İ K L İ M

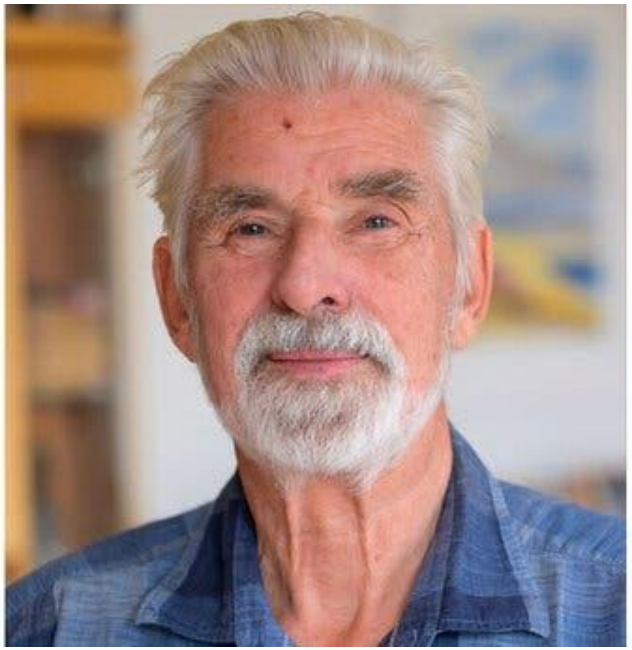
ORTAM KOŞULLARININ SİSTEMATİĞİ

Prof.Dr.rer.nat. D. Ali Ercan

ADD Bilim Kurulu Başkanı

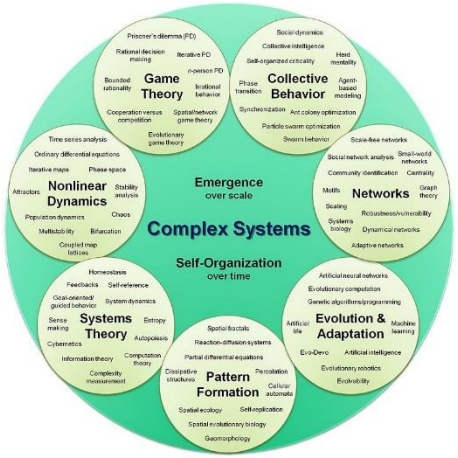
03 Şubat 2022, Ankara

2021 NOBEL FİZİK ÖDÜLÜ



Giorgio Parisi (73) Klaus Hasselmann (89) Syukuro Manabe (90)

"..Küresel iklim değişkenliğinin (küresel ısınımın) güvenilir öngörülerine yol açan teorik modellemeler.... "

