

# La foresta mediterranea...



E il suo degrado



# Allevamento brado in Corsica



# Allevamento brado in Corsica



# La fine dell'ultima era glaciale

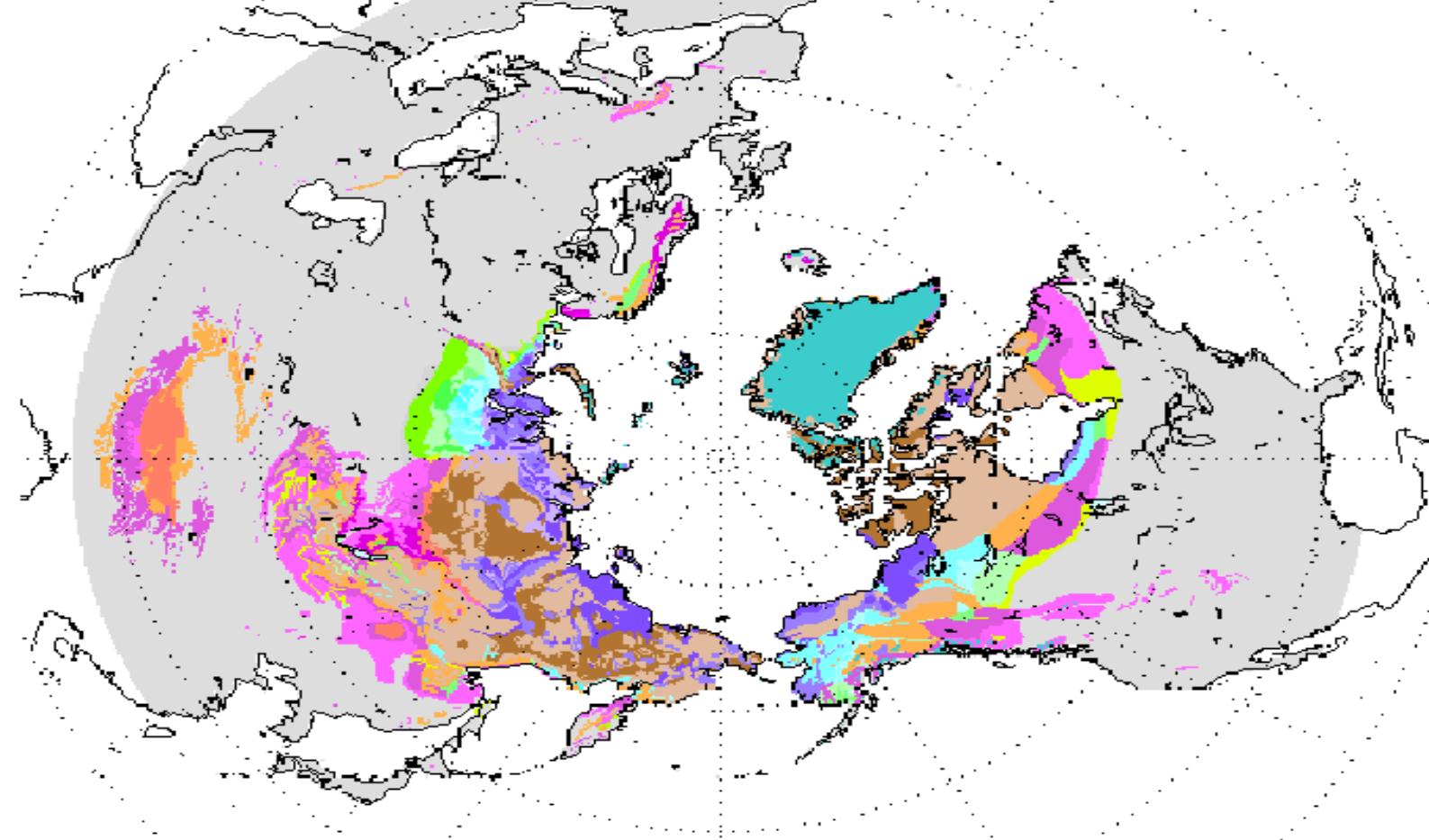
Alla fine dell'era glaciale, il mitigarsi delle condizioni climatiche rese possibile un progressivo aumento della densità delle popolazioni umane le quali, dai loro rifugi franco-iberici, centro-europei, italici e balcanici iniziarono ad espandersi verso Nord e verso Est, così come all'interno della regione alpina, colonizzando le regioni che via via si liberavano dai ghiacci. Questi ultimi, a mano a mano che si scioglievano, lasciavano dietro di sè, nelle zone pianeggianti, un suolo intriso d'acqua, che non poteva percolare nel sottosuolo per la presenza del ***permafrost***. Le condizioni di umidità erano, inoltre, accentuate dall'aumento delle precipitazioni.

