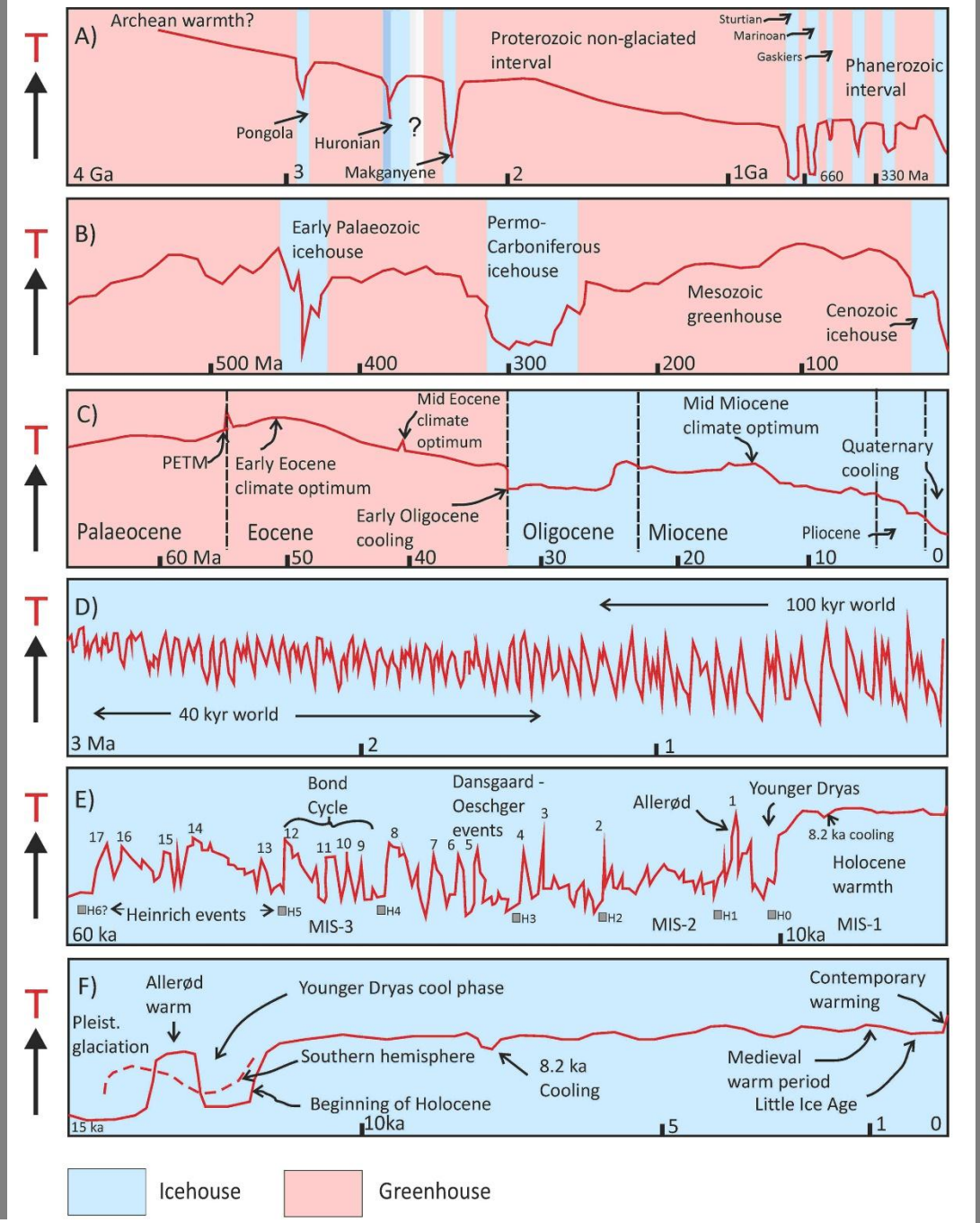
El Antropoceno y la Tecnosfera desde una perspectiva geológica

Alejandro Cearreta
(UPV/EHU, Anthropocene Working Group)



Historia geológica

Eón Fanerozoico

Era Cenozoica

Periodo Cuaternario

Último ciclo climático

Época Holoceno

(Steffen, W. et al., 2016. Earth's Future, 4: 324-345)

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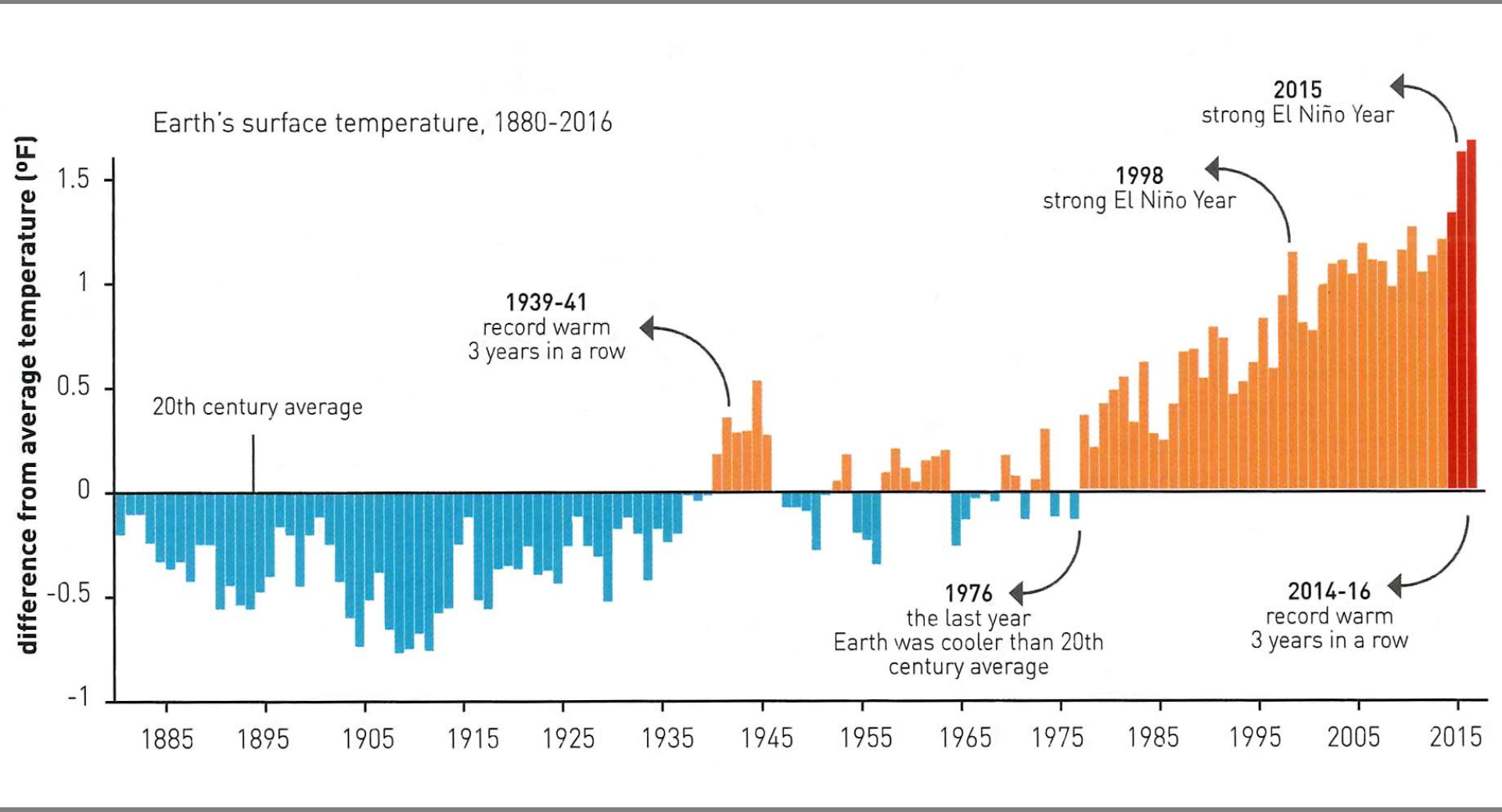

(NOAA: climate.org)

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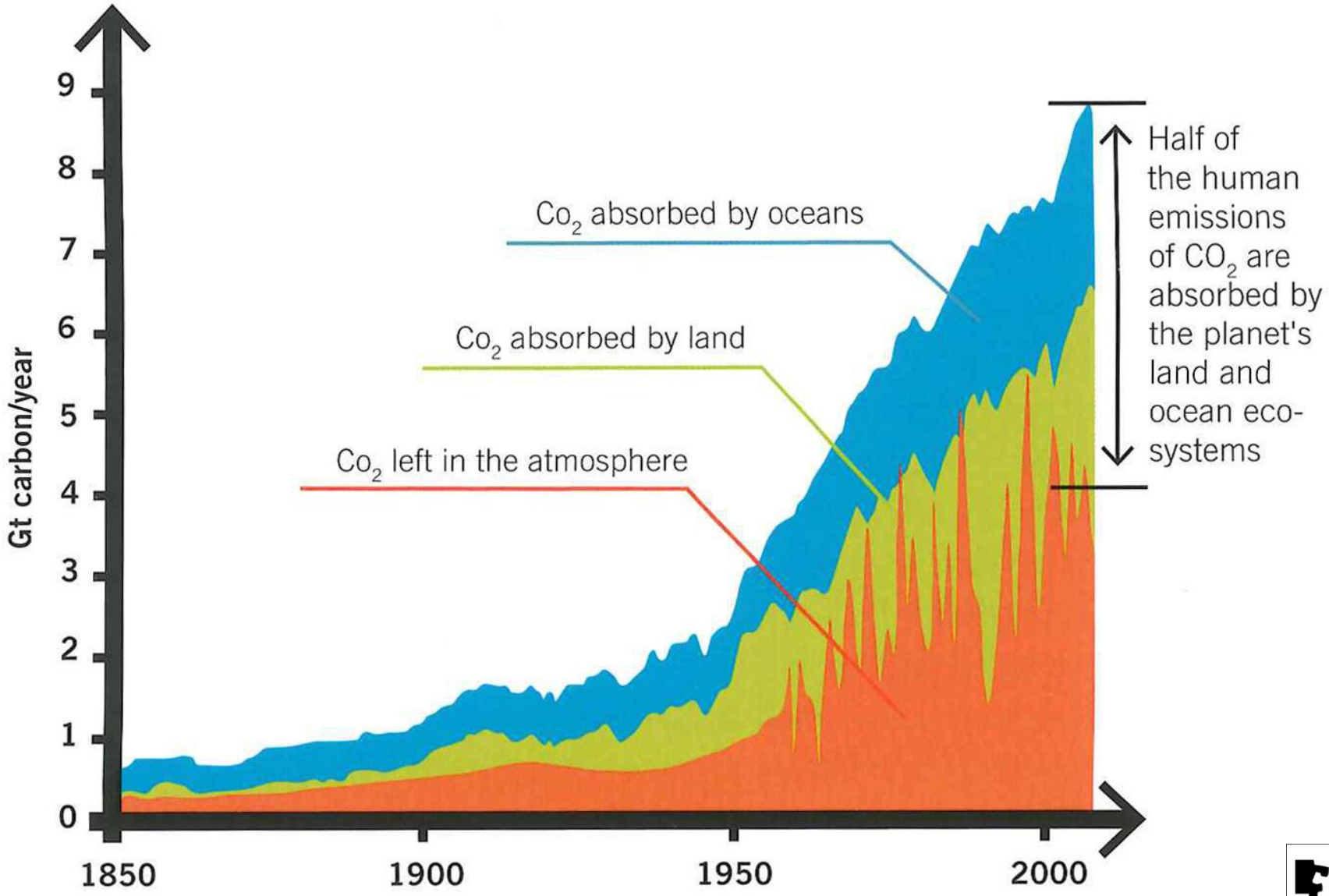
EARTH'S GREAT SERVICE TO HUMANKIND



(Rockström, J. & Klum, M., 2015. Big World, Small Planet, 207 p.)

