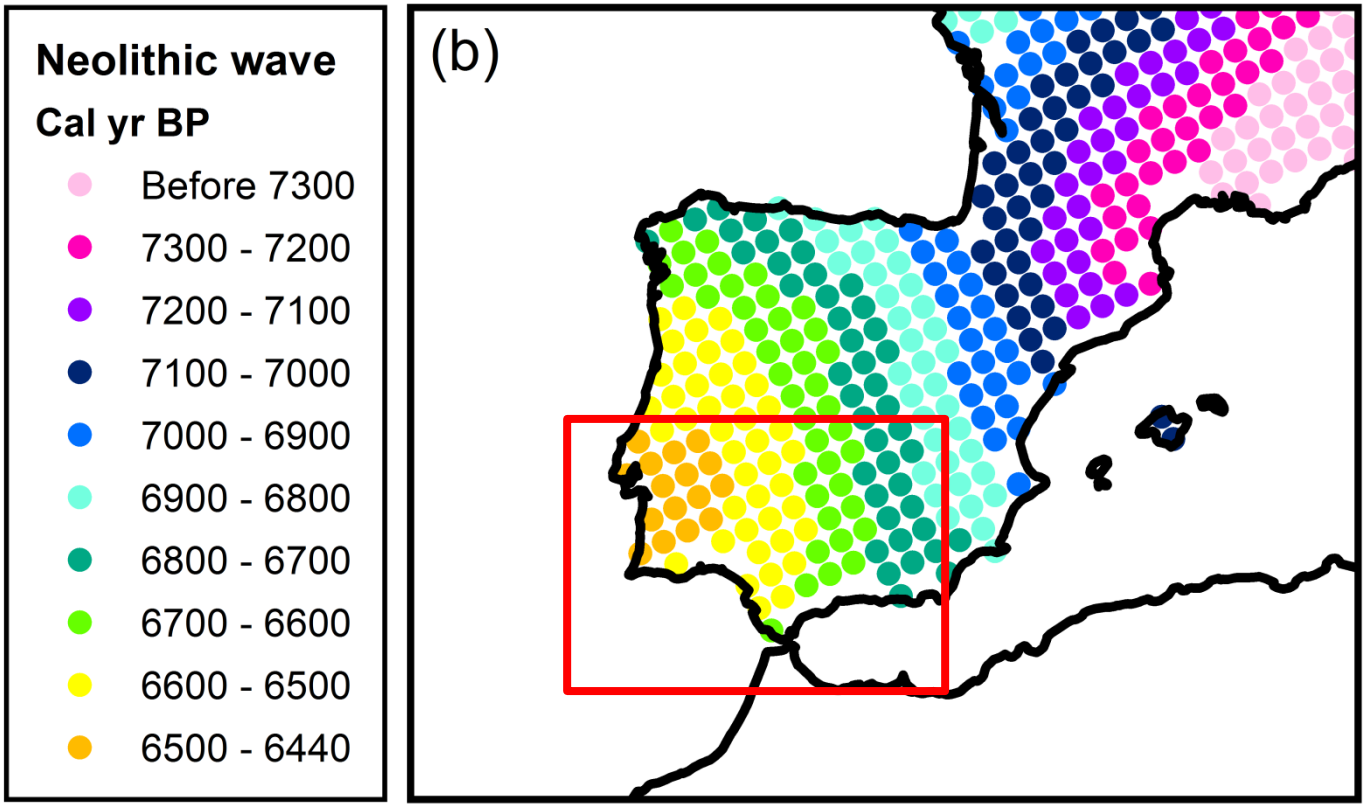


Possible African entrance



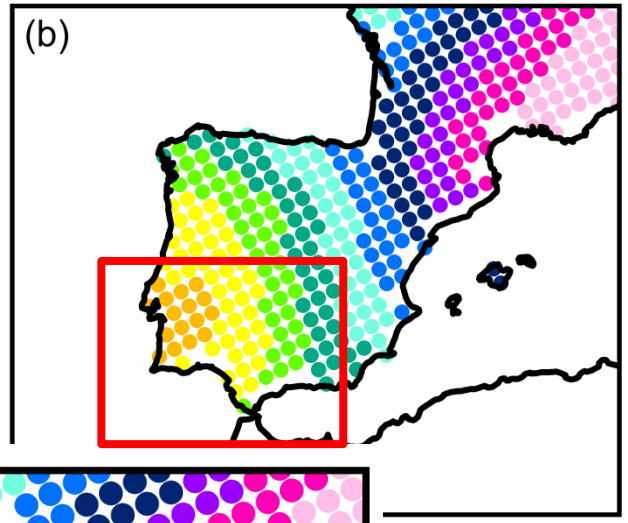
No African expansion allowed

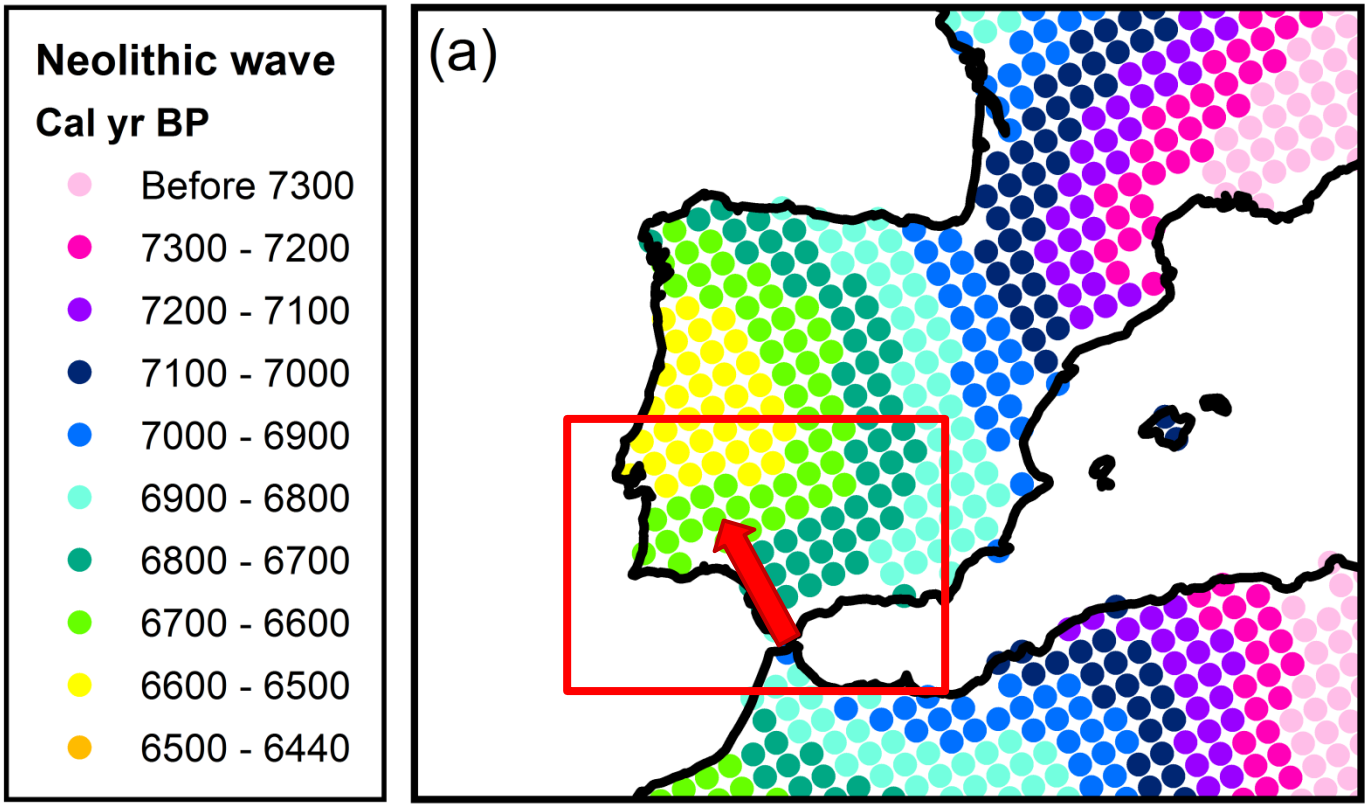
- No northward expansion from the south



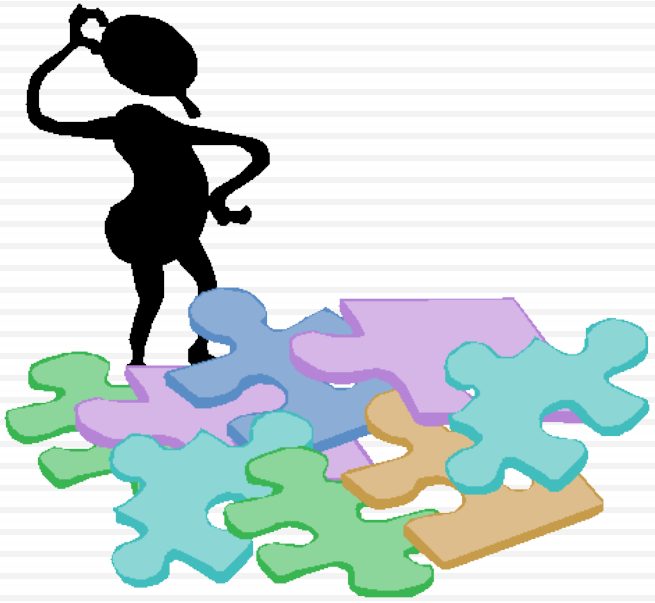
African expansion allowe

- **Northward** expansion from the south
  - African entrance





Conclusions



Conclusions

- The data show a clear expansion from the south at western Iberia
- Archaeological remains support the possibility of this expansion having its origin at the African coast
- The mathematical analysis cannot distinguish between an African origin and a fast coastal expansion form the north.
- The model only predicts the northward expansion when allowing an African entrance. However, a more refined sea-travel model could change this.
- More data on the African shore is required to validate or discard the hypothesis of an expansion with African origin.

~ Thank you!

- Isern N, Fort J, Carvalho AJ, Gibaja JF, Ibañez JJ. *J Archaeol Method Theory*, **21**, 447–450 (2014)

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