In queste condizioni, le piante erbacee (graminacee, leguminose ed altre famiglie) non possono svilupparsi e vengono sostituite da una formazione a muschi e licheni, con radi larici, abeti, pini silvestri, ontani e betulle: si è, così, formata la **tundra**.

# La fine dell'ultima era glaciale

«*In general, the vegetation in Northeastern Siberia from ca. 12,500 to 11,500 BP changed from grass and grass-shrub tundra to shrub birch and alder (ontano) tundra.*»

# II permafrost



| Permafrost Extent<br>(percent of area) | Ground Ice Content<br>(visible ice in the upper 10-20 m of the ground; percent by volume)                    |                 |                   |   |               |
|--|--|-----------------|-------------------|---|---------------|
|  | Lowlands, highlands, and intra-and intermontane depressions characterized by thick overburden cover (>5-10m) |                 |                   | Mountains, highlands, ridges, and plateaus characterized by thin overburden cover (<5-10 m) and exposed bedrock |               |
|  | High (> 20%)   | Medium (10-20%) | Low (0-10%)       | High to medium (>10%)   | Low (0-10%)   |
| Continuous (90-100%)                   | Dark Purple  | Medium Purple   | Light Purple      | Brown   | Light Brown   |
| Discontinuous (50-90%)                 | Cyan   | Light Cyan      | Very Light Cyan   | Orange  | Light Orange  |
| Sporadic (10-50%)                      | Green  | Light Green     | Very Light Green  | Magenta   | Light Magenta |
| Isolated Patches (0-10%)               | Yellow   | Light Yellow    | Very Light Yellow | Pink  | Light Pink    |
| Ice caps and glaciers                  |  |                 |                   |   |               |

## II permafrost



Massive blue ground ice exposure on the north shore of Herschel Island, Yukon, Canada.

**La fusione del permafrost fa emergere carcasse mummificate,  
resti scheletrici e zanne di mammut**



A woolly-mammoth tusk emerging from permafrost on Wrangel Island, off the coast of northeastern Siberia.

**La fusione del permafrost fa emergere carcasse mummificate,  
resti scheletrici e zanne di mammut**



Love Dalén and colleague Patrícia Pečnerová with a mammoth tusk on Wrangel Island.

# Ma nell'isola di Wrangel i mammut riuscirono a sopravvivere ancora per migliaia di anni!



# Holocene dwarf mammoths from Wrangel Island in the Siberian Arctic

S. L. Vartanyan, V. E. Garutt & A. V. Sher

[Nature](#) 362, 337–340 (1993) | [Cite this article](#)

1635 Accesses | 184 Citations | 134 Altmetric | [Metrics](#)

## Abstract

THE cause of extinction of the woolly mammoth, *Mammuthus primigenius* (Blumenbach), is still debated. A major environmental change at the Pleistocene–Holocene boundary, hunting by early man, or both together are among the main explanations that have been suggested. But hardly anyone has doubted that mammoths had become extinct everywhere by around 9,500 years before present (BP). We report here new discoveries on Wrangel Island in the Arctic Ocean that force this view to be revised. Along with normal-sized mammoth fossils dating to the end of the Pleistocene, numerous teeth of dwarf mammoth dated 7,000–4,000 yr BP have been found there. The island is thought to have become separated from the mainland by 12,000 yr BP. Survival of a mammoth population may be explained by local topography and climatic features, which permitted relictual preservation of communities of steppe plants. We interpret the dwarfing of the Wrangel mammoths as a result of the insularity effect, combined with a response to the general trend towards unfavourable

