



**Interpretative Honesty and Transparency in Skyscape Research:
the Rego da Murta passage graves as an example**

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MA CAA Module AHAN7043 :: May 2017

Aims of Today's Lecture

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Published archaeoastronomical work tends to be *positive-result biased*.

By this I mean that only positive results are reported and published: i.e. hypotheses that find validation in the available evidence.

This is a wider problem in academia (including medical research!!) that only began to be recognised a couple of years ago

Aims of Today's Lecture



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Publication bias against negative findings is detrimental to the progression of science.



*As a large funder of biomedical research, the Wellcome Trust is keen to ensure that the findings of that research are widely and openly shared. There is a body of evidence that indicates a bias against writing up and publishing of negative findings. **Jonathon Kram** and **Adam Dinsmore**, from the Wellcome Trust evaluation team, discuss why this could create a barrier to scientific progress.*



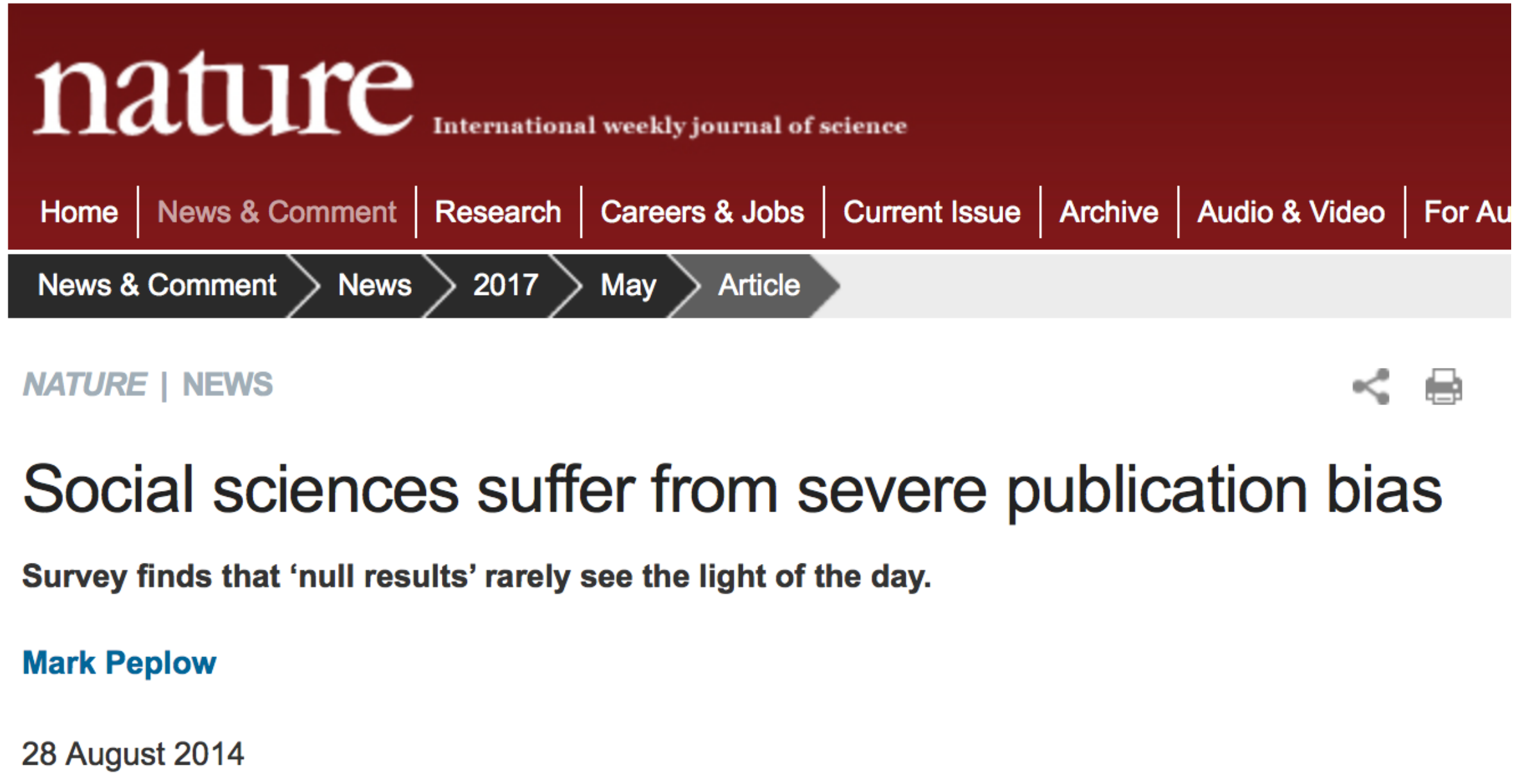
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<http://blogs.lse.ac.uk/impactofsocialsciences/2014/09/15/publication-bias-negative-findings-detrimental/>

Aims of Today's Lecture



The image is a screenshot of a web page from the journal Nature. The top navigation bar is dark red with the 'nature' logo in white. Below the logo, the text 'International weekly journal of science' is visible. A horizontal menu contains links: Home, News & Comment, Research, Careers & Jobs, Current Issue, Archive, Audio & Video, and For Authors. A secondary navigation bar below this shows a breadcrumb trail: News & Comment > News > 2017 > May > Article. The main content area has a header 'NATURE | NEWS' on the left and share/print icons on the right. The article title is 'Social sciences suffer from severe publication bias' in large black font. Below it is a subtitle: 'Survey finds that 'null results' rarely see the light of the day.' The author's name, 'Mark Peplow', is in blue. The date '28 August 2014' is at the bottom left.

nature International weekly journal of science

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio & Video | For Authors

News & Comment > News > 2017 > May > Article

NATURE | NEWS

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Mark Peplow

28 August 2014

<http://www.nature.com/news/social-sciences-suffer-from-severe-publication-bias-1.15787>

Aims of Today's Lecture

Why it's time to publish research “failures”

Publishing bias favors positive results; now there's a movement to change that

By Lucy Goodchild van Hilten Posted on 5 May 2015



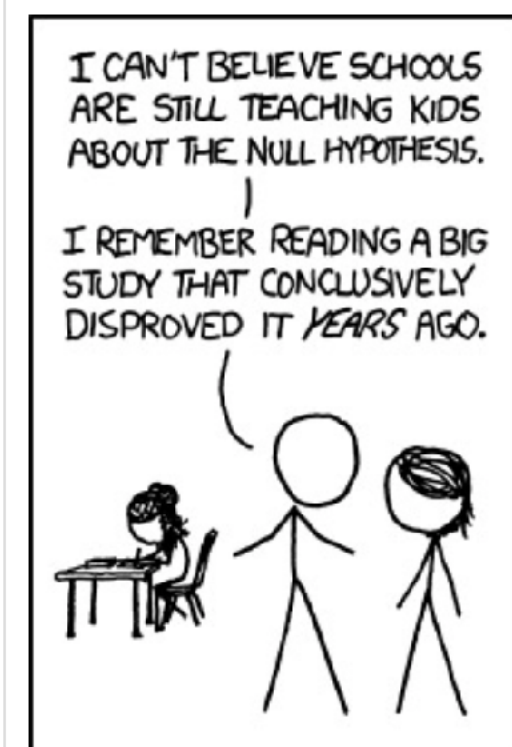
Share story: [f](#) [t](#) [g](#) [in](#) [e](#) [v](#) [e](#)

After hours of testing, retesting, checking and confirming, Dr. Jones closes her lab book; her experiments have not disproved the [null hypothesis](#) [↗] and they don't support her new theory. She leaves her negative results behind, moving on to work on something new in the hope that she'll have a positive outcome next time.

Meanwhile, what happened in her lab will stay in her lab. No point in publishing negative results, after all.

Or is there?

Publication bias affects the body of scientific knowledge in different ways, including skewing it towards statistically significant or “positive” results. This means that the results of thousands of experiments that fail to confirm the efficacy of a treatment or vaccine – including the outcomes of clinical trials –



Source: xkcd.com

<https://www.elsevier.com/connect/scientists-we-want-your-negative-results-too>

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By this I mean that only positive results are reported and published: i.e. hypotheses that find validation in the available evidence.