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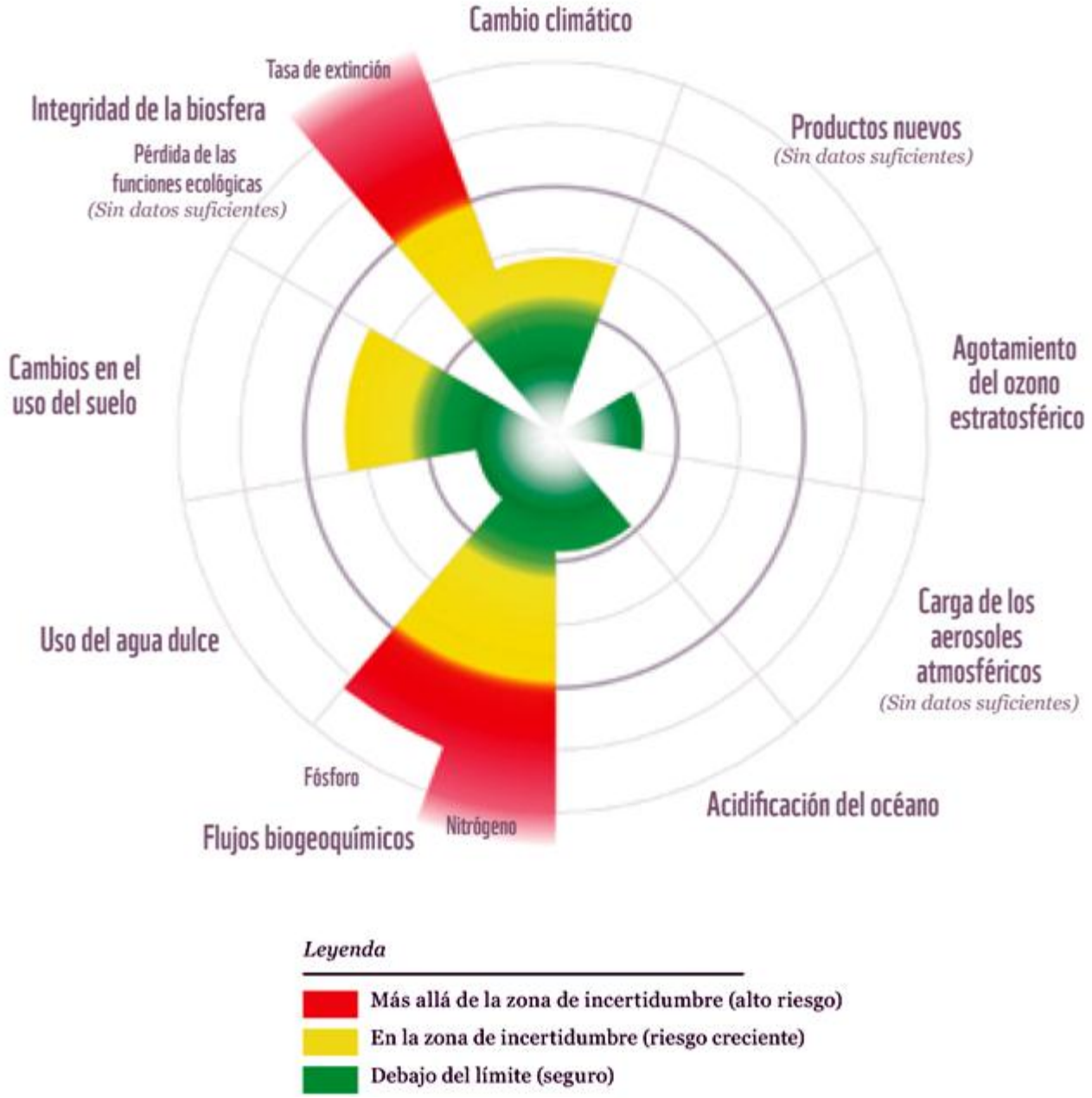

(Rockström, J. & Klum, M., 2015. Big World, Small Planet, 207 p.)

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GLOBAL CHANGE
NEWSLETTER
No. 41 May 2000
The International Geosphere–Biosphere Programme (IGBP): A Study of Global Change
of the International Council for Science (ICSU)

The "Anthropocene"

by Paul J. Crutzen and Eugene F. Stoermer

The name Holocene ("Recent Whole")for the post-glacial geological epoch of the past ten to twelve thousand years seems to have been proposed for the first time by Sir Charles Lyell in 1833, and adopted by the International Geological Congress in Bologna in 1885 **(1)**. During the Holocene mankind's activities gradually grew into a significant geological, morphological force, as recognised early on by a number of scientists. Thus, G.P. Marsh already in 1864 published a book with the title "Man and Nature", more recently reprinted as "The Earth as Modified by Human Action" (2). Stoppani in 1873 rated mankind's activities as a "new telluric force which in power and universality may be compared to the greater forces of earth" [quoted from Clark (3)]. Stoppani already spoke of the anthropozoic era. Mankind has now inhabited or visited almost all places on Earth; he has even set foot on the moon.

The great Russian geologist V.I.Vernadsky (4) in 1926 recognized the increasing power of mankind as part of the biosphere with the following excerpt "... the direction in which the processes of evolution must proceed, namely towards increasing consciousness and thought, and forms having greater and greater influence on their surroundings". He, the French Jesuit P. Teilhard de Chardin and E. Le Roy in 1924 coined the term "noösphere", the world of thought, to mark the growing role played by mankind's brainpower and technological talents in shaping its own future and environment.

The expansion of mankind, both in numbers and per capita exploitation of Earth's resources has been astounding (5). To give a few examples: During the past 3 centuries human population increased tenfold to 6000 million, accompanied e.g. by a growth in cattle population to 1400 million (6) (about one cow per average size family). Urbanisation has even increased tenfold in the past century. In a few generations mankind is exhausting the fossil fuels that were generated over several hundred million years. The release of SO_2, globally about 160 Tg/year to the atmosphere by coal and oil burning, is at least two times larger than the sum of all natural emissions, occurring mainly as marine dimethyl-sulfide from the oceans (7); from Vitousek et al. (8) we learn that 30-50% of the land surface has been transformed by human action; more nitrogen is now fixed synthetically and applied as fertilizers in agriculture than fixed naturally in all terrestrial ecosystems; the escape into the atmosphere of NO from fossil fuel and biomass combustion likewise is larger than the natural inputs, giving rise to photochemical ozone ("smog") formation in extensive regions of the world; more than half of all accessible fresh water is used by mankind; human activity has increased the species extinction rate by thousand to ten thousand fold in the tropical rain forests (9) and several climatically important "greenhouse" gases have substantially increased in the atmosphere: CO_2 by more than 30% and CH_4 by even more than 100%. Furthermore, mankind releases many toxic substances in the environment and even some, the chlorofluorocarbon gases, which are not toxic at all, but which nevertheless have led to the Antarctic "ozone hole" and which would have destroyed much of the ozone layer if no international regulatory measures to end their production had been taken. Coastal wetlands are also affected by humans, having resulted in the loss of 50% of the world's mangroves. Finally, mechanized human predation ("fisheries") removes more than 25% of the primary production of the oceans in the upwelling regions and 35% in the temperate continental shelf regions (10). Anthropogenic effects are also well illustrated by the history of biotic communities that leave remains in lake sediments. The effects documented include modification of the geochemical cycle in large freshwater systems and occur in systems remote from primary sources (11-13).

Considering these and many other major and still growing impacts of human activities on earth and atmosphere, and at all, including global, scales, it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term "anthropocene" for the current geological epoch. The impacts of current human activities will continue over long periods. According to a study by Berger and Loutre (14), because of the anthropogenic emissions of CO_2, climate may depart significantly from natural behaviour over the next 50,000 years.

To assign a more specific date to the onset of the "anthropocene" seems somewhat arbitrary, but we propose the latter part of the 18th century, although we are aware that alternative proposals can be made (some may even want to include the entire holocene). However, we choose this date because, during the past two centuries, the global effects of human activities have become clearly noticeable. This is the period when data retrieved from glacial ice cores show the beginning of a growth in the atmospheric concentrations of several "greenhouse gases", in particular CO_2 and CH_4 (7). Such a starting date also coincides with James Watt´s invention of the steam

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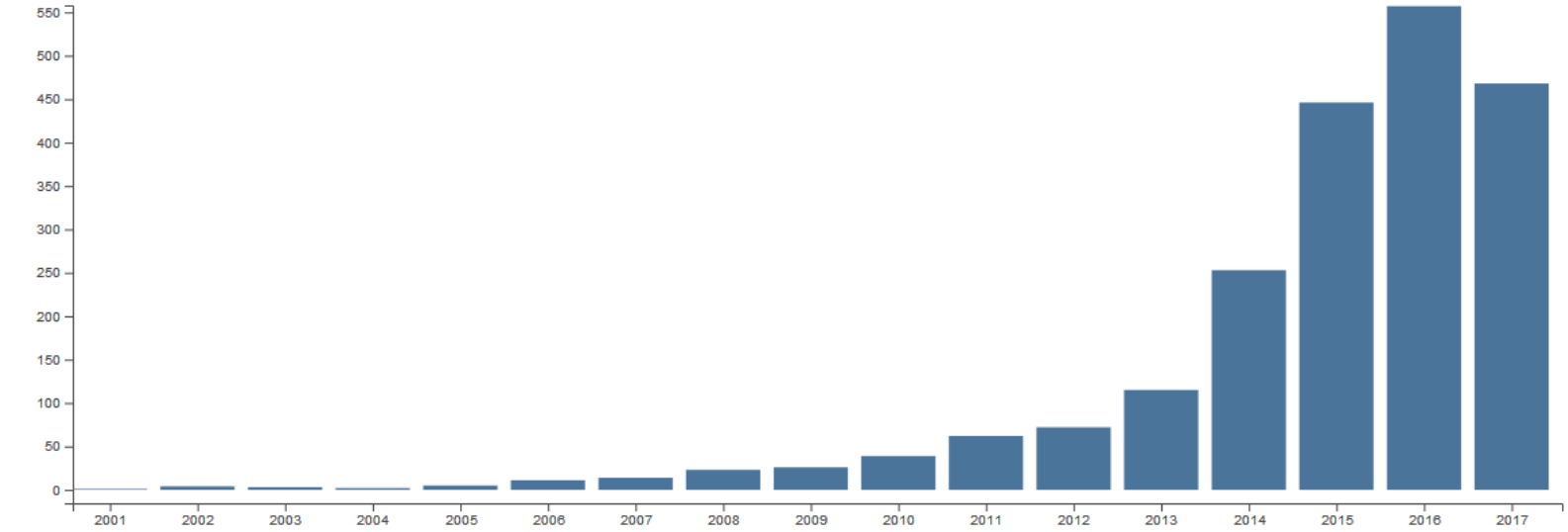