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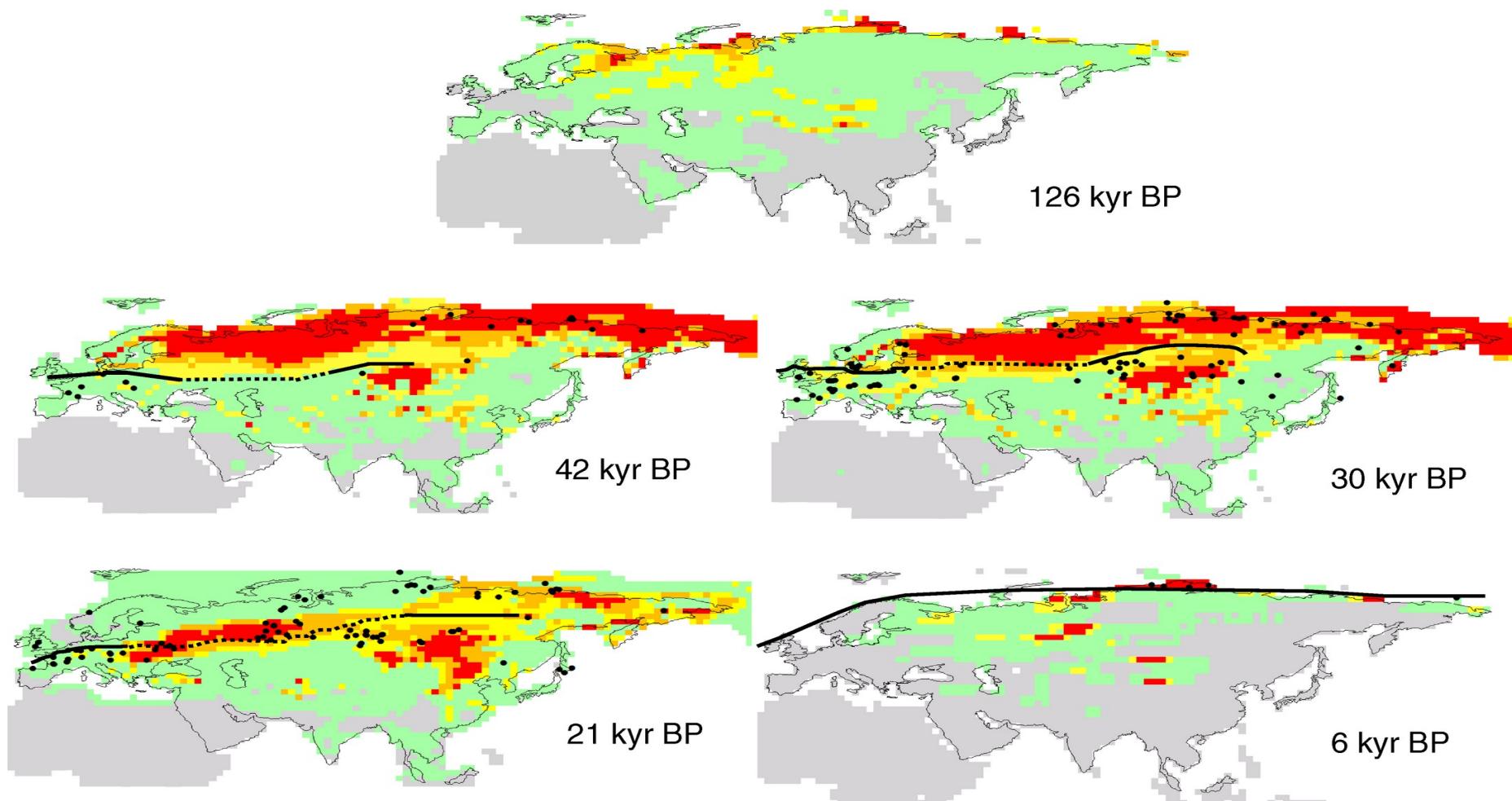
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Are rooftop solar panels the  answer to meeting China's challenging climate targets?



# Global change ed estinzione del mammut

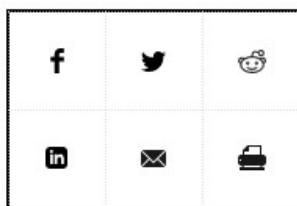


Maps of Projected Climatic Suitability for the Woolly Mammoths in the Late Pleistocene and Holocene. Suitability scores are divided into four colour-scale classes (quartiles 1 [more suitable] to 4 [less suitable]), where **increasing intensities of red represent increasing suitability of the climate** and **increasing intensities of green represent decreasing suitability**. Black points are the records of mammoth presence for each of the periods. Black lines represent the northern limit of modern humans [59]. Black dotted lines indicate uncertainty in the limit of modern humans.