This is a wider problem in academia (including medical research!!) that only began to be recognised a couple of years ago

Publishing negative results is advantageous because:

- (1) it can save time in future
- (2) it can set the scene for future interpretation when more evidence is available
- (3) it makes research more transparent and honest

Aims of Today's Lecture

By the end of this lecture I will have argued that:

(1) It is important for the discipline that we consider and report all hypotheses

reporting is necessary for transparency

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(2) It is equally important to recognise when there isn't sufficient evidence to support a single hypothesis

i.e. interpretative honesty

This is relevant since, in archaeology as in most other fields, there is always the possibility of finding new evidence in the future.

But also, it is important to demonstrate transparency and honesty when trying to convince others of your research results (as well as to convince them the field itself is relevant!).

Iberian Passage Graves





















A Recent Case Study

Proceedings of the Prehistoric Society, page 1 of 18 © The Prehistoric Society
doi:10.1017/ppr.2018.4

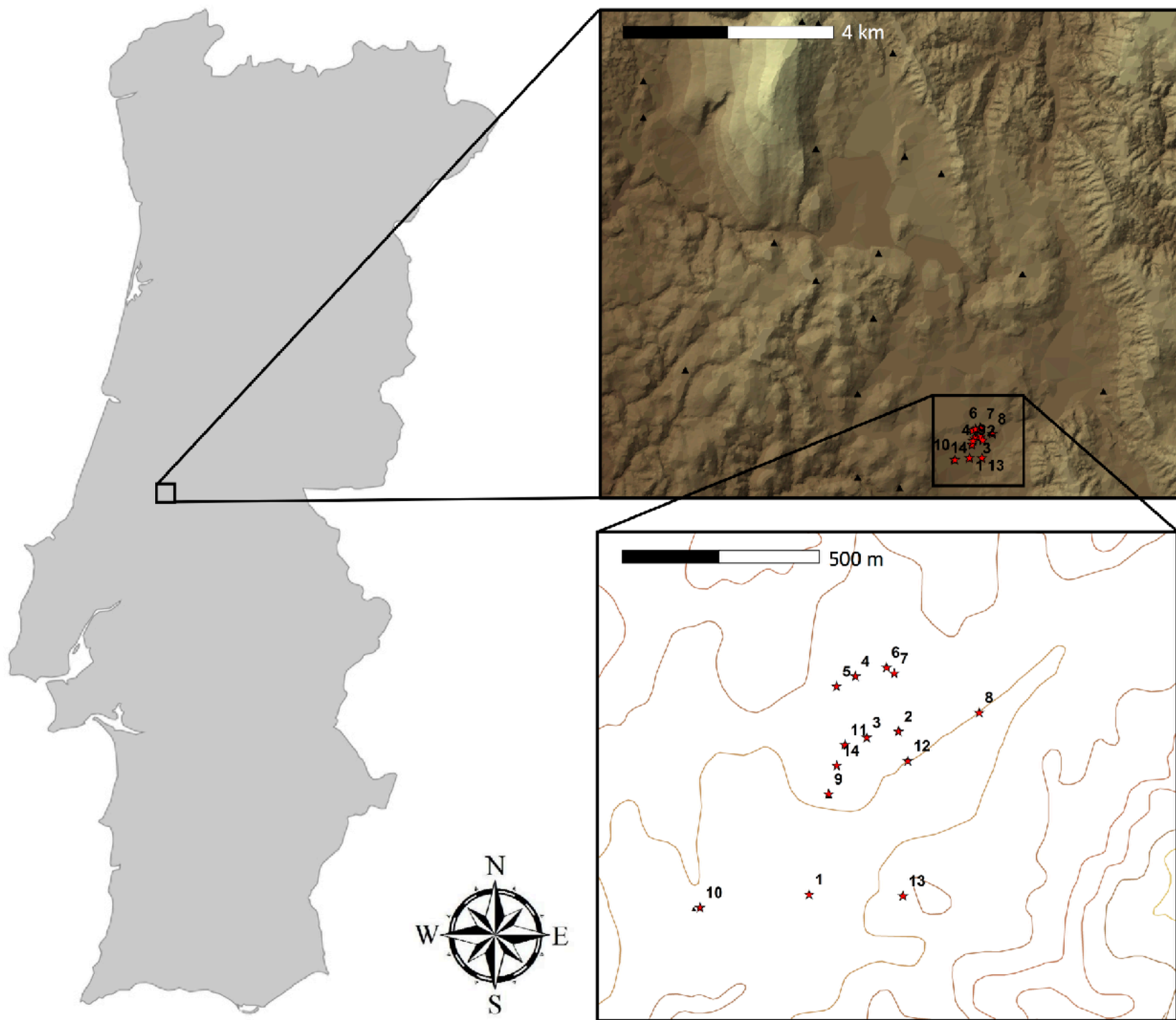
The Planning and Orientation of the Rego da Murta Dolmens (Alvaiázere, Portugal)

By ALEXANDRA FIGUEIREDO¹, BENITO VILAS-ESTÉVEZ², *and* FABIO SILVA^{3,4}

During the excavation of Rego da Murta Dolmen I, a structure belonging to a megalithic cluster in central Portugal, a number of small sub-quadrangular quartzite stones were found embedded within a layer below that of the deepest orthostat. In this paper, we report on these findings and highlight three key features of these small stones, namely their location relative to the dolmen's plan, the distances between them, and their orientations. We suggest the quartzite stones could have been markers used in the planning of this megalithic structure. In addition, we analyse the orientations of the two main structures of the cluster (Dolmen I & Dolmen II), which are reflected by the orientation of the quartzite stones. We tentatively suggest potential landscape and skyline alignments for their orientations, including three hypotheses for the observed differences in orientation between the two.

Keywords: megalithic tombs, Portugal, archaeoastronomy, skylines, Late Neolithic, Chalcolithic, window of visibility

Rego da Murta Cluster



The Rego da Murta megalithic cluster is a large complex of megalithic monuments in Alvaiázere, in the Leiria district of central Portugal.

- 1 : Dolmen I
- 2 : Dolmen II
- 3-9 : Menhirs
- 10-14 : Other (smaller) structures

Undergoing excavation since 1998.

Burial evidence indicates Late Neolithic and Early Bronze Age use, roughly 3500-2000 BCE

Rego da Murta Cluster



Burials from two distinct periods (LN and EBA).

Minimum of 50 individuals, both male and female, and various ages.

Also wild (mainly rabbit) and domestic (pig, ovicaprid and dog) animal bones.

Ceramic vessels, blades, arrowheads, necklace beads, axes, etc.

Rego da Murta Cluster

Located to the North of Dolmen.

No clear distinction between chamber and corridor.

Includes a paved area.

Later, eight pit deposits with a mixture of human and animal bones (minimum number of 54 people), closed off by limestone rocks associated with overturned vessels



Rego da Murta Cluster

The two Dolmens might have experienced periods of use and disuse; they underwent **profound alterations of their internal structures**, but had minimal changes to their lithic structures:

- both dolmens were **probably constructed and used at the same time**, as indicated by the oldest radiocarbon dates of the two structures (3370–3090 cal BC).

- in the Late Neolithic/Early Chalcolithic, the interior of **Dolmen II** was **cleared of its contents, a pavement placed, and the ossuaries deposited**. By contrast, Dolmen I was never cleared, but its interior presented evidence of extensive mixing of material, including of the bone assemblages.

- this might indicate the occurrence of a **shift in funerary practice in the Early Bronze Age**, a period in which burials lack the lithic structures that were visible in the mid- to late Chalcolithic.