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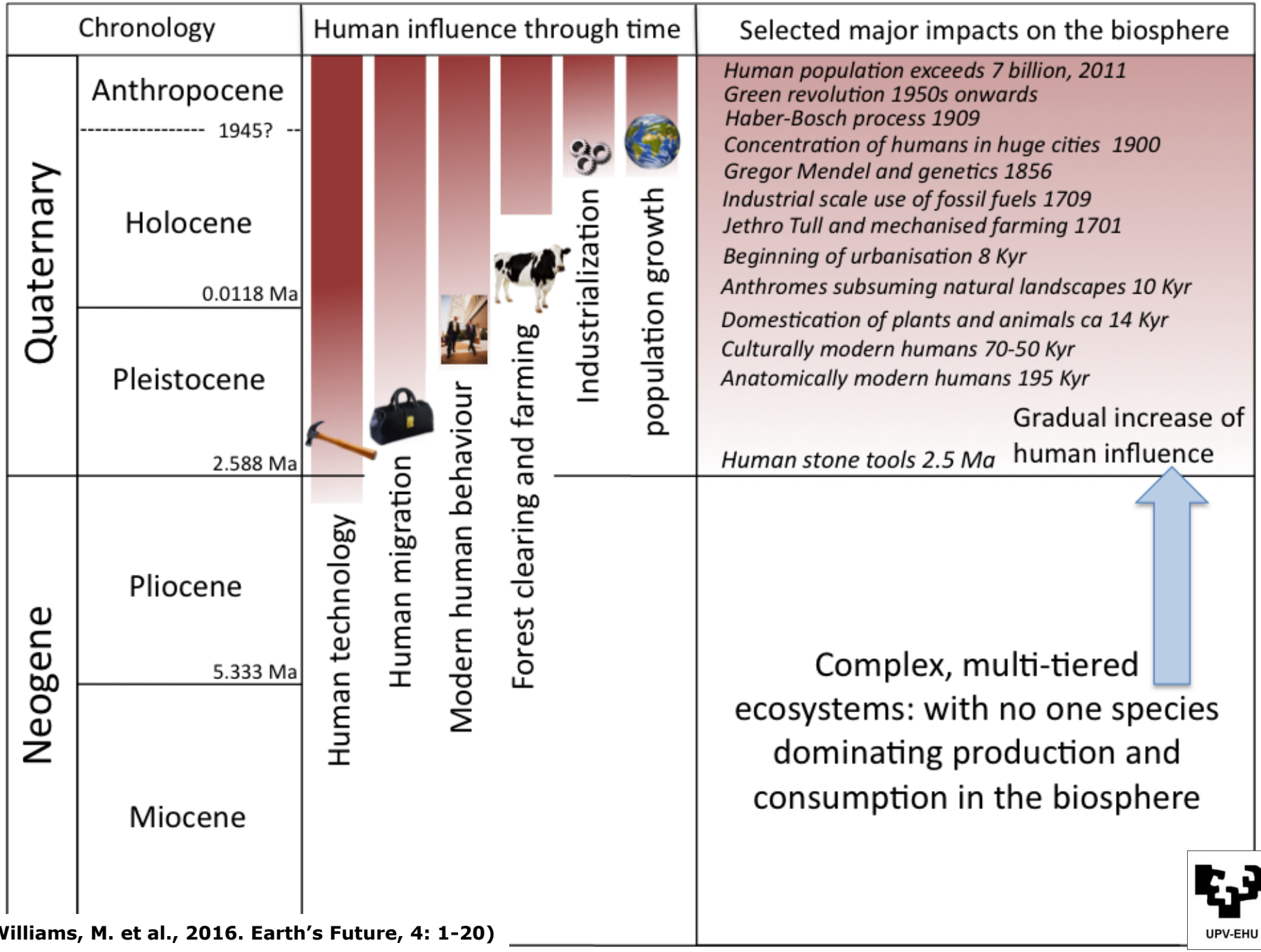

(Williams, M. et al., 2016. Earth's Future, 4: 1-20)

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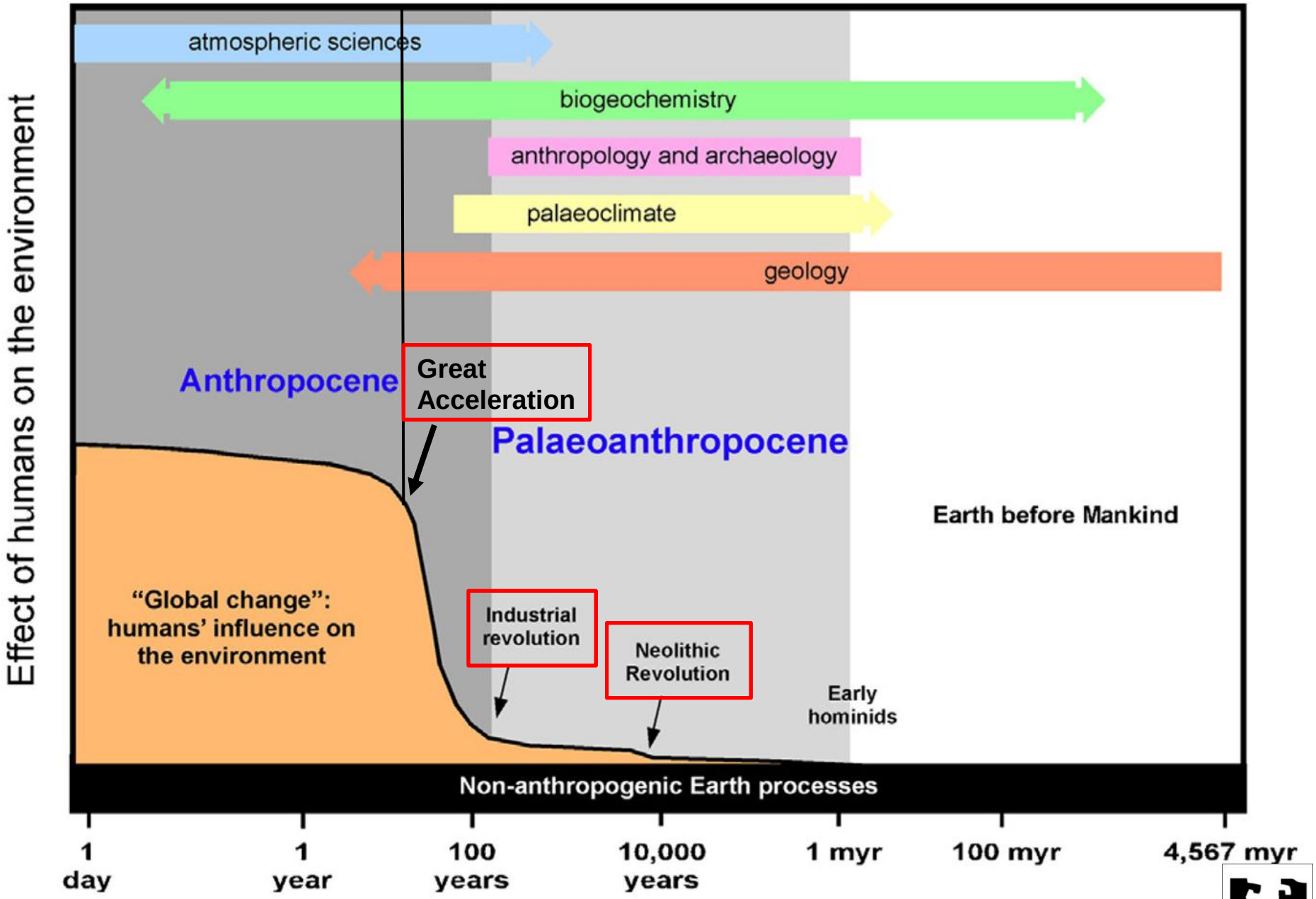

(Foley, S.F. et al., 2013. Anthropocene, 3: 83-88)

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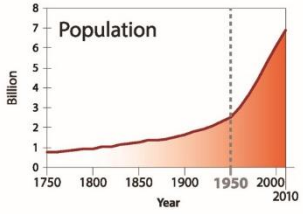
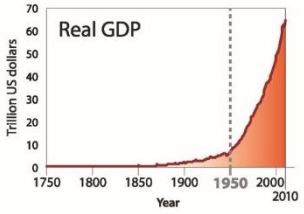
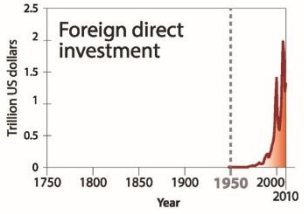
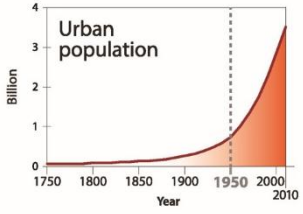
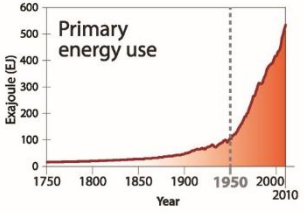
Socio-economic trends

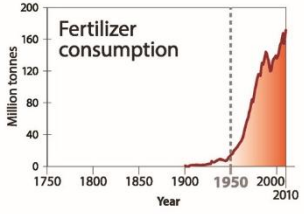


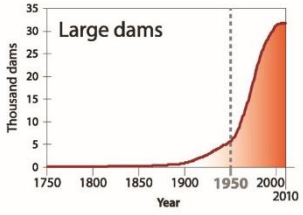


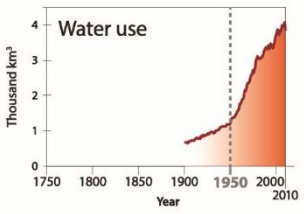


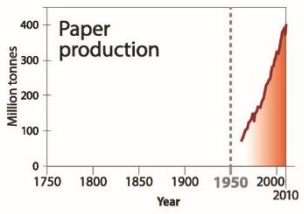


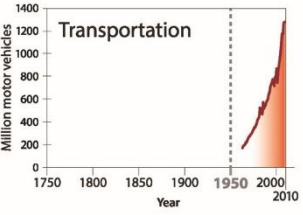


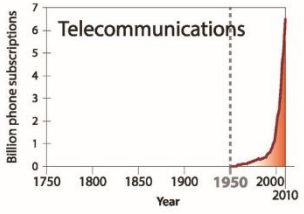


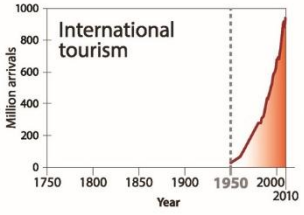




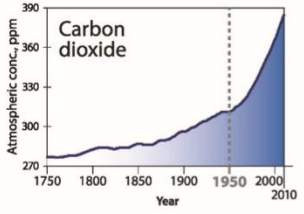


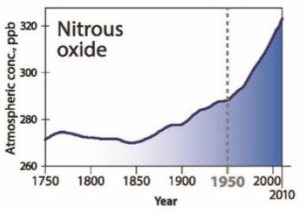


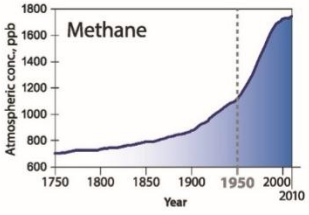


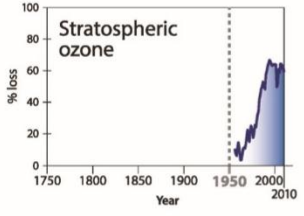


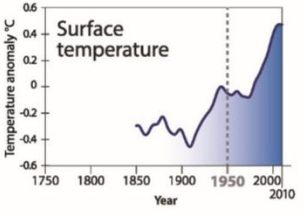
Earth system trends

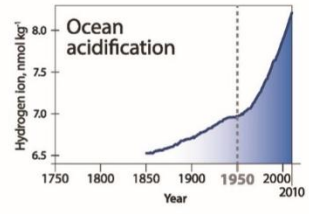


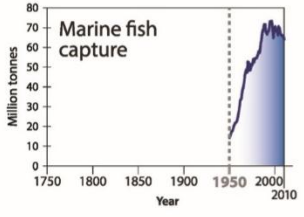


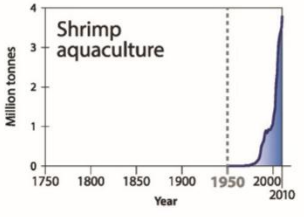


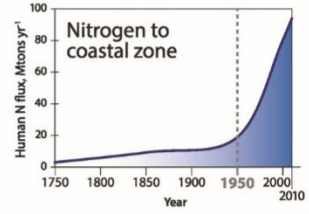


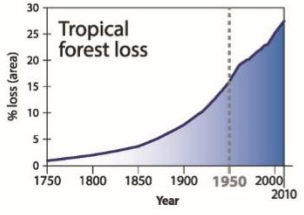


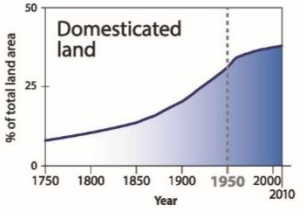


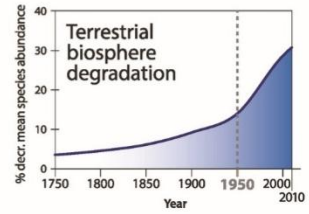












(Steffen, W. et al., 2015. The Anthropocene Review, 2: 81-98)