# Organisms from the Ice? As Earth Warms, the Diseases That May Lie within Permafrost Become a Bigger Worry

Scientists are witnessing the theoretical turning into reality: infectious microbes emerging from a deep freeze

November 1, 2016 [Véalo en español](#)



This past summer anthrax killed a 12-year-old boy in a remote part of

## ANTHROPOLOGY

Mammoths Roamed when Humans Started Using Tobacco at Least 12,300 Years Ago

Rachel Nuwer

## ASTRONOMY

'Auroral' Exoplanets Could Help Boost Searches for Alien Life

Nola Taylor Tillman

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A Strategy for Rescheduling Psilocybin

Mason Marks | Opinion

## ANIMALS

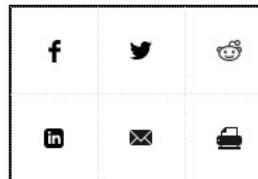
Save the Right Whales by Cutting through the Wrong Noise

CLIMATE CHANGE | OPINION

# Deep Frozen Arctic Microbes Are Waking Up

Thawing permafrost is releasing microorganisms, with consequences that are still largely unknown

By Kimberley R. Miner, Arwyn Edwards, Charles Miller on November 20, 2020



Thermokarst, Russia. Credit: Alamy

In August 2019, Iceland held a funeral for the Okjökull Glacier, the first Icelandic glacier lost to climate change. The community commemorated the

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Mindy Weisberger and LiveScience

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Benjamin Storrow and E&E News

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Teresa Carey

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**COGNITION**

People Who Jump to Conclusions Show Other Kinds of Thinking Errors

Carmen Sanchez and David Dunning

# $\mu$ organismi dal ghiaccio? NATURE | NEWS

## Giant virus resurrected from 30,000-year-old ice

Largest virus yet discovered hints at viral diversity trapped in permafrost.

Ed Yong

03 March 2014



*Julia Bartoli & Chantal Abergel; Information Génomique et Structurale, CNRS-AMU*

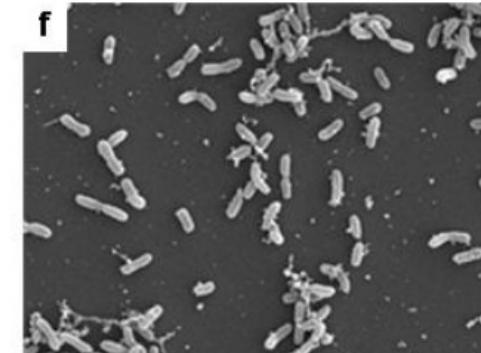
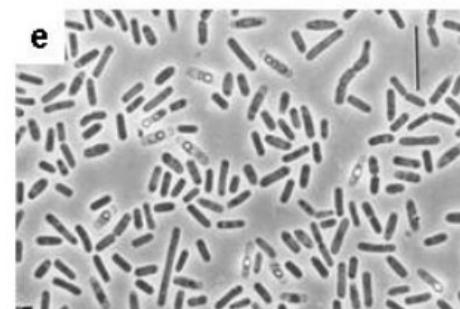
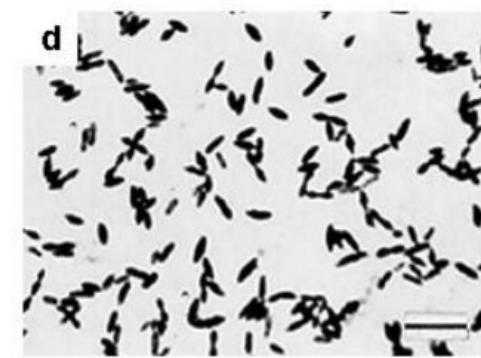
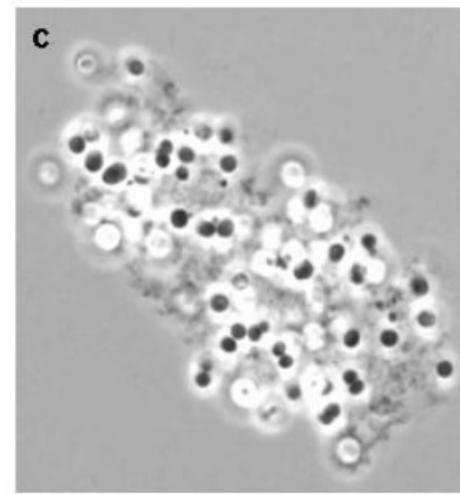
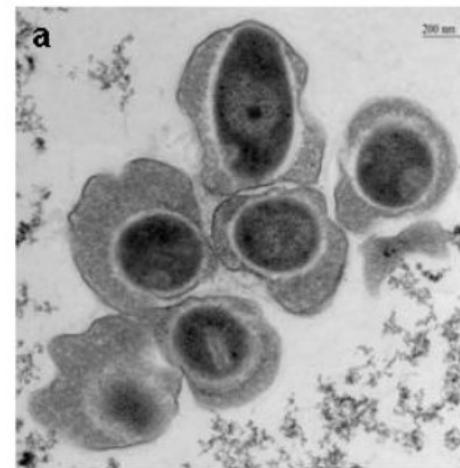
Larger than some bacteria, this virus — seen in a cross-section under a transmission electron microscope — was still able to infect amoebae despite having spent 30 millennia in a frozen state.