Dolmen II



Dolmen I

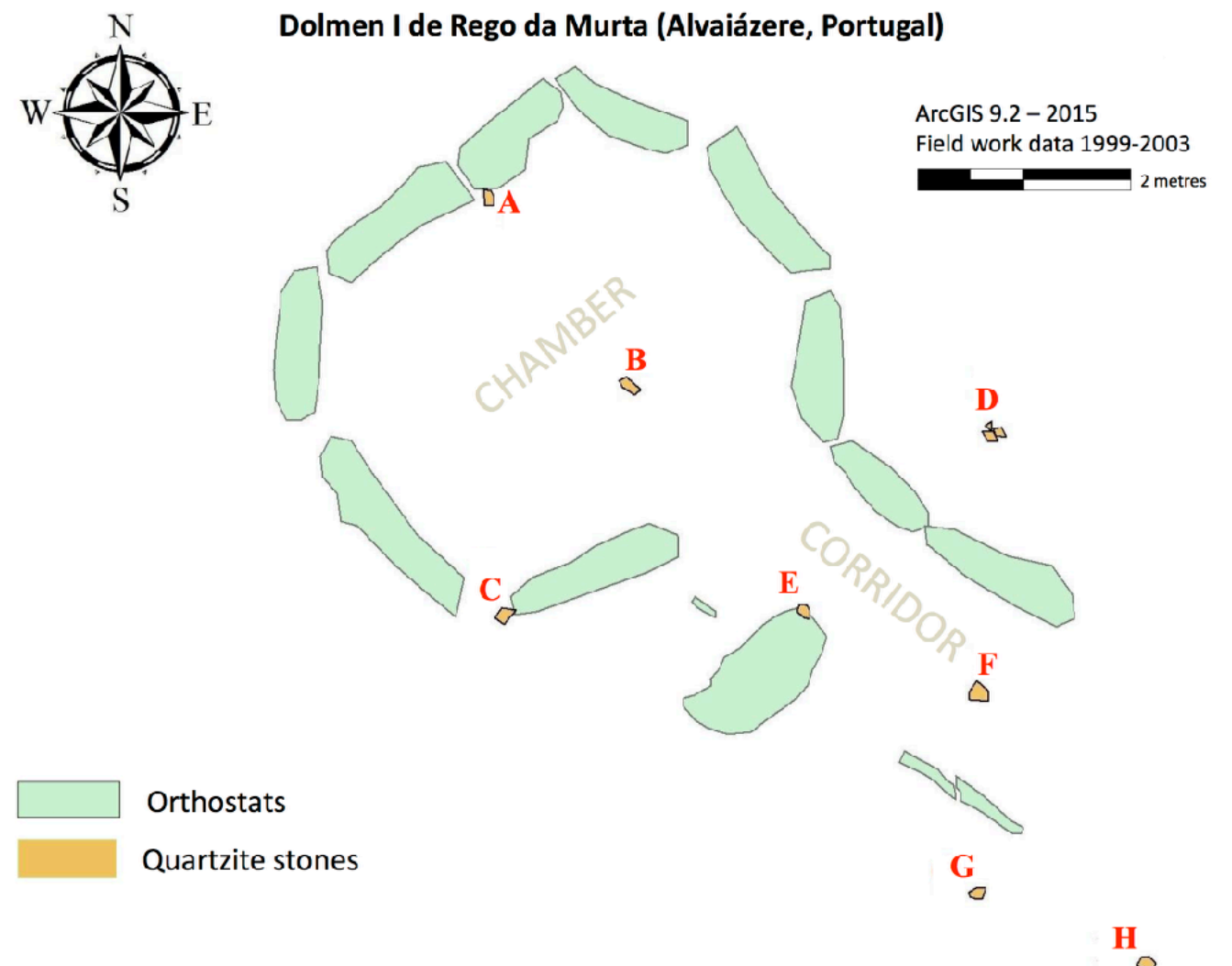
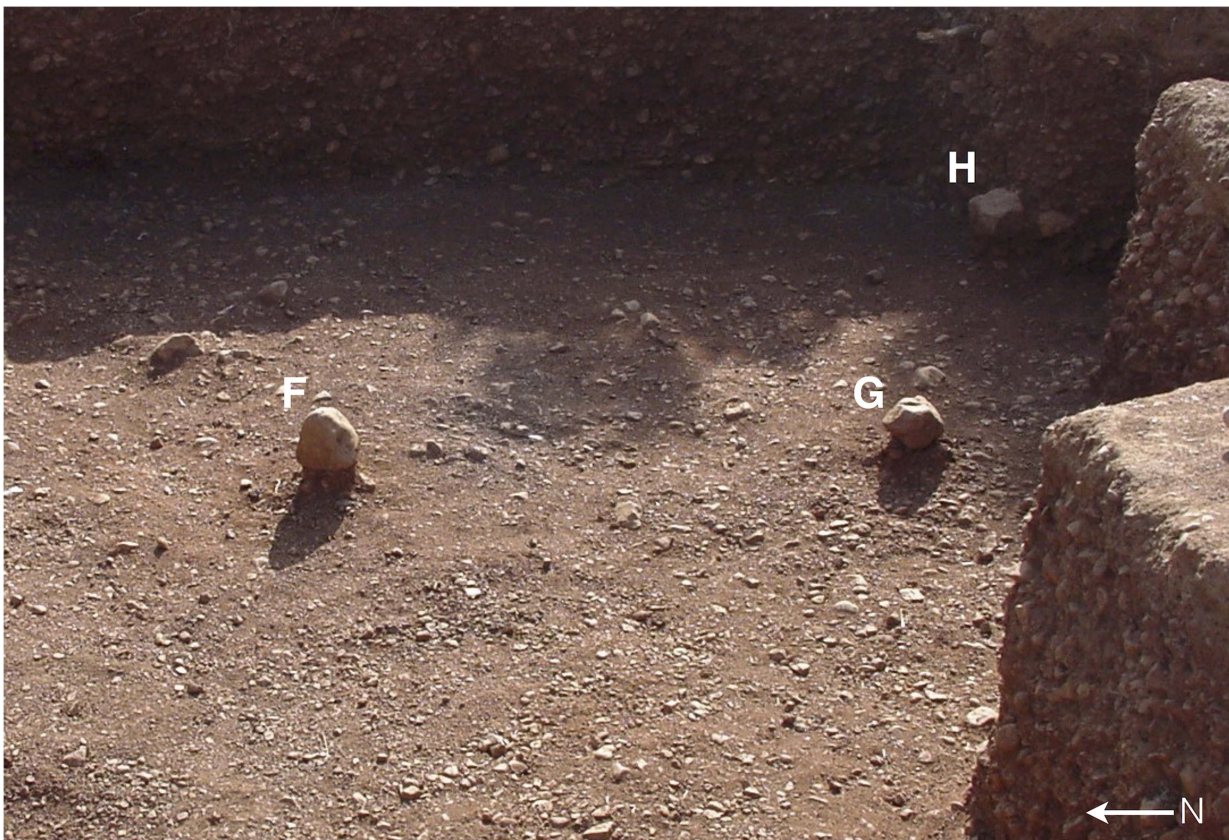
Side note: the quartzite stones

At the end of the Dolmen I excavation, a set of **small sub-quadrangular stones** were found at the bottom of all the archaeological layers.

They are very **different from the other stones** used in these monuments, both in shape and material constitution.

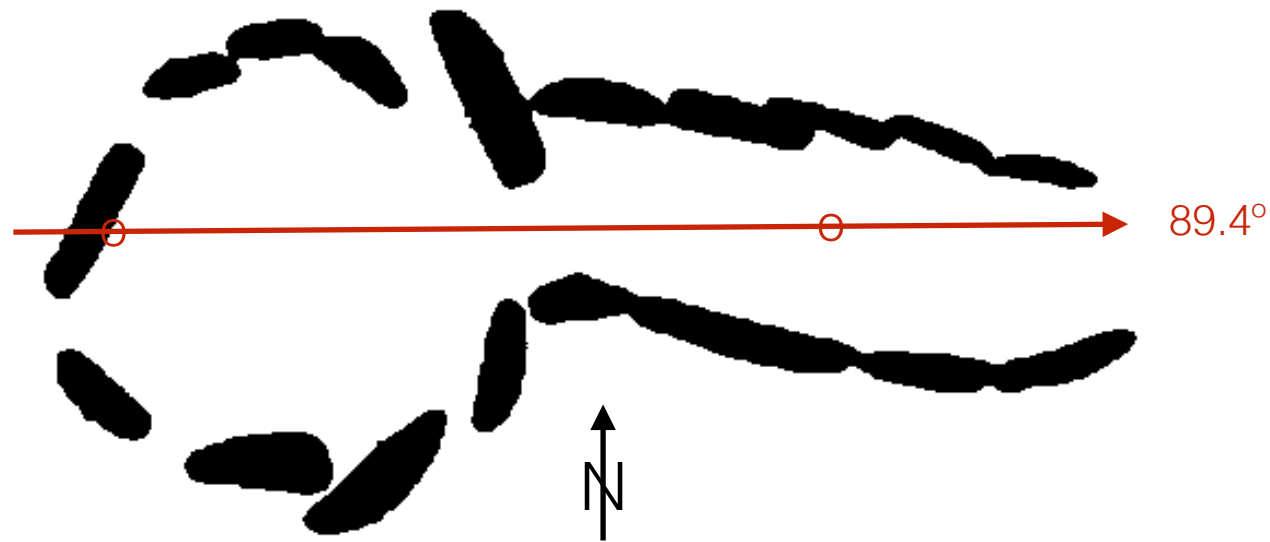
They were **placed in the deepest layer**, but extended in height to the level where the orthostats are planted.