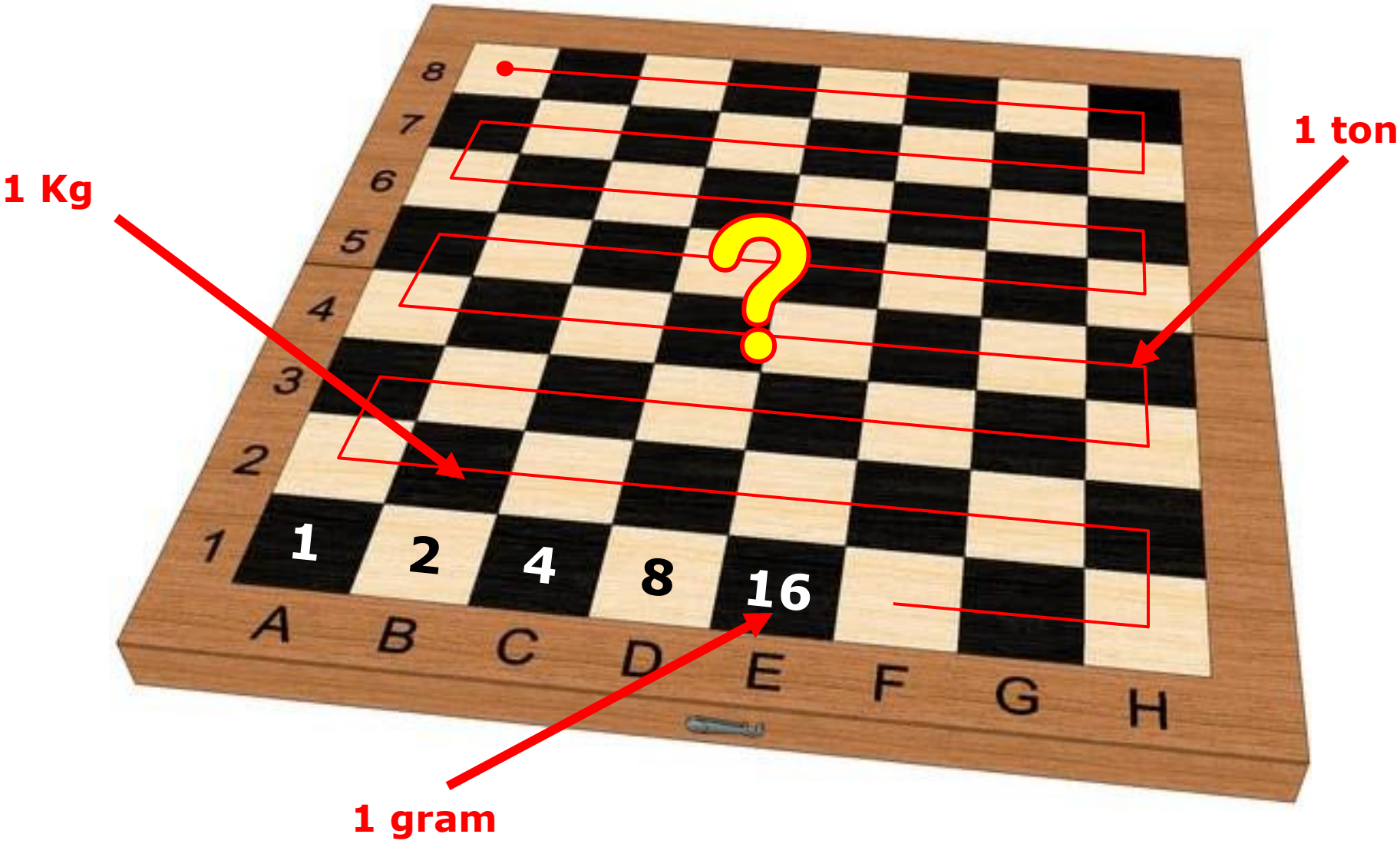


Stochastic climate models
Time dependent climate change

Climatology of a general circulation model

SATRANÇ TAHTASI ÜZERİNDE BUĞDAY TANELERİ

32 tane = 1 gr



576 milyar ton !