# Microorganismi dal ghiaccio?

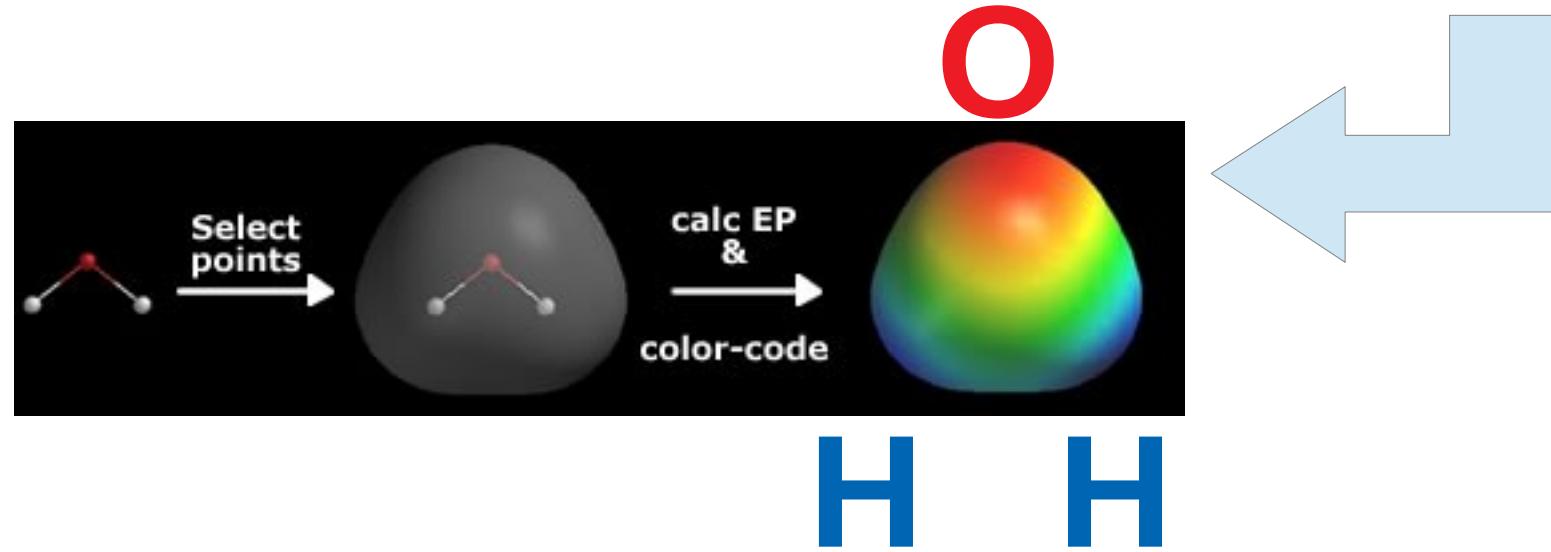
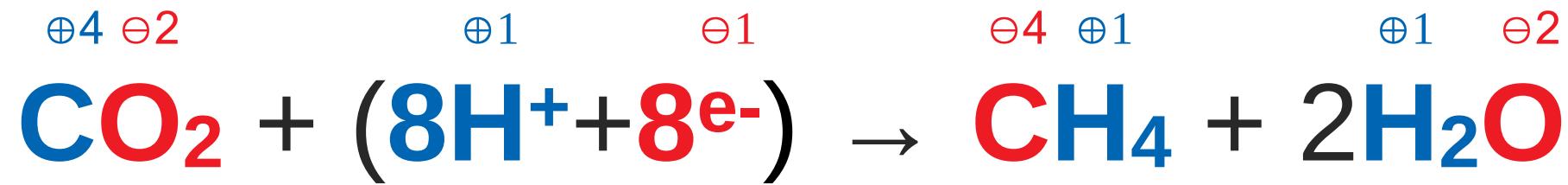
Più che i potenziali patogeni, sono gli Archaea metanigeni a destare le maggiori preoccupazioni...

Selected microorganisms (Archaea) isolated from different permafrost environments:

- a. *Candidatus Nitrotoga arctica*;
- b. *Methylobacter tundripaludum*;
- c. *Methanosarcina* sp.;
- d. *Acetobacterium tundrae*;
- e. *Clostridium algoriphilum*.