The intentional placement of these stone markers in the ancient soil **suggests there was a plan for the construction of the monument prior to the placement of the orthostats that formed the chamber and corridor.**



Methodology

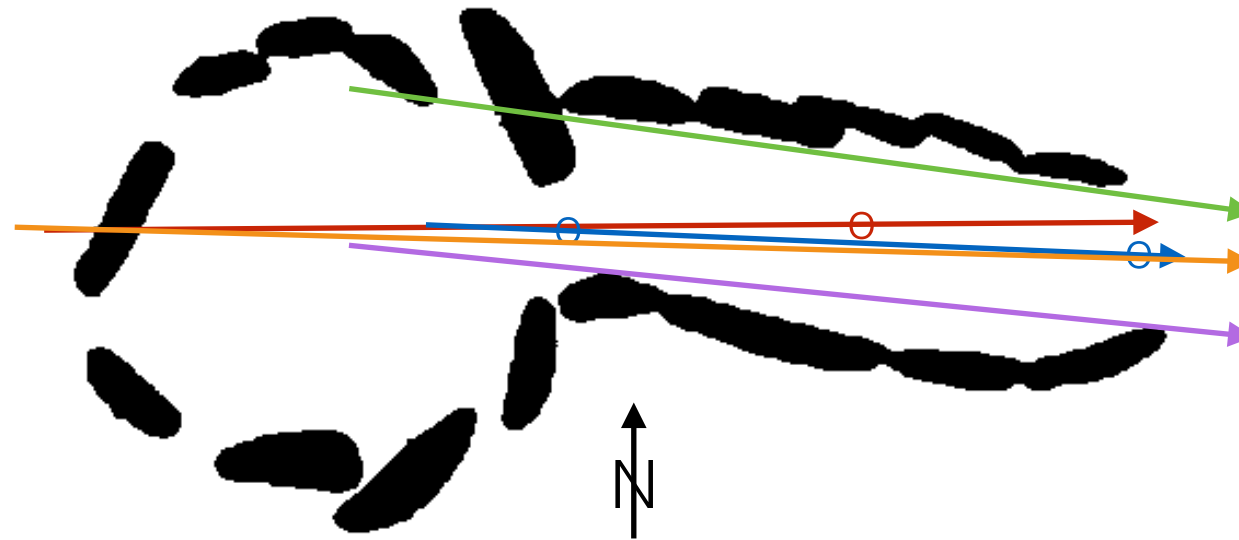
Previous scholars have focused on a 'single' measurement of orientation (below) and mentioned an uncertainty of 2° or 3° , although the latter was never used!



This I will call the *axis of symmetry*, or the *traditional*, method.

Methodology

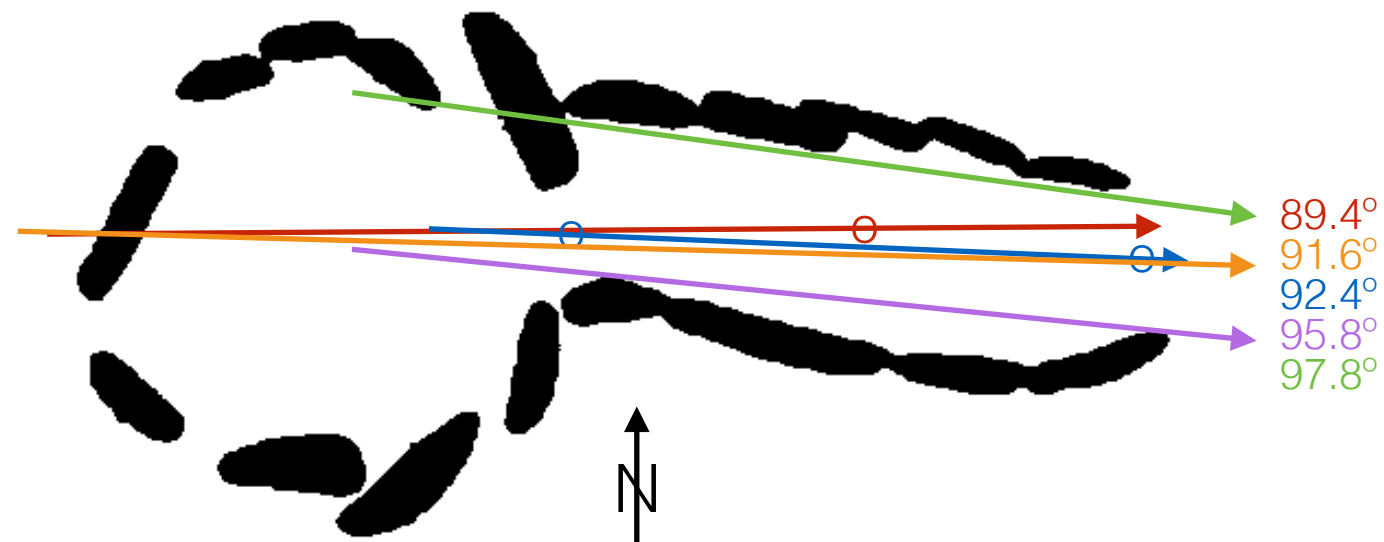
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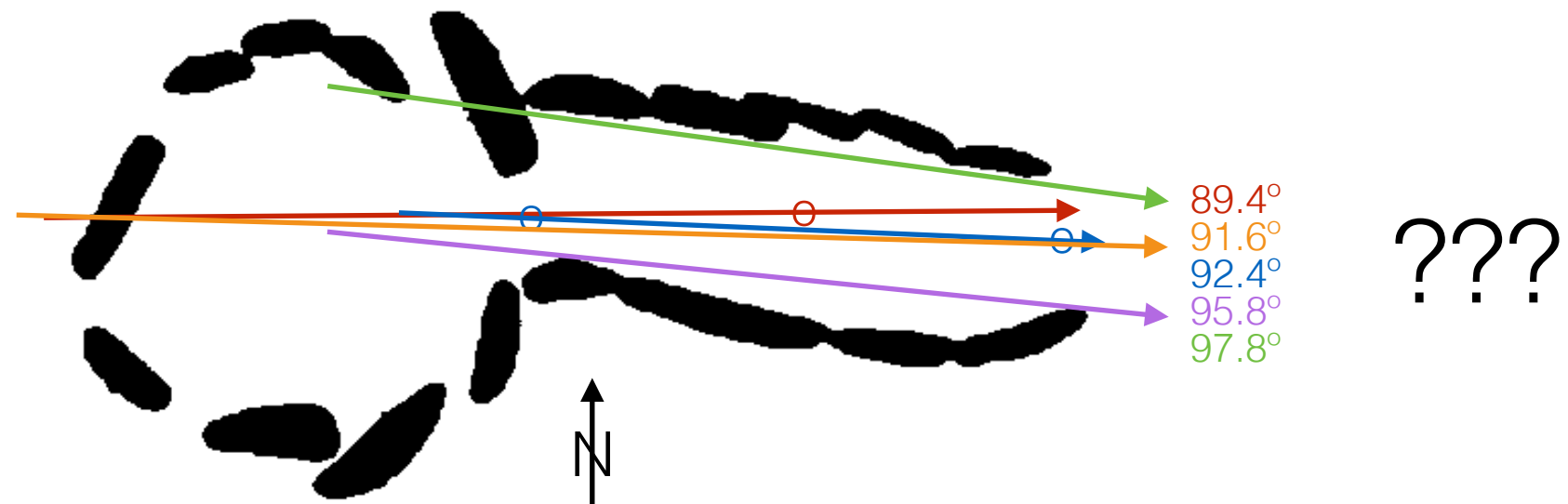


But many such 'single' orientations are possible to measure...

Differences in azimuth can ascend to 10° or more!!!