DÜNYANIN 800 YILLIK ÜRETİMİ

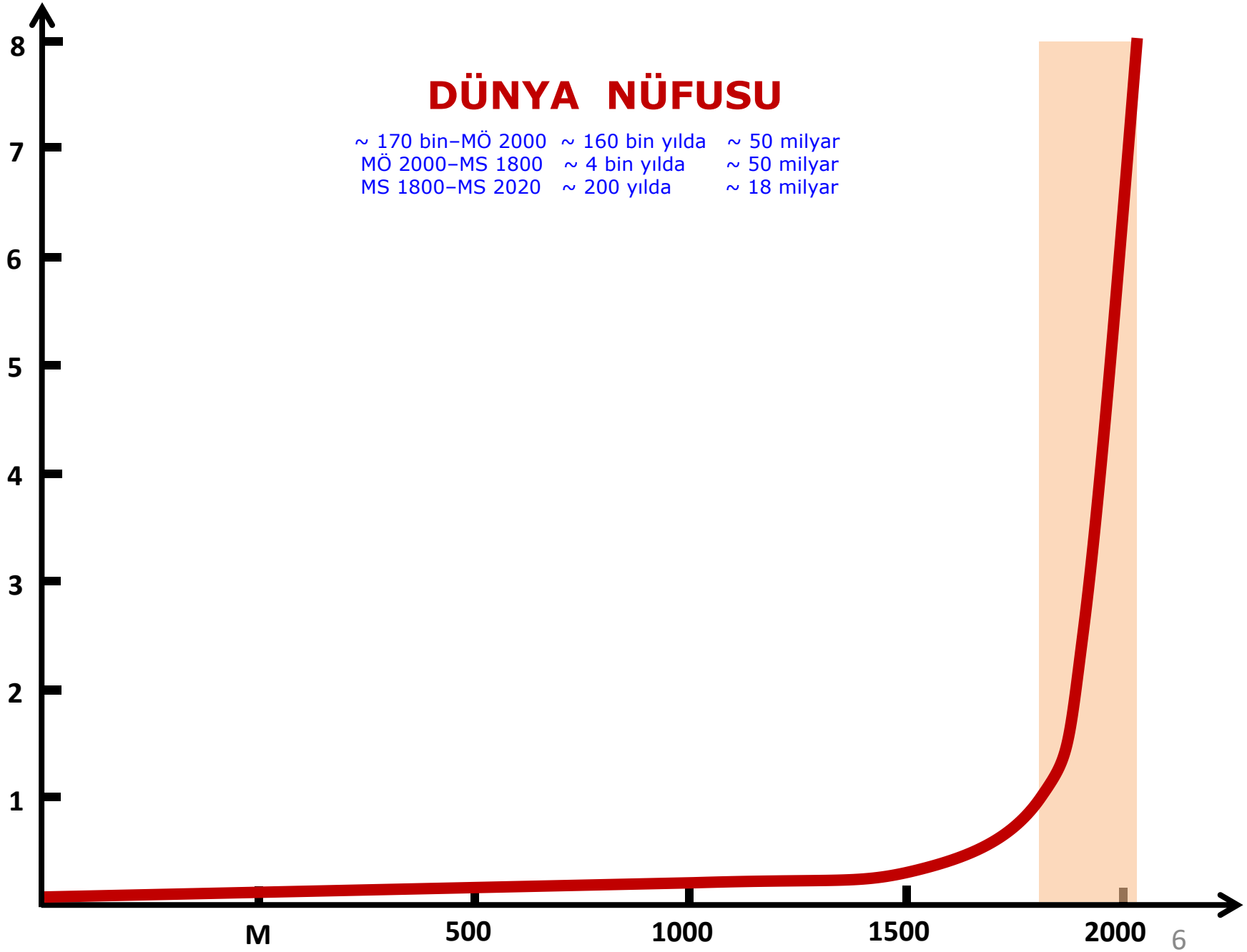
720 milyon ton x 800

2^{64} = 18 446 744 073 709 551 616 →

SATRANÇ TAHTASINDAKİ TOPLAM BUĞDAY MİKTARI

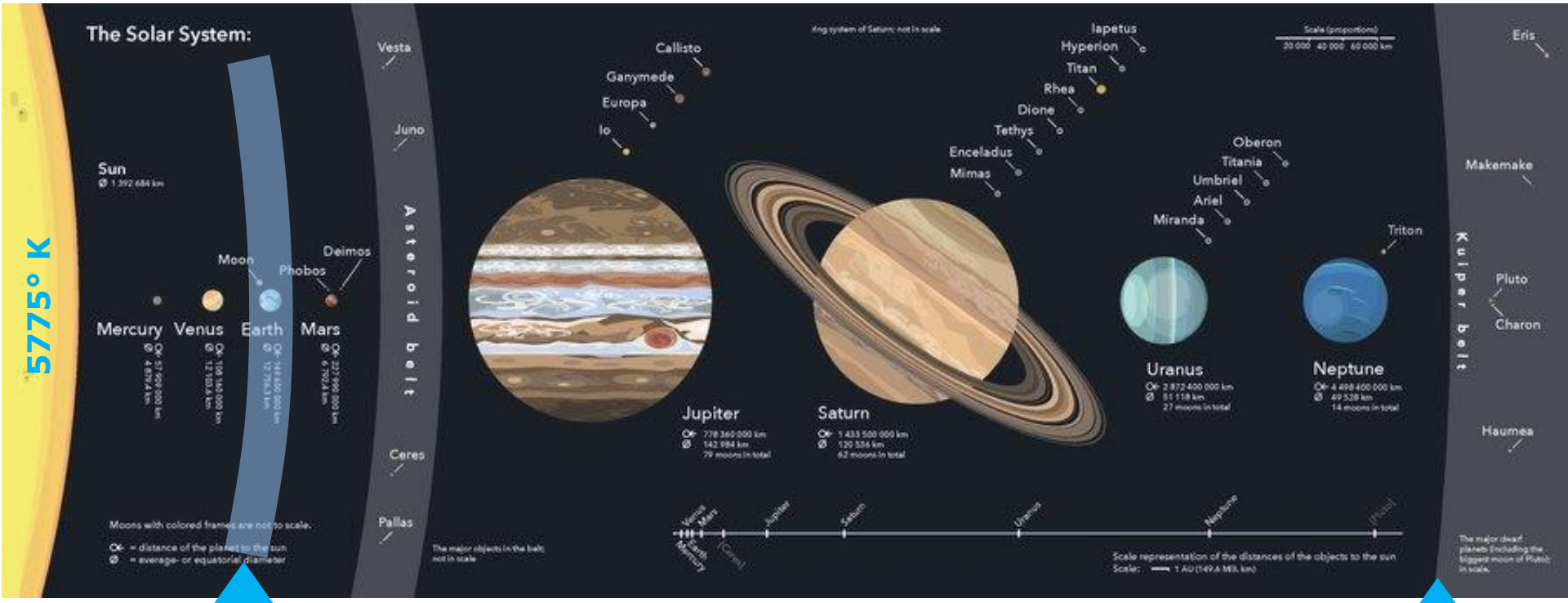
8 16 24 32 40 48 56 56 64

K A R E L E R (n)


DÜNYA NÜFUSU
~ 170 bin–MÖ 2000 ~ 160 bin yılda ~ 50 milyar
MÖ 2000–MS 1800 ~ 4 bin yılda ~ 50 milyar
MS 1800–MS 2020 ~ 200 yılda ~ 18 milyar