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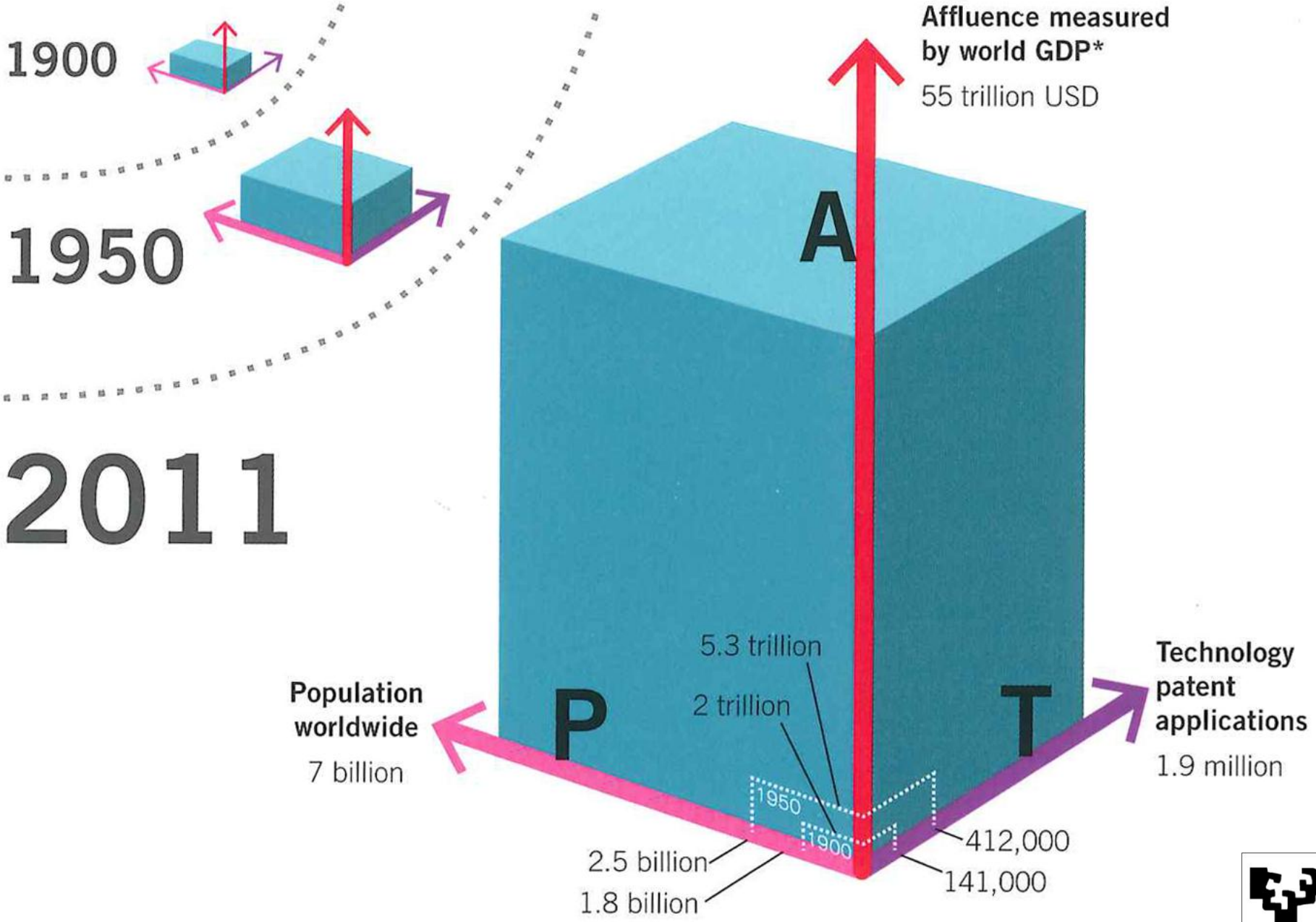

(Steffen, W. et al., 2011. Ambio, 40: 739-761)

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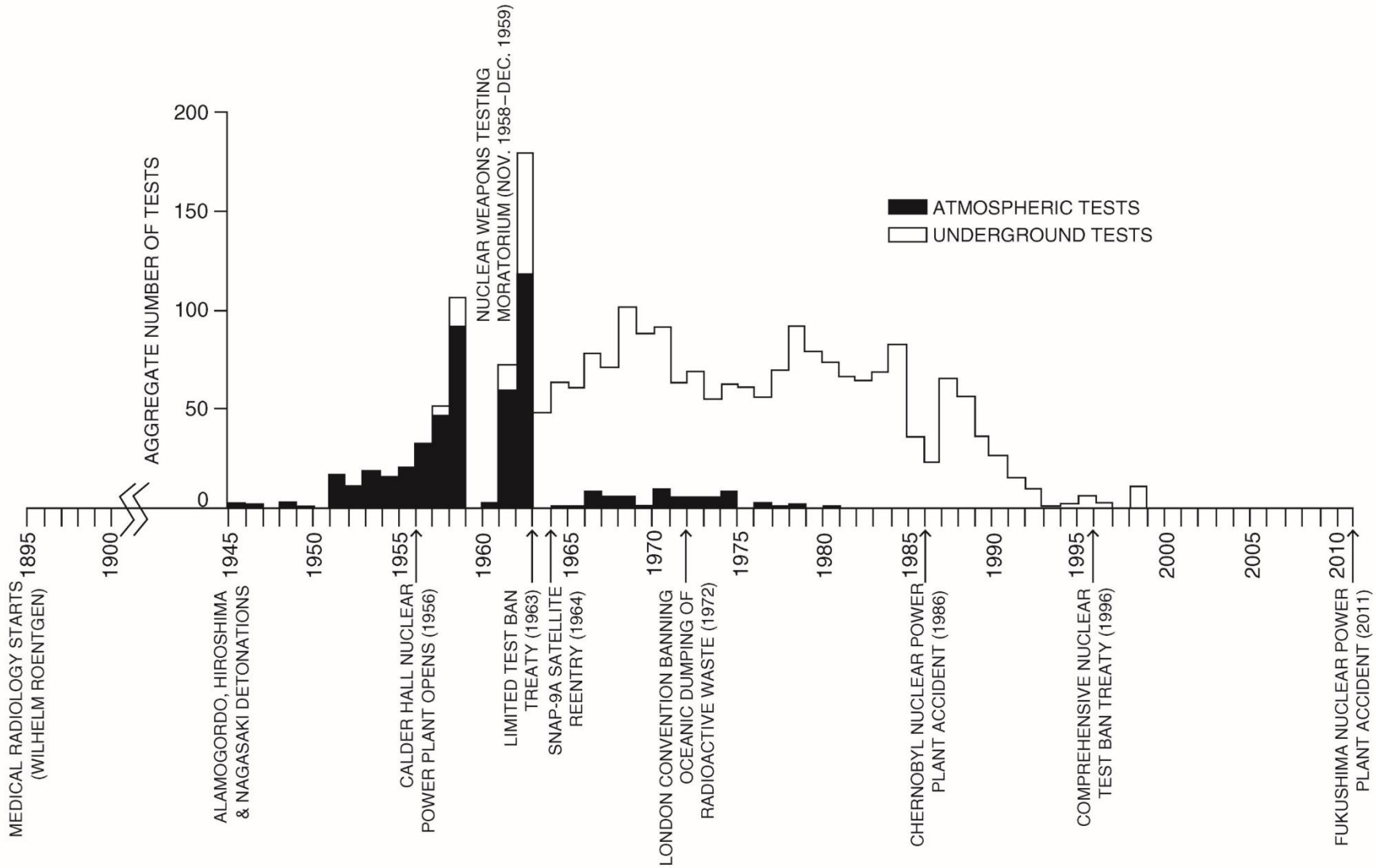

Source: UNSCEAR (2000)

(Waters, C.N. et al., 2015. Bulletin of the Atomic Scientists, 71: 46-57)

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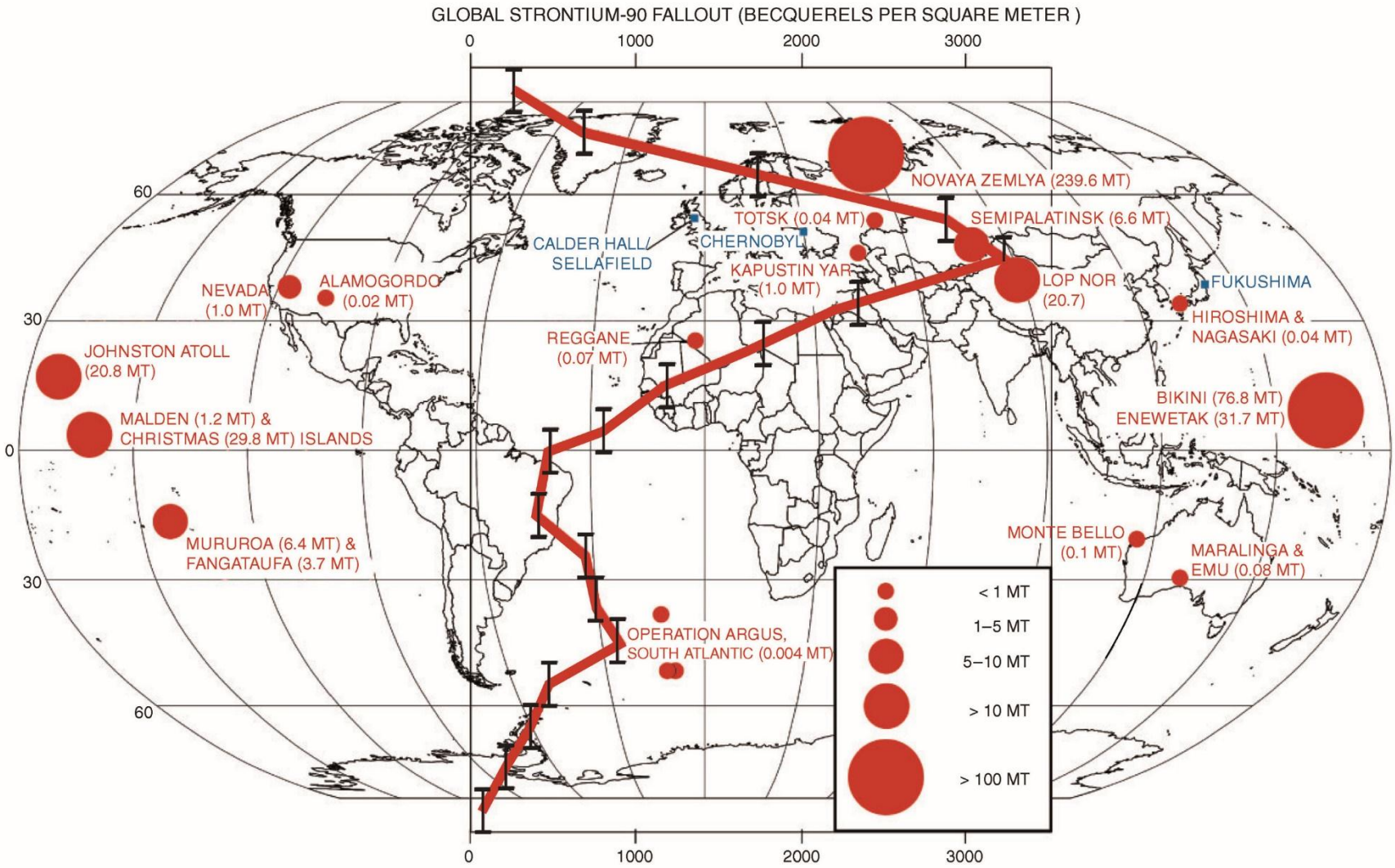