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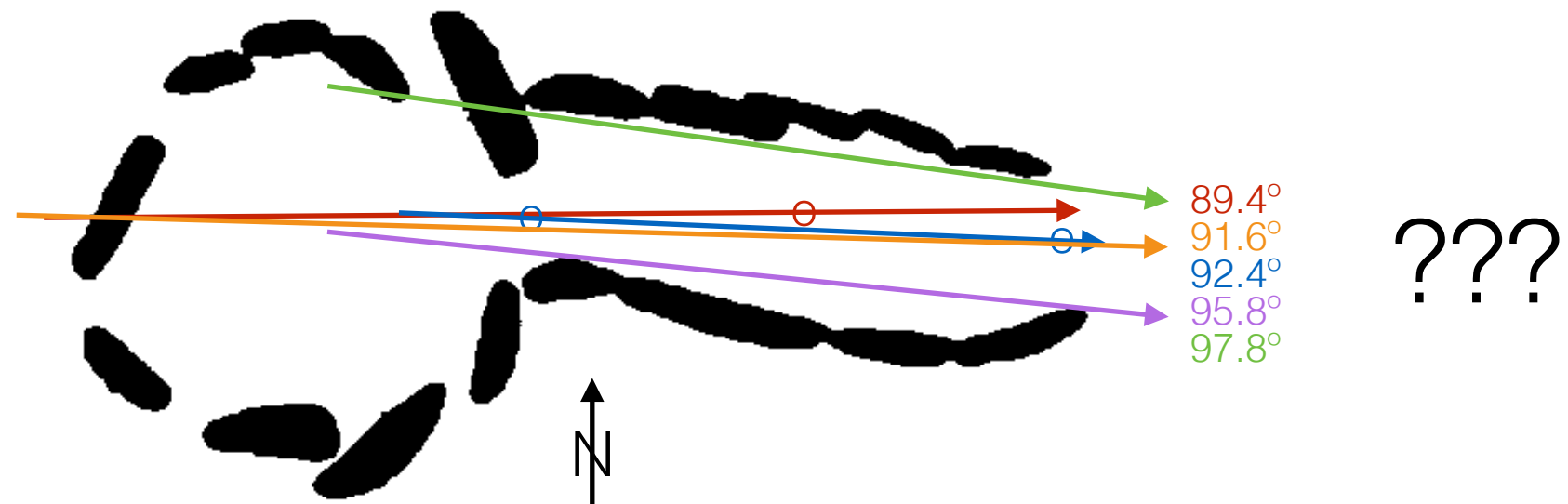
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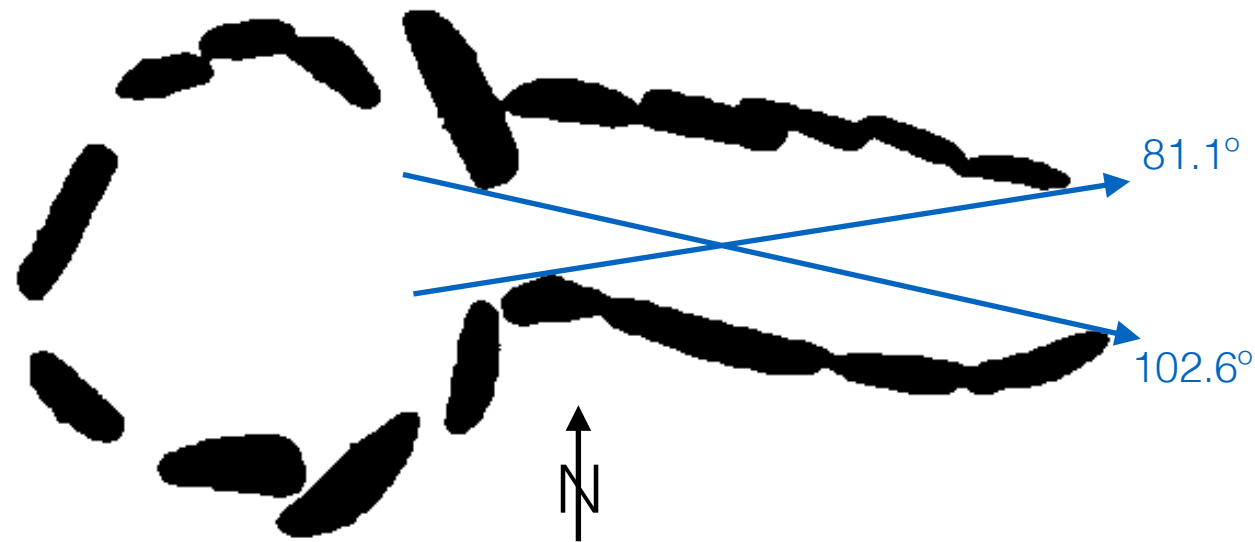
Differences in azimuth can ascend to 10° or more!!!

How can we say which line best captures what the prehistoric people had in mind?

We cannot!

Methodology

Instead, I've proposed a different methodology, where we **measure the minimum and maximum azimuths**, or what I have called the '**window of visibility**'



There are two reasons for preferring this methodology:

(statistical) : working with maximum uncertainty

(phenomenological) : this window is what is actually experienceable

Hence, both quantitatively and qualitatively we are working with **fewer biases!**

Dolmen I de Rego da Murta (Alvaiázere, Portugal)



ArcGIS 9.2 – 2015

Field work data 1999-2003

2 metres

Traditional Axis

Azimuth: 134°

Horizon Altitude: 2.5°

Declination: -30.6°

Minimum

Azimuth: 106°

Horizon Altitude: 5°

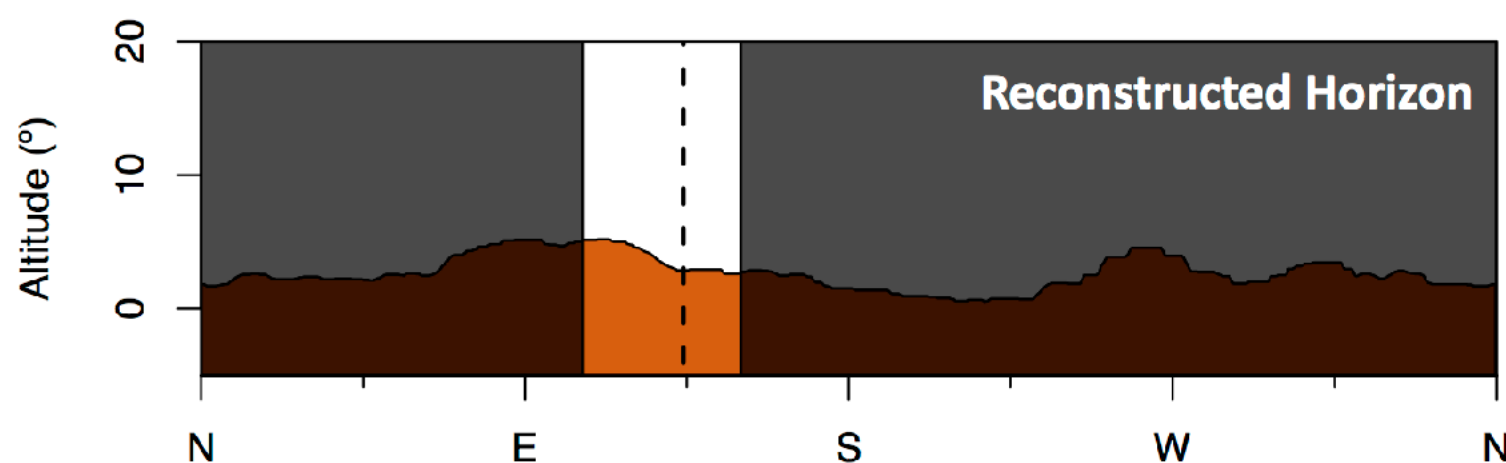
Declination: -9°

Maximum

Azimuth: 150°

Horizon Altitude: 2.5°

Declination: -39.9°



Dolmen II de Rego da Murta (Alvaiázere, Portugal)