8
7
6
5
4
3
2
1
M
500
1000
1500
2000

Kozmik İklim

GÜNEŞ SİSTEMİ



Habitable Zone
15 milyon km.
‰ 2

Güneş Sistemi/Evren → *virüs/Dünya

50 AU
~7,5 milyar km.
7 Lh

Güneş m= 2 x 10^{30} kg (%99,7)
Δmc^2 = 4,3 milyon ton/s
E = 3,84 x 10^{26} Joule/s

GÜNEŞ

$T_0 = 5775°$ K

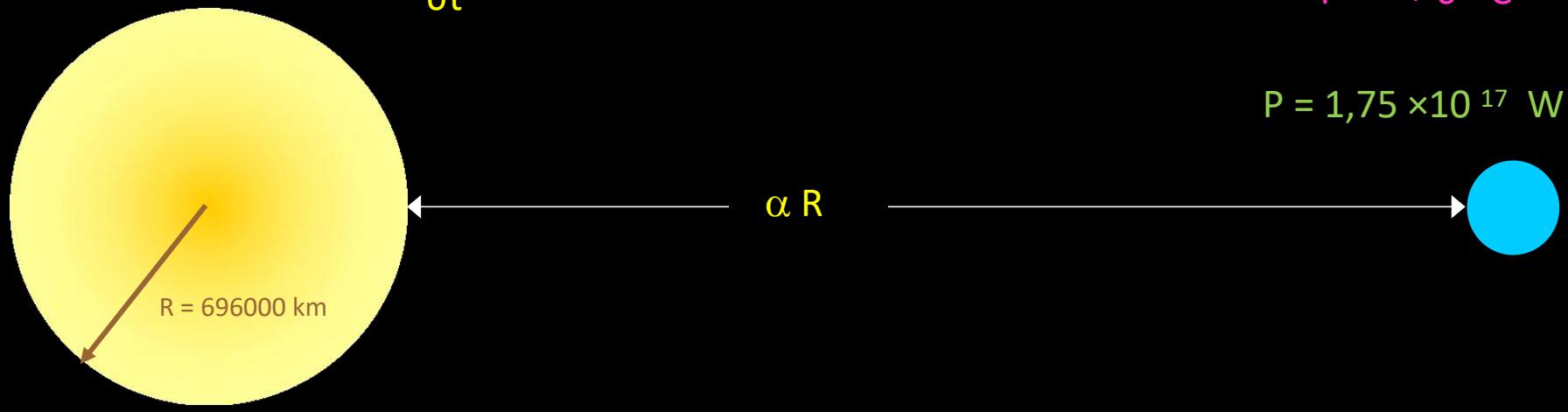
$$\frac{\partial}{\partial t} E_0 = \sigma T_0^4 \times 4 \pi R^2$$