# Metanogenesi batterica



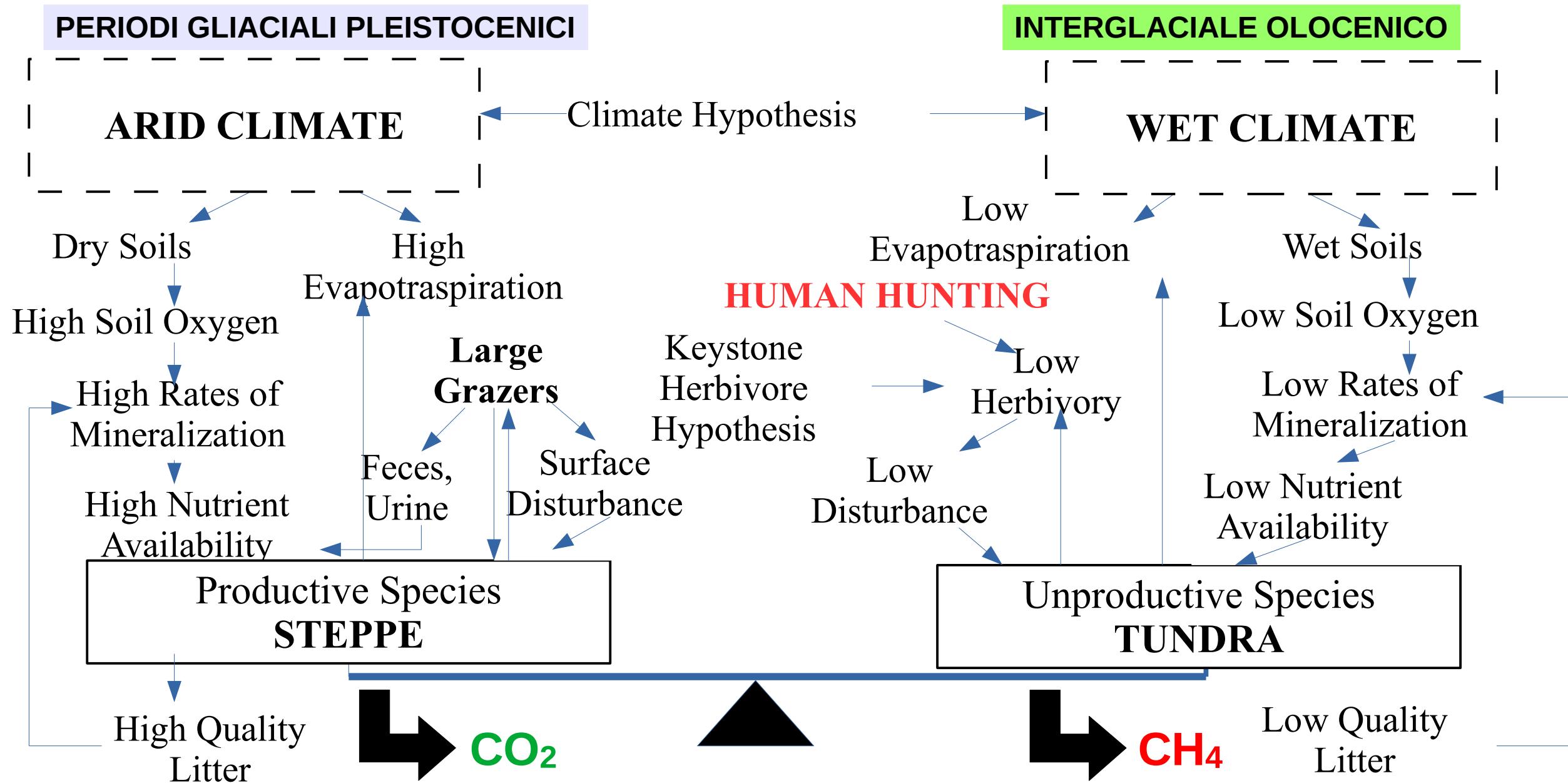
Mappa del potenziale elettrico [quantità di energia necessaria per spostare una unità di carica (1 Coulomb) da un punto ad un altro] di una molecola d'acqua, in cui l'**atomo di ossigeno** ha una carica più negativa rispetto agli **atomi di idrogeno** (positivi).