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(Waters, C.N. et al., 2015. Bulletin of the Atomic Scientists, 71: 46-57)

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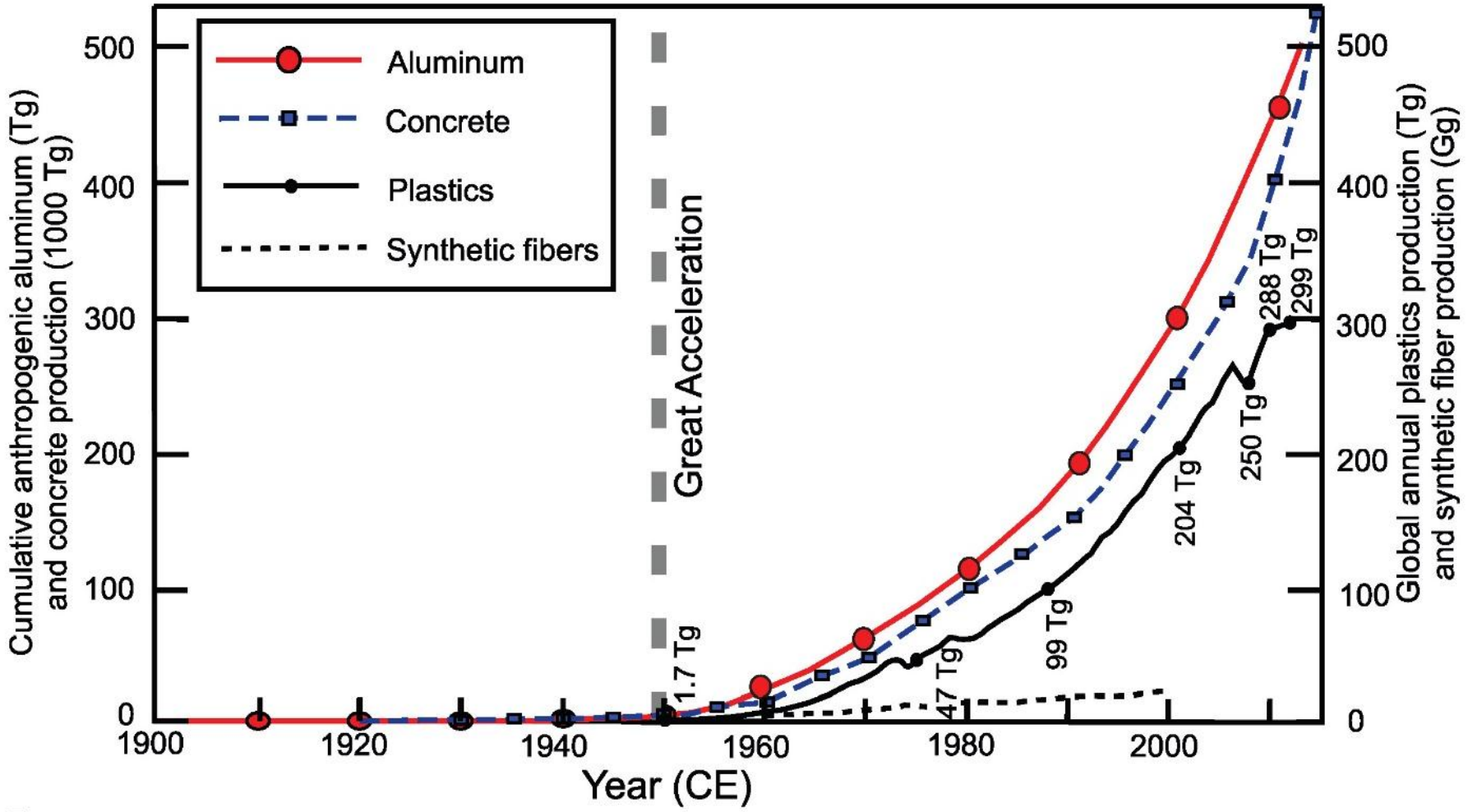

(Waters, C.N. et al., 2016. Science, 351 (6269): aad2622-1/10)

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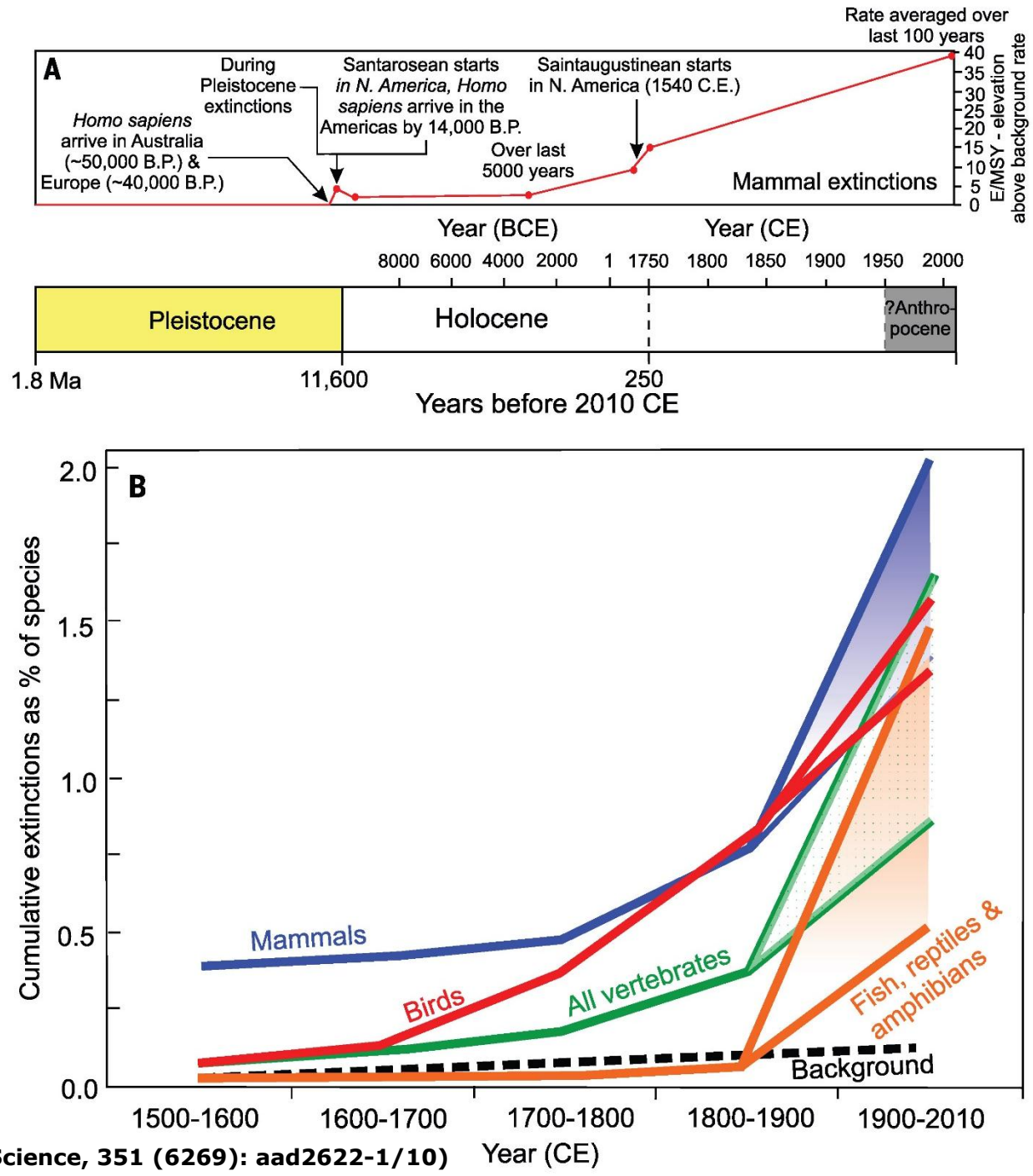

(Waters, C.N. et al., 2016. Science, 351 (6269): aad2622-1/10)

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Playa de Tunelboca (Getxo)

tecnofósiles

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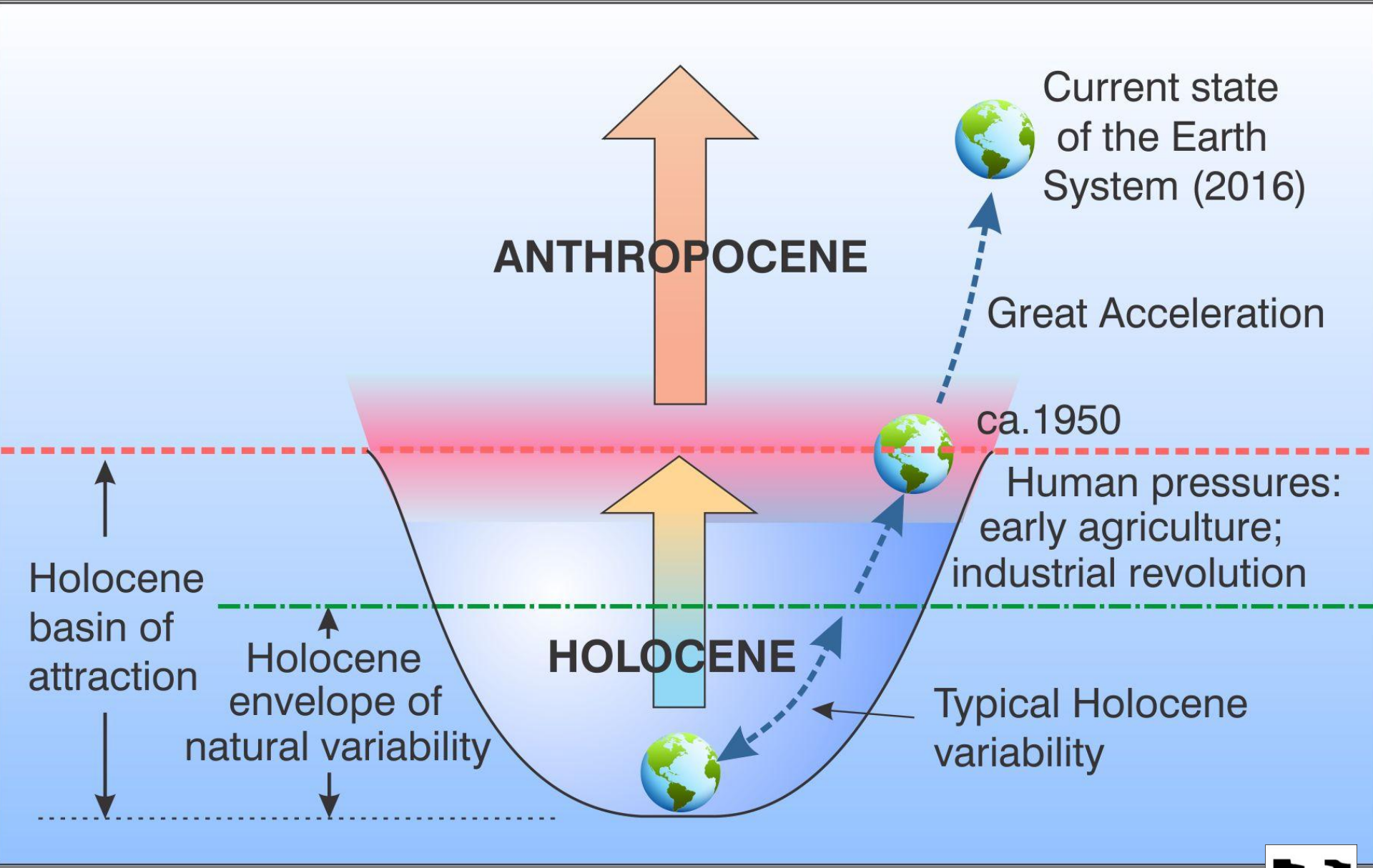