DÜNYA

r = 6371 km.

$T^* = +6\ ^0C$

$P = 1{,}75 \times 10^{17}$ W



$$E_1 = \pi r^2/(4 \pi \alpha^2 R^2) \times \frac{\partial}{\partial t} E_0$$

$$E_2 = \sigma T^4 \times 4 \pi r^2$$

Termodinamik Denge → $E_1 = E_2$

$$\boxed{T = T_0 / \sqrt{2\alpha}}$$

$\alpha = 213{,}9$; $T = 279{,}2°$ K → **T = + 6 ⁰C**

Venüs

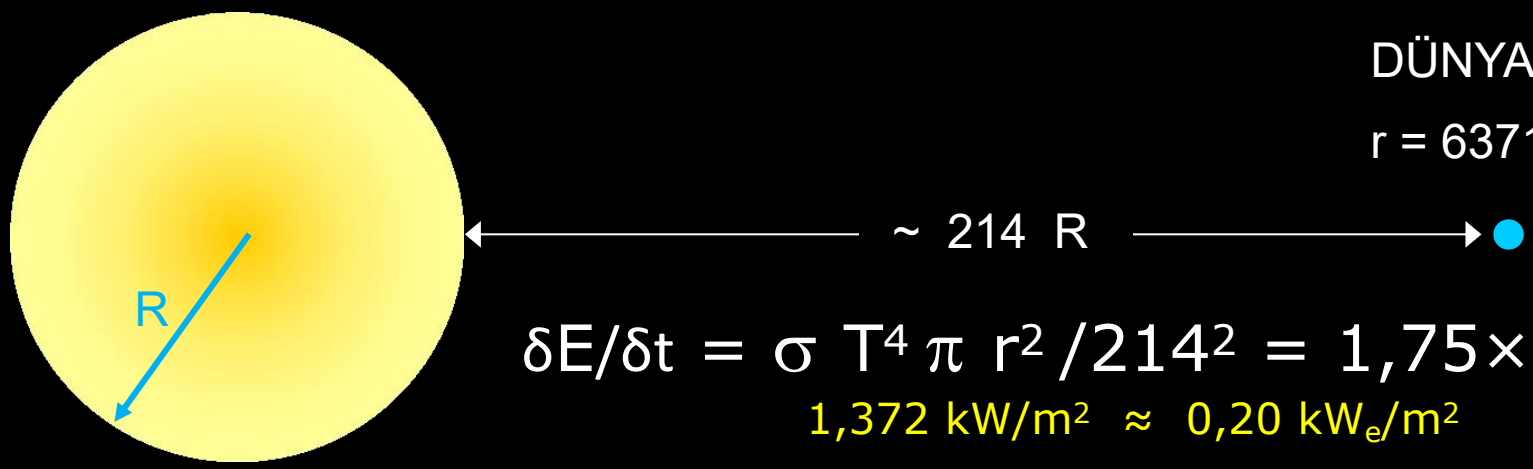