# Metanogenesi batterica





# Steppa o tundra?

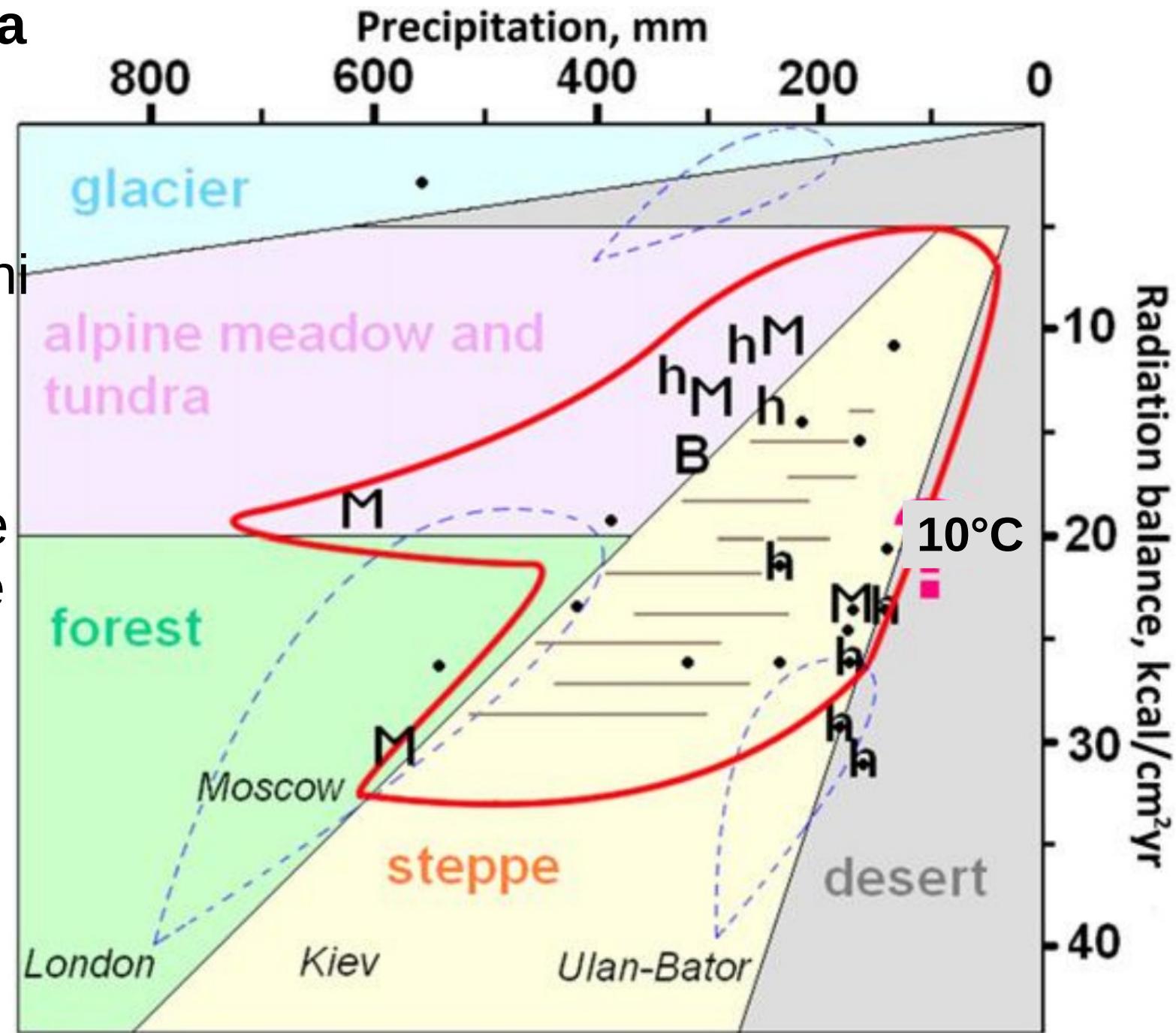


# La necromassa



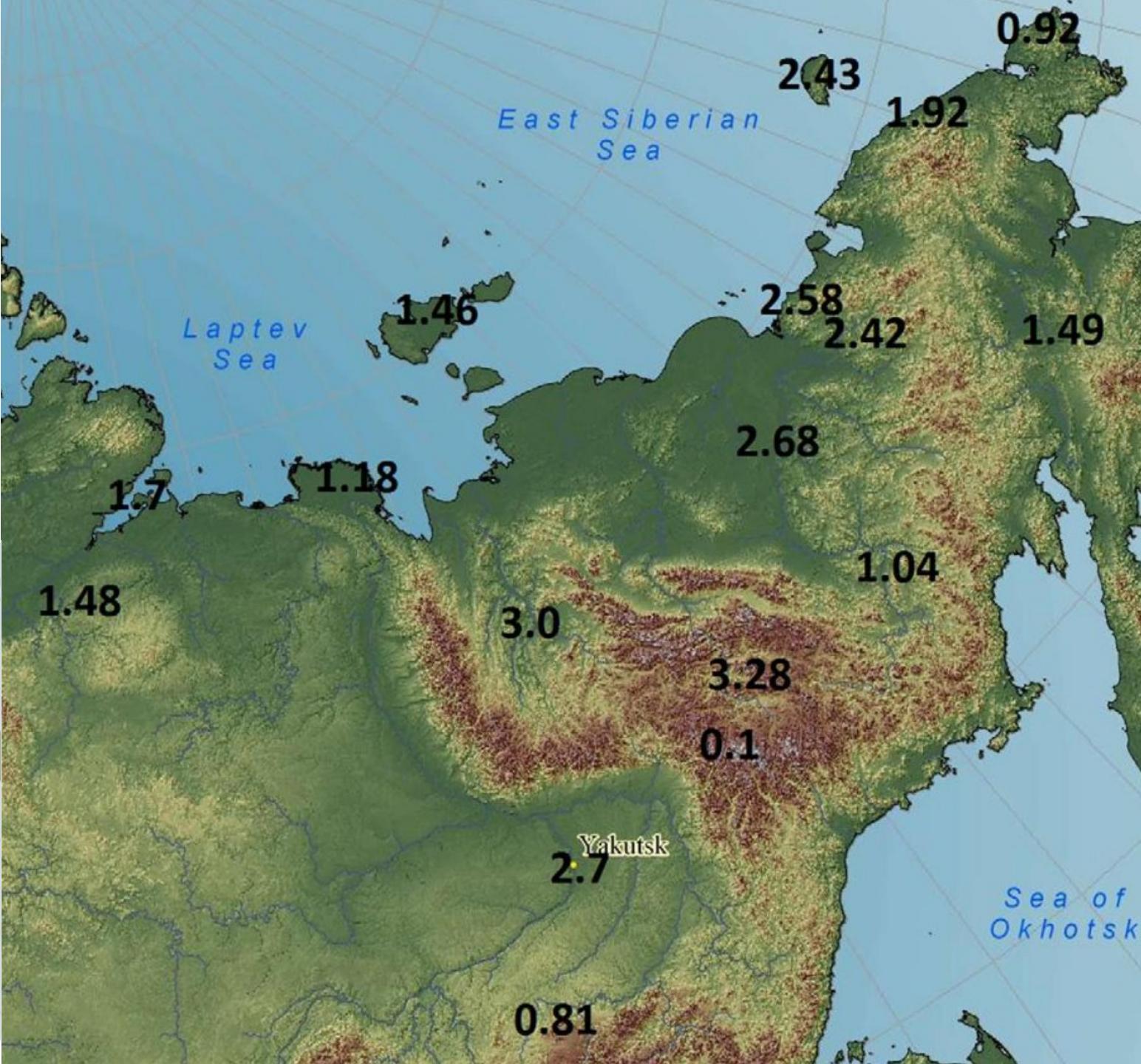
# Il clima attuale della Siberia orientale è umido o arido?

- Aumento delle precipitazioni compensato dall'aumento delle temperature estive
- La forte evapotraspirazione mantiene il suolo asciutto e ben aerato



# Budyko's Radiation Aridity Index (RAI)

- RAI < 1:** the climate is humid
- RAI > 1:** the climate is arid
- $1 \leq RAI \leq 2$ :** steppe
- $2 \leq RAI \leq 3$ :** semi-desert
- RAI > 3:** desert environments



# Il Parco del Pleistocene

Progetto di **biomanipolazione** mirato a:

- spostare il funzionamento dell'ecosistema artico dalla produzione di CH<sub>4</sub> (metanogenesi) alla produzione di CO<sub>2</sub>
- ridurre la fusione del permafrost (?) attraverso l'aumento della quantità di energia solare assorbita dall'erba mediante la fotosintesi e dal suolo mediante l'evaporazione

# Ecosystem Hypothesis

The mammoth ecosystem was relatively insensitive to climatic variation: numerous animals maintained highly productive grasslands over a wide range of climates. Under such a strong disturbance regime, mosses and shrubs were trampled, and highly productive actively transpiring graminoids and herbs dominated.

During the **Pleistocene-Holocene Transition (PHT)** the rise in precipitation was accompanied by increased temperature, so climatic aridity did not change substantially.