(Steffen, W. et al., 2016. Earth's Future, 4: 324-345)

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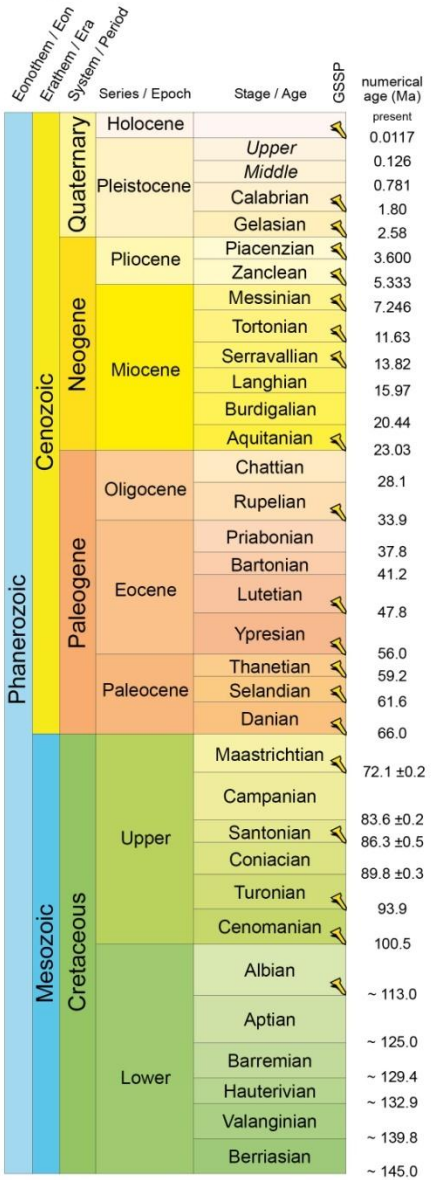
INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

IUGS

www.stratigraphy.org

International Commission on Stratigraphy

v 2016/04



Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on ratified GSSPs are available at the website http://www.stratigraphy.org. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaran; only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (~) is provided.

Numerical ages for all systems except Lower Pleistocene, Permian,Triassic, Cretaceous and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012); those for the Lower Pleistocene, Permian, Triassic and Cretaceous were provided by the relevant ICS subcommissions.

Coloring follows the Commission for the Geological Map of the World (http://www.ccgm.org)

Chart drafted by K.M. Cohen, S.C. Finney, P.L. Gibbard & J.-X. Fan

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013; updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

URL: http://www.stratigraphy.org/ICSchart/ChronostratChart2016-04.pdf

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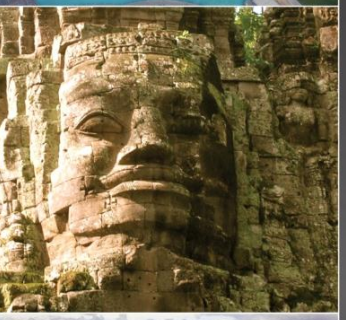
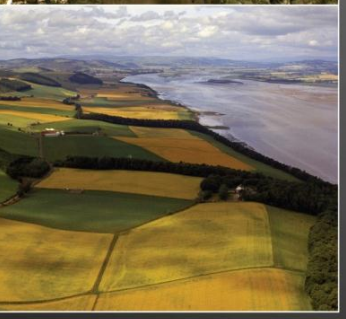
2011

The Anthropocene:

A New Epoch of Geological Time?

Wednesday 11th May





The concept of the Anthropocene represents one of the most democratic and bottom-up organizing principles that Earth science has ever seen. The term is already embedded in the language of scientists, socio-economists, politicians, and the media. If we are to understand the significance and scale of contemporary global change, in all its forms, we need to know it, to see it, against the backcloth of the Earth's full story. And we need to see it from as many perspectives, from as many realms, as possible.

This conference will bring together the range of disciplines and realms to discuss, to debate the evidence for the Anthropocene.

SPEAKERS

Paul Crutzen
Andrew Revkin
Dennis Dimick
Will Steffen
Davor Vidas
James Syvitski
Dorothy Merritts
Erle Ellis
Toby Tyrrell

CONVENERS

Michael Ellis
British Geological Survey

Jan Zalasiewicz
University of Leicester

Mark Williams
British Geological Survey
& University of Leicester

Alan Haywood
University of Leeds

CONFERENCE THEMES

LIFE AND ITS DIVERSITY
HUMANS AND GEOLOGY
SOCIO-ECONOMIC ISSUES

For further information please contact:
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La incidencia de la especie humana sobre la faz de la Tierra (1955-2005)

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El *Índice Planeta Vivo*, que mide los niveles de abundancia de la biodiversidad con base en el monitoreo de 14.152 poblaciones de 3.706 especies de vertebrados, muestra una tendencia decreciente constante.

RIESGOS

Nuestro empleo de los recursos naturales ha aumentado de forma impresionante, especialmente desde la mitad del siglo XX, por lo que estamos poniendo en peligro los sistemas medioambientales claves de los que dependemos.

ANTROPOCENO

Los científicos plantean que, como resultado de la actividad humana, hemos transitado del Holoceno a una nueva época geológica: el "Antropoceno".

RESILIENCIA

El siglo XXI le plantea a la humanidad el doble desafío de conservar todas las formas y funciones de la naturaleza y de construir un hogar equitativo para las personas en un planeta finito.

WWF

Por qué estamos aquí

Para detener la degradación del ambiente natural del planeta y construir un futuro en el cual los humanos convivan en armonía con la naturaleza.

wwf.es/informeplanetavivo

UPV-EHU

XORNADA

O ANTROPOCENO E A "GRANDE ACELERACIÓN". UNHA OLLADA DESDE GALICIA

Consello da Cultura Galega
Santiago de Compostela
Xoves, 23 de novembro de 2017

CONSELLO DA CULTURA GALEGA

PROGRAMA

Sesión da mañá

09:45 horas
Presentación

10:00 horas
O Antropoceno: tempo xeolóxico ou declaración política?
Alejandro Cearreta, UPV/EHU-Anthropocene Working Group

11:00 horas
Pausa

11:30 horas
Mesa redonda
Achega cuantitativa sobre uso e consumo de recursos en Galicia no século XX

Enerxía. **Xan Doldan**, USC
Adubos. **Lourenzo Fernández Prieto**, USC / **Beatriz Corbacho**, USC
Repoboación forestal pública e produción de madeira. **Eduardo Rico Boquete**, USC
Residuos urbanos e mineiros.**Mª Teresa Barral**, USC
Urbanización. **Xosé Mª Tubio Sánchez**, USC
Auga retida nos encoros. **Francisco Díaz-Fierros**, USC

Sesión da tarde

16:30 horas
A "Grande Aceleración" e os límites do crecemento
Jorge Riechmann, Universidad Autónoma de Madrid

17:30 horas
Mesa redonda
Achega persoal sobre a degradación do sistema biolóxico galego no século XX

Biodiversidade vexetal. **Pablo Ramil**, USC
Vertebrados. **Carlos Vales**, CEIDA, Xunta de Galicia
O declive dos anfibios e réptiles. **Pedro Galán**, *UdC*
Paxaros. **Xan Rodríguez Silvar**, SGHN
Bioloxía fluvial. **Fernando Cobo**, Estación de Hidrobioloxía da USC "Encoro do Con"

19:00 horas
Debate

20:00 horas
Remate da xornada

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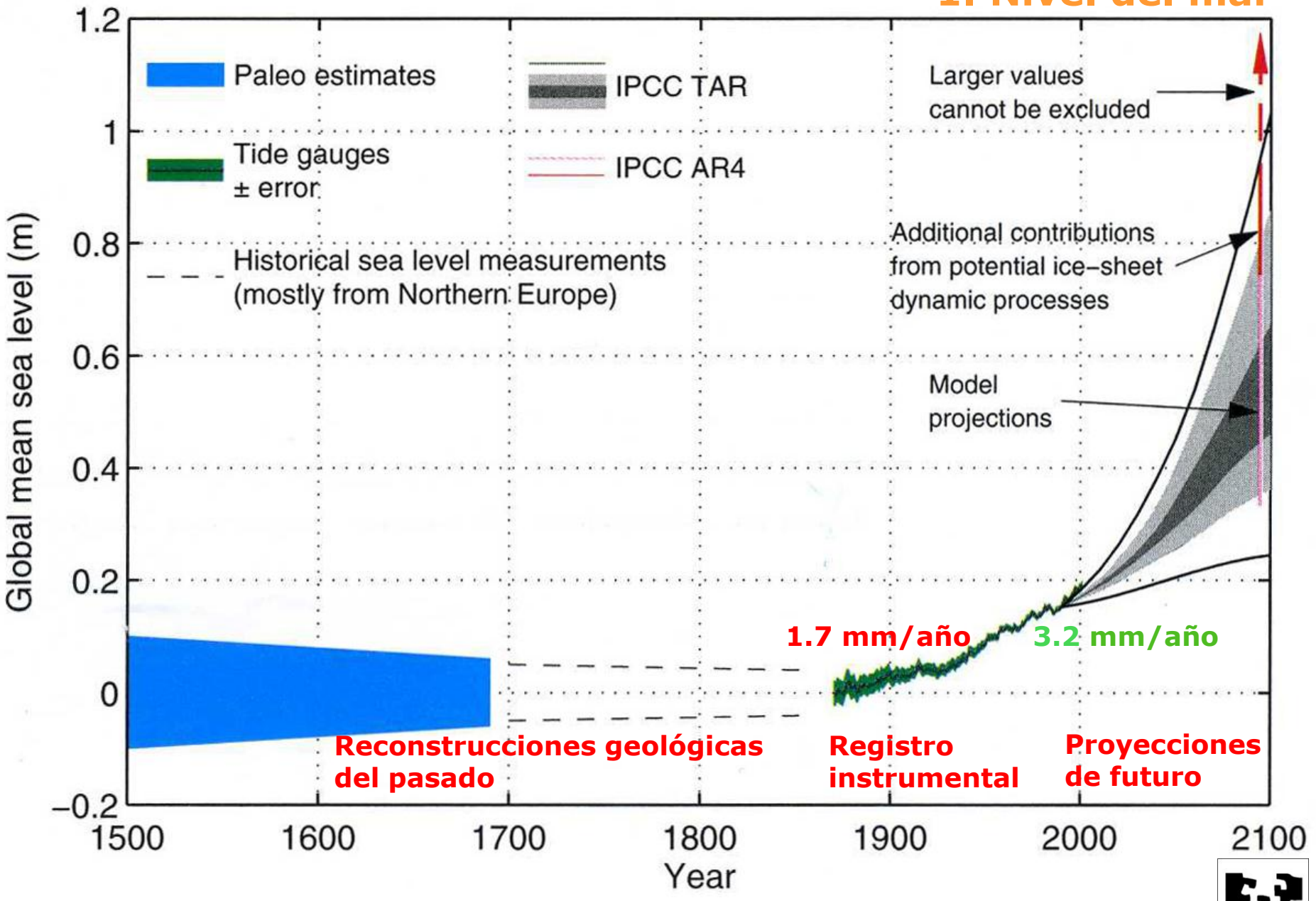
1. Nivel del mar



(Church, J.A. et al., 2008. Sustainability Science, 3: 9-22)