ArcGIS 9.2 – 2015

Field work data 1999-2003

2 metres

Traditional Axis

Azimuth: 105°

Horizon Altitude: 5.5°

Declination: -7.9°

Minimum

Azimuth: 91°

Horizon Altitude: 5°

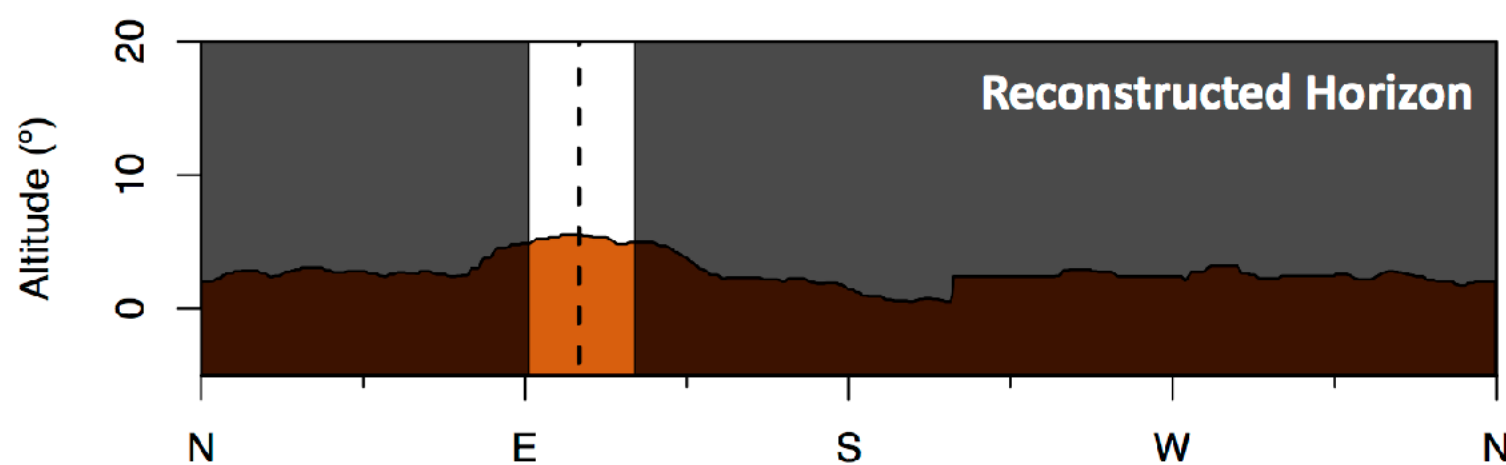
Declination: 2.4°

Maximum

Azimuth: 120.5°

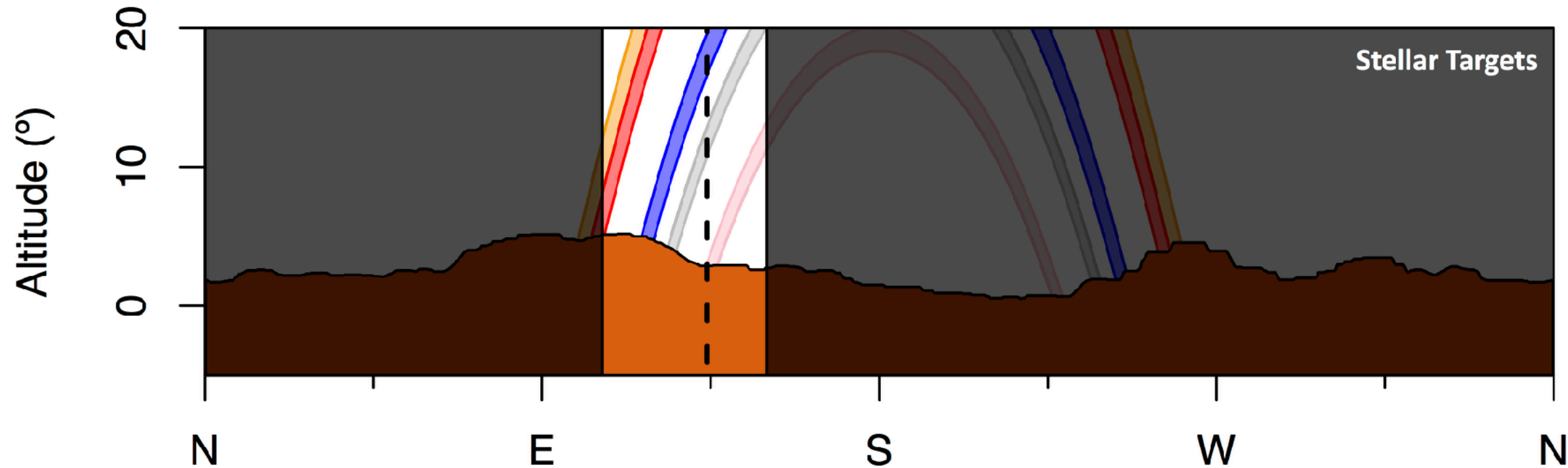
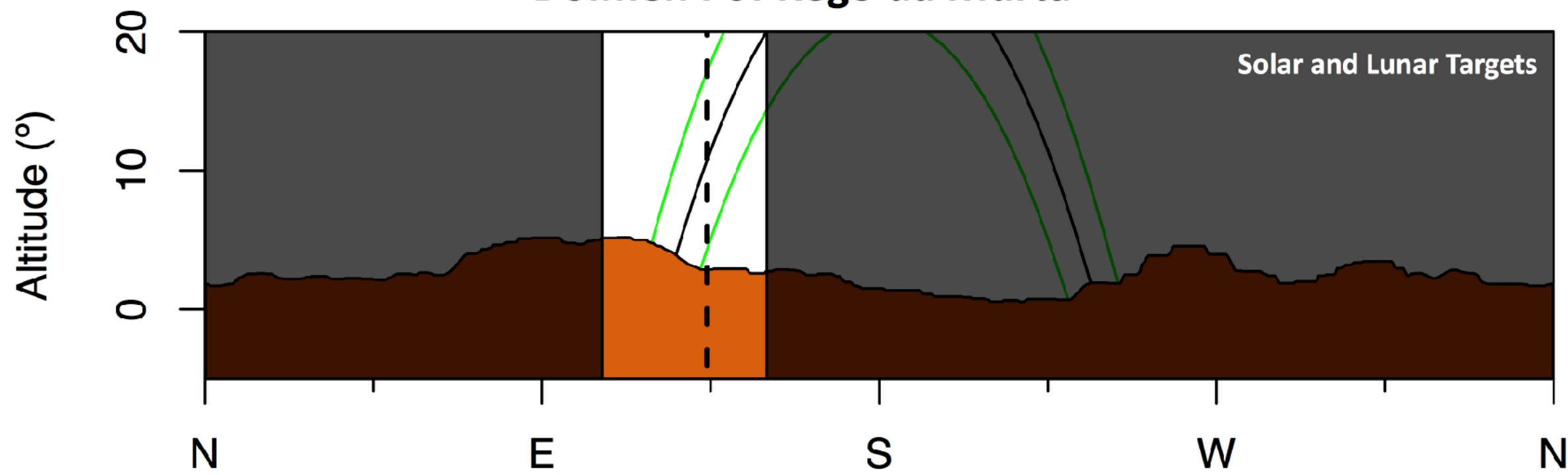
Horizon Altitude: 5°