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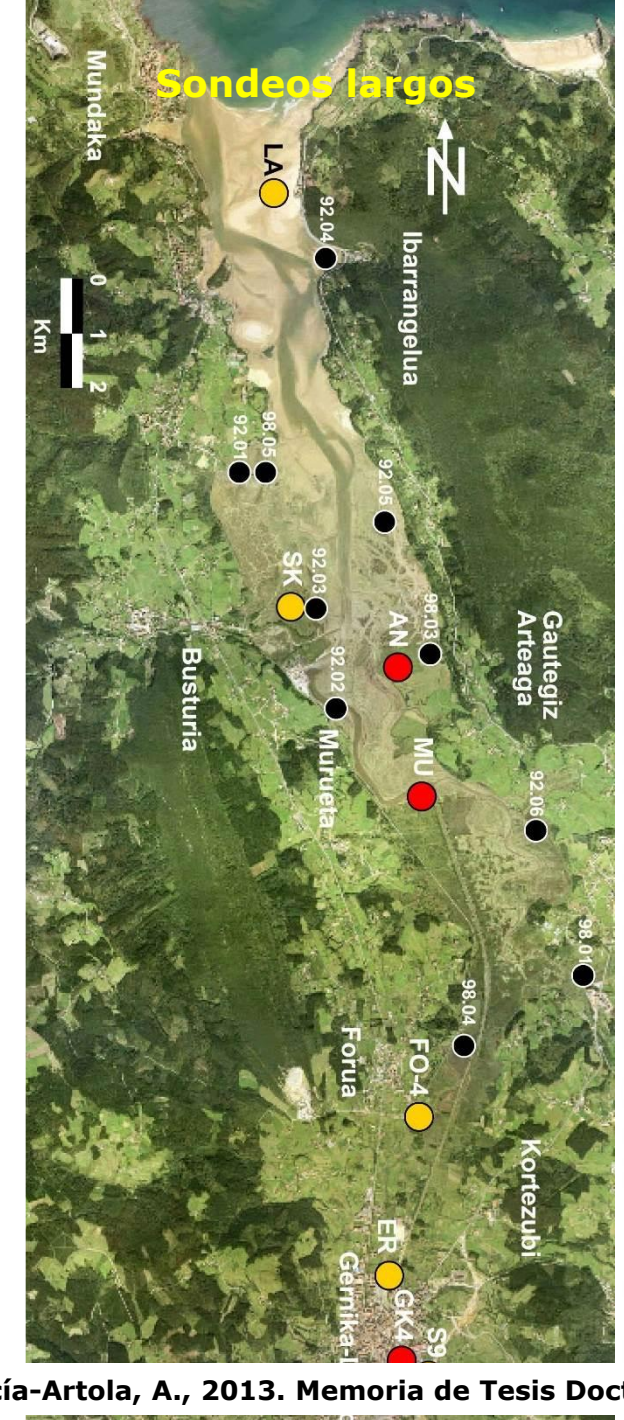

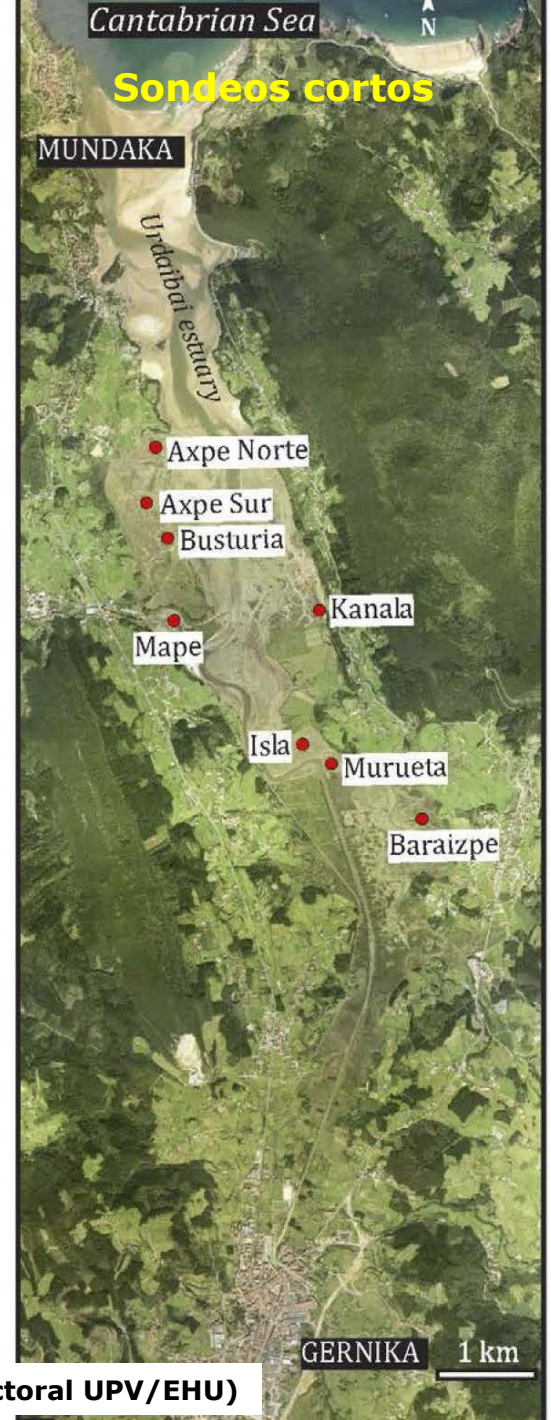

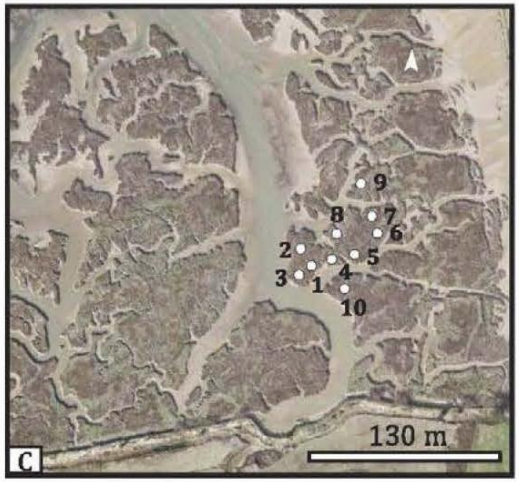

(García-Artola, A., 2013. Memoria de Tesis Doctoral UPV/EHU)

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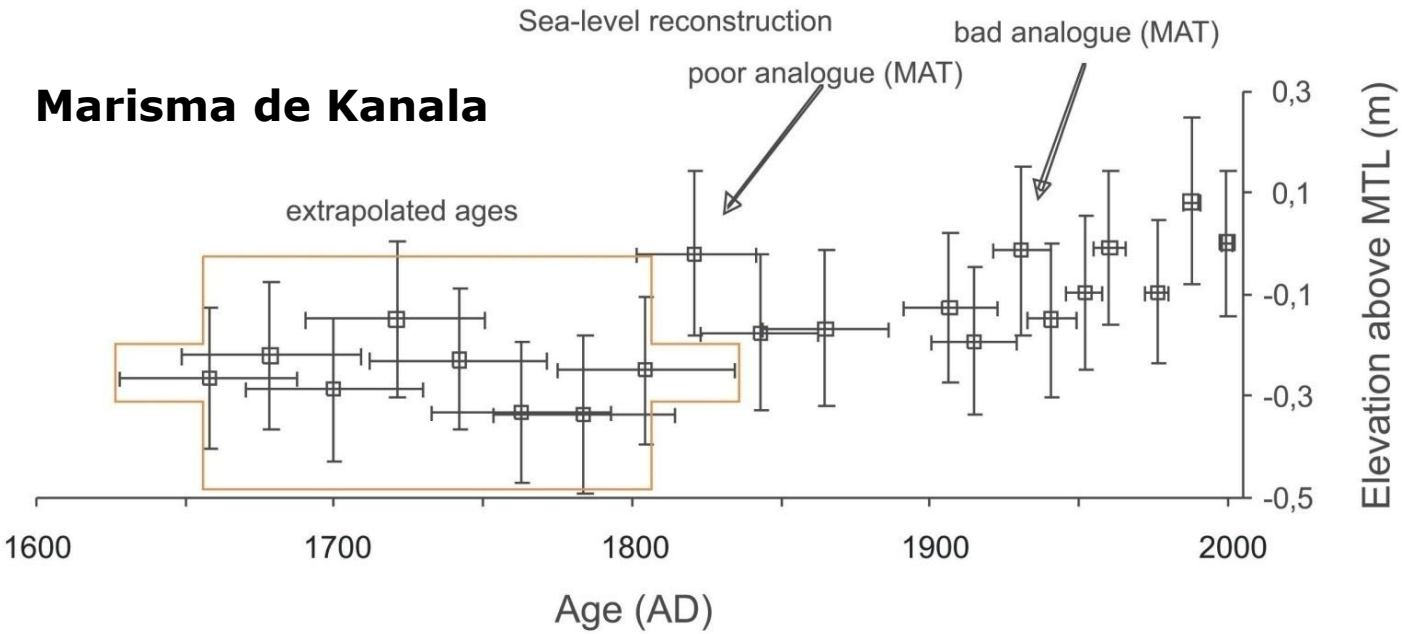

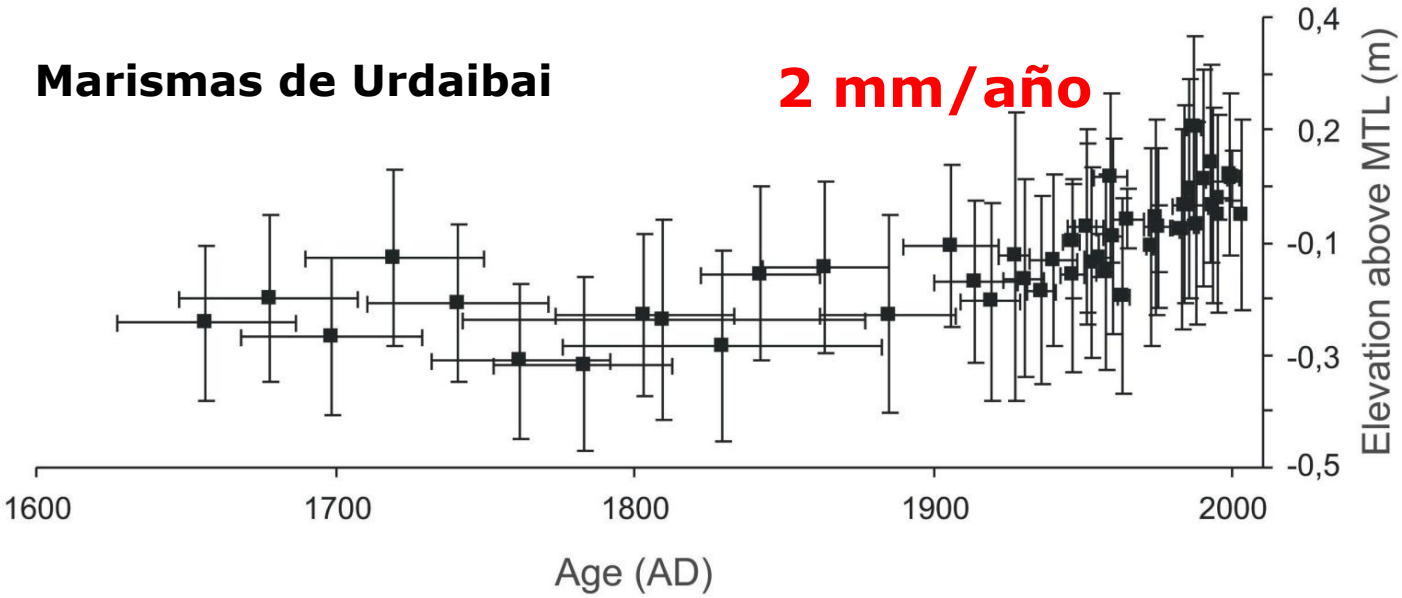

(García-Artola, A. et al., 2009. Geogaceta, 47: 109-112)