Declination: -19.4°



Celestial Interpretations

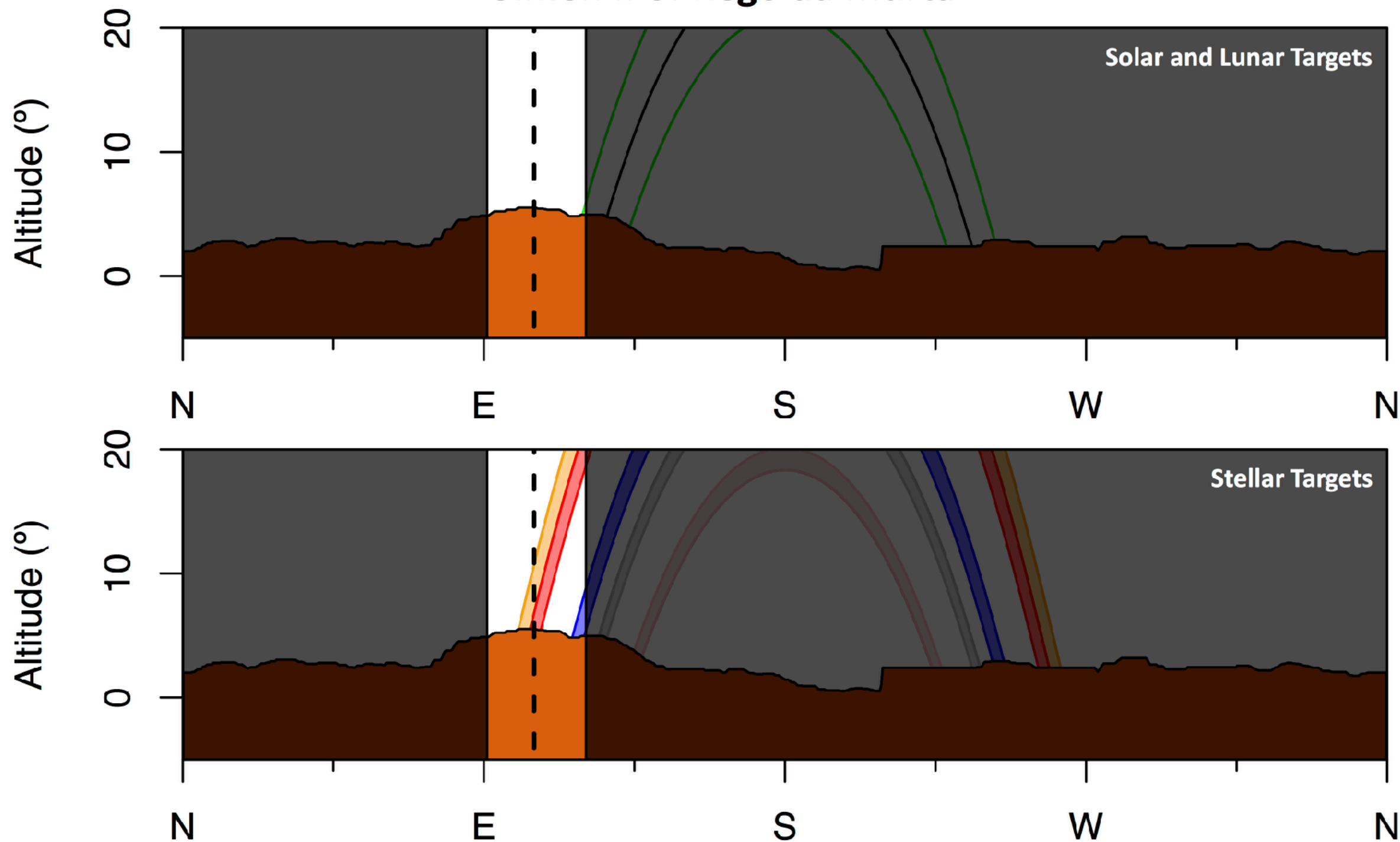
Dolmen I of Rego da Murta



- Legend :
- | | | |
|------------------------------------|----------------------------------|---------------------------------|
| — December Solstice sunrise | — Extreme moonrise limits | — Alnilam (ϵ Orionis) |
| — Aldebaran (α Tauri) | — Betelgeuse (α Orionis) | |
| — Sirius (α Canis Majoris) | — Gacrux (γ Crucis) | |

Celestial Interpretations

Dolmen II of Rego da Murta



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Interpretative Hypotheses

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Always consider this!

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The fact that both structures target the same hilltop, albeit different sections of it, suggests that it was significant to these Late Neolithic/Chalcolithic communities. This hypothesis could be strengthened by finds of other megalithic structures orientated towards this hill in its vicinity, as well as potential archaeological finds on the hilltop itself, which is a mere 2 km away from the Rego da Murta cluster.

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H2 : despite their different central axes, the two monuments **target and align with a single celestial object**, in addition to aligning with the same hill

Comparing their ranges, one finds that there is a small but considerable overlap in declination (-9° to -18.5°). The stars **Betelgeuse** and those of **Orion's belt** are the only celestial objects of note that match this declination range for the period under consideration .

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H3 : the two monuments target different celestial objects

Dolmen I could be targeting the sunrise in or around the **December solstice**, the **summer full moon**, the star **Sirius**, or the **Southern Cross** constellation. On the other hand, Dolmen II could be targeting the **spring full moon**, or the stars **Aldebaran** and **Betelgeuse**.

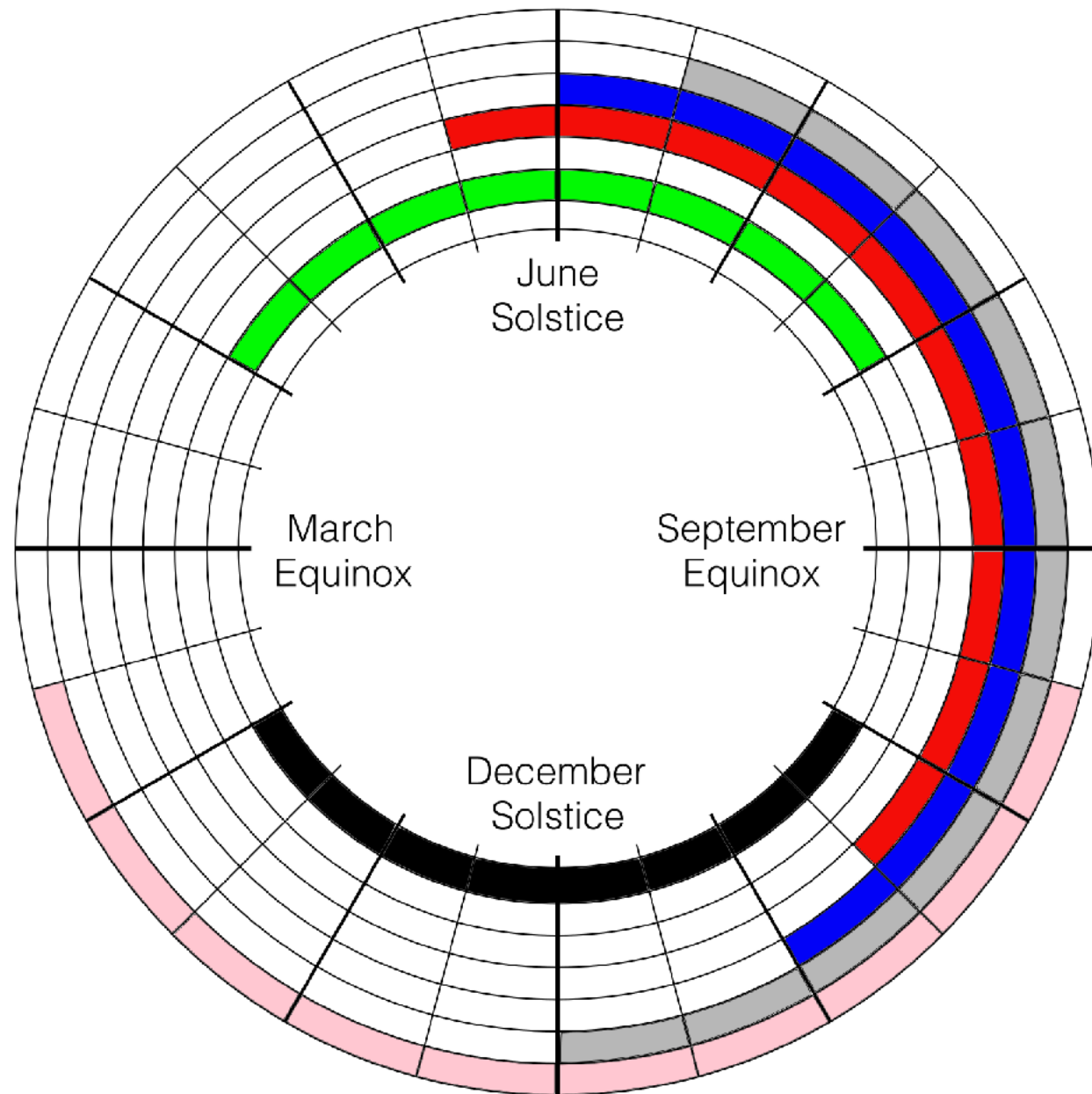
Seasonality

We've discussed how seasonality can help discern between alternative targets in the last seminar (on *Identification and Interpretation*).

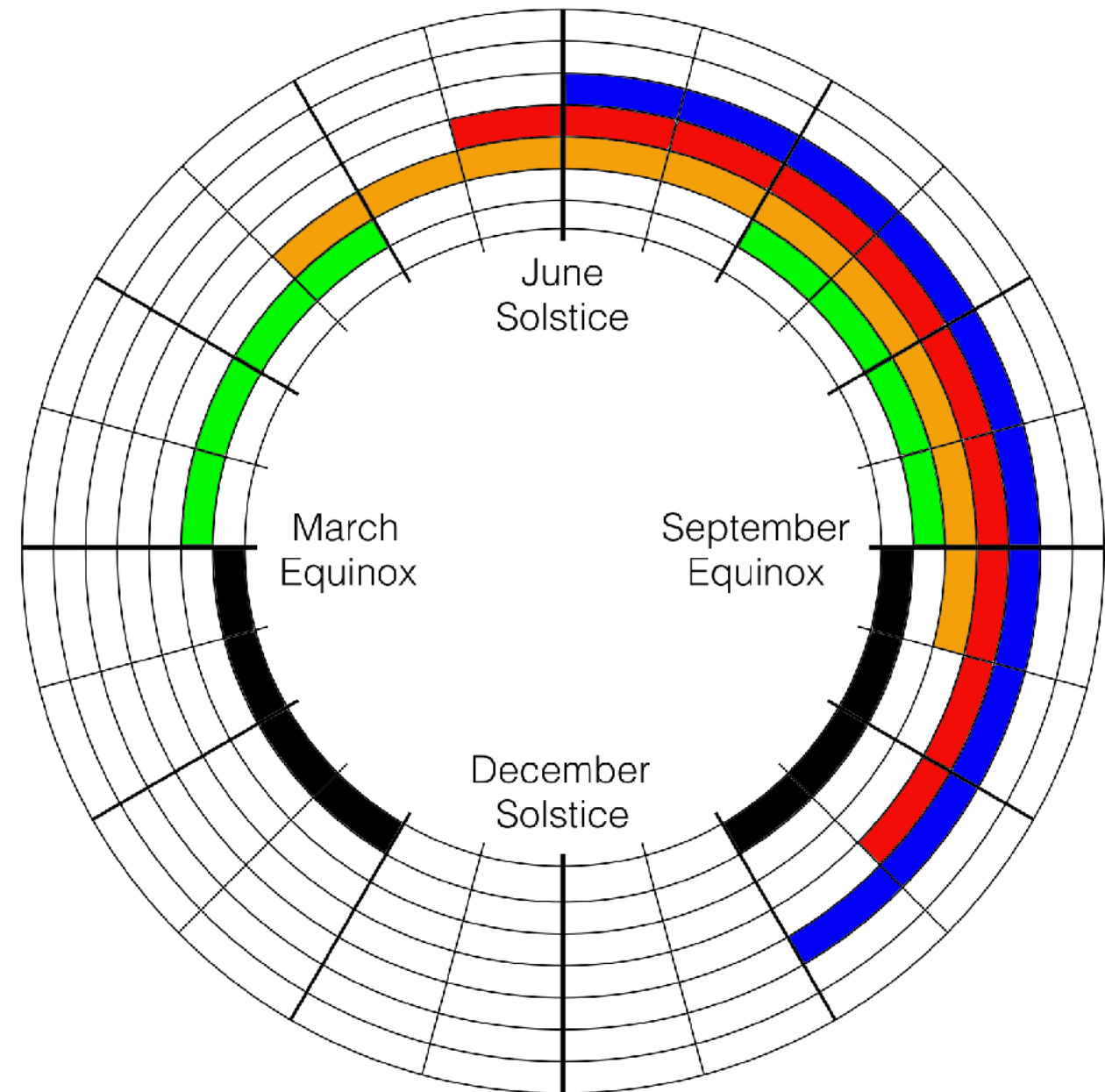
If there is evidence of seasonal occupation or use of a site this can be used to build a case for, or against, some celestial targets — hopefully this can help narrow down our hypotheses.

Seasonality

Dolmen I



Dolmen II



Legend :

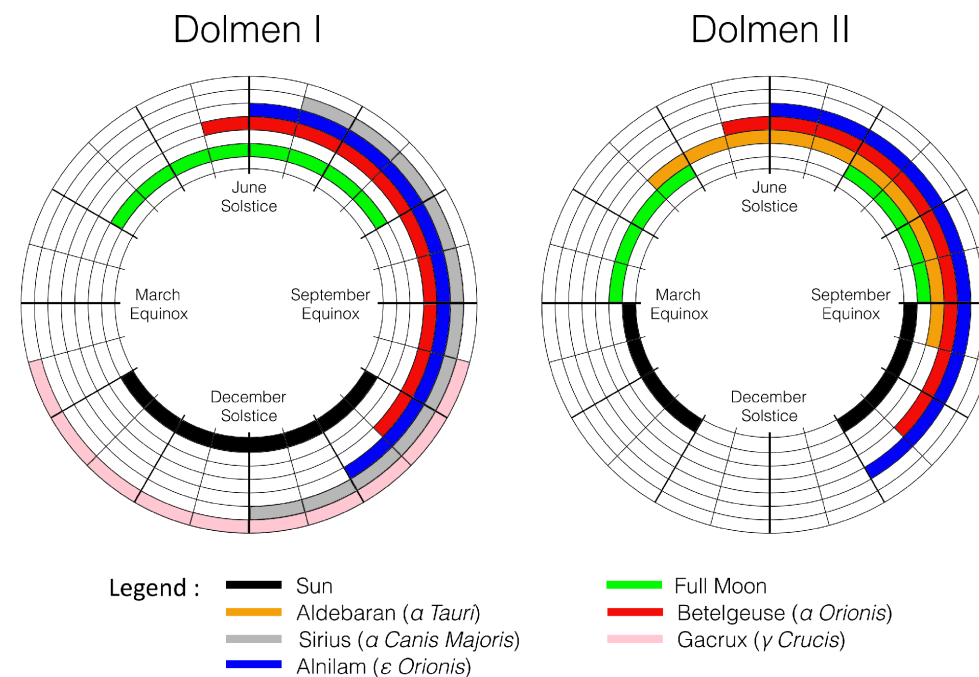
- Sun
- Aldebaran (α Tauri)
- Sirius (α Canis Majoris)
- Alnilam (ϵ Orionis)

- Full Moon
- Betelgeuse (α Orionis)
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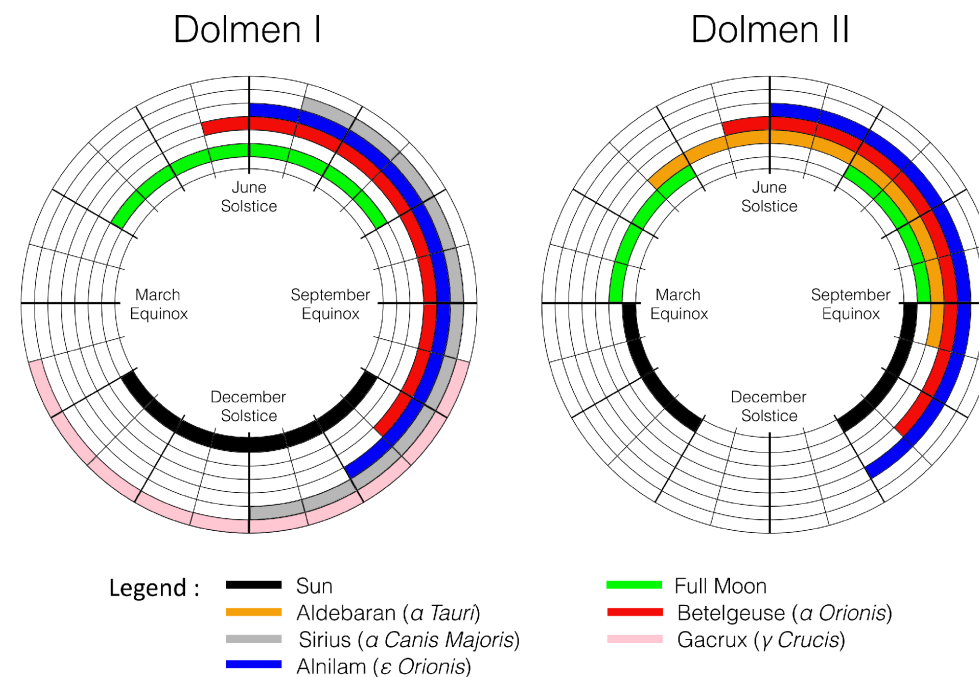


Unfortunately, the megalithic cluster's seasonality of occupation, as inferred from the archaeological record, is **inconclusive**. Access to the dolmens would have been difficult in winter as they are located on floodplains, which might preclude any winter alignments.

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Unfortunately, the megalithic cluster's seasonality of occupation, as inferred from the archaeological record, is **inconclusive**. Access to the dolmens would have been difficult in winter as they are located on floodplains, which might preclude any winter alignments.

“However, based on the presently available data, or lack thereof, we refrain from speculating any further, but hope to return to these hypotheses later when more evidence is available.” (p. 15)

Conclusions & Best Practice

(1) Always consider all hypotheses

(2) See how those hypotheses fare against the evidence available

(3) In essays and publications, mention all hypotheses considered and how they fare against the evidence

(4) Recognise and acknowledge when there is insufficient evidence to choose between different hypotheses