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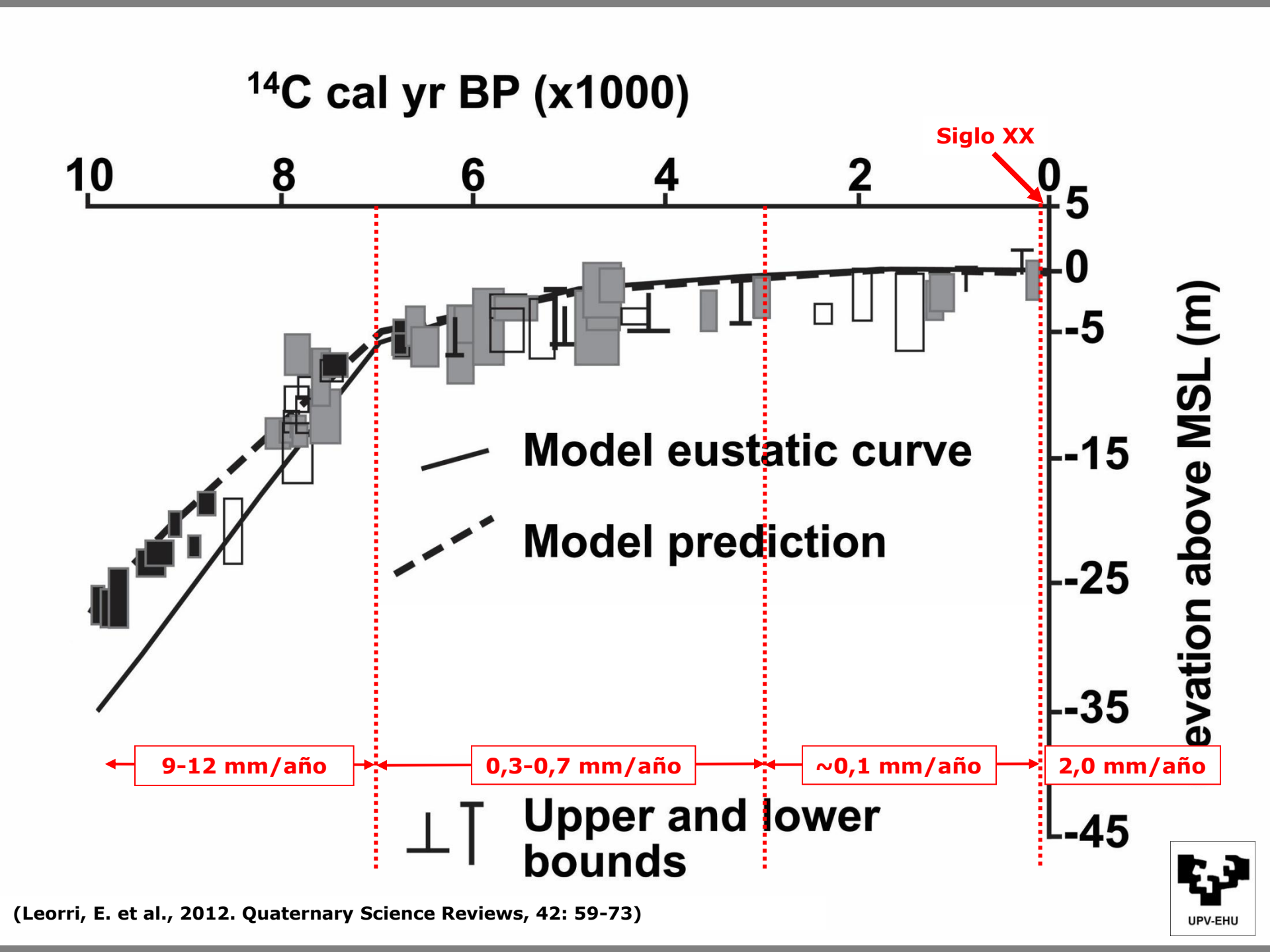

(Leorri, E. et al., 2012. Quaternary Science Reviews, 42: 59-73)

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Isla
Murueta
1990
1957
(desde inicio del siglo XIX)
Estuario superior del Oka
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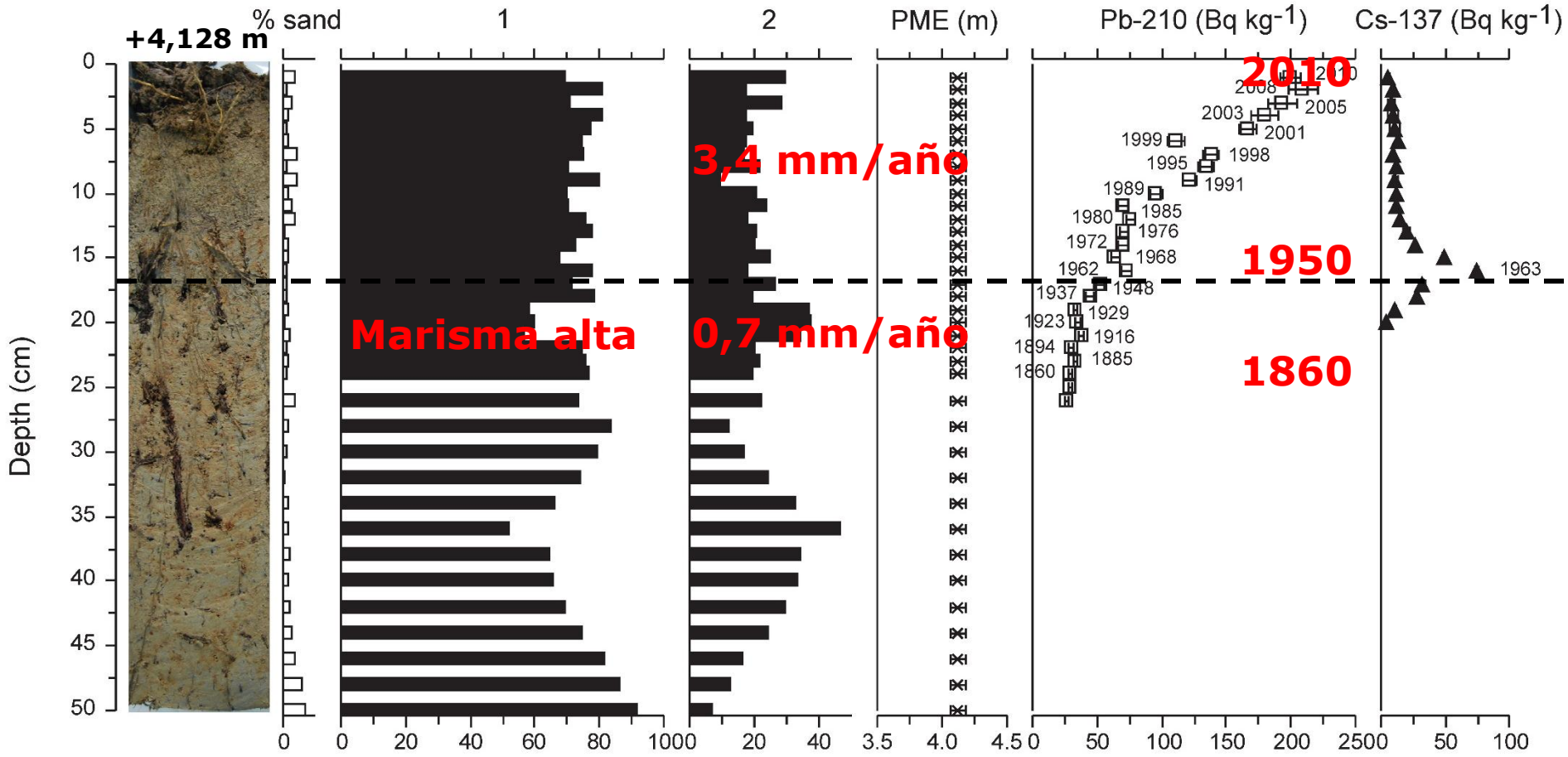
2. Velocidad de sedimentación



sondeo Murueta

(García-Artola, A. et al., 2015. Quaternary International, 364: 172-180)

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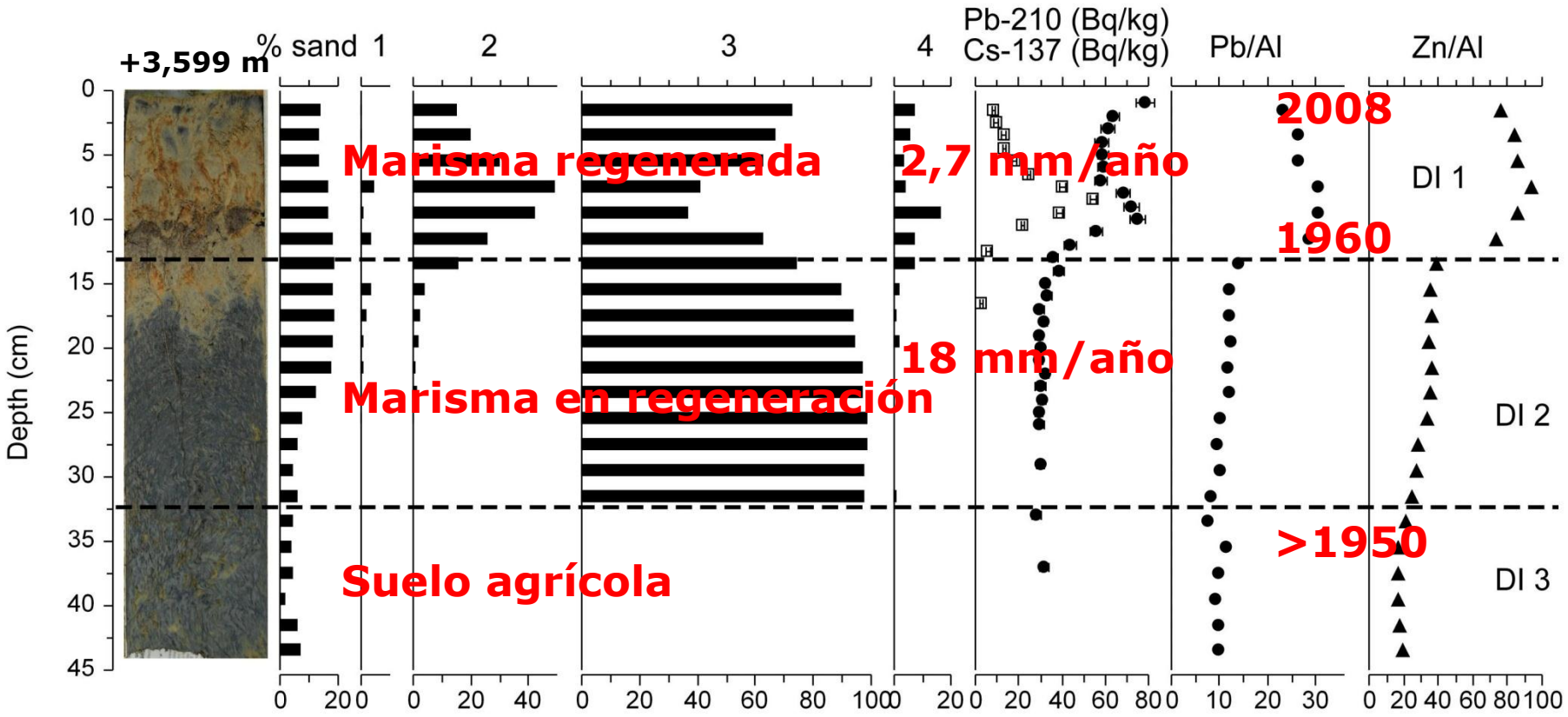
3. Regeneración de marismas

duración: 10 años
tasa de sedimentación: 13-18 mm/año



sondeo Isla

(Cearreta, A. et al., 2013. Journal of Marine Systems, 109-110: 203-212)

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(Woolston, R., 2013. Edge Hill University, Liverpool, UK)

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Eskerrik asko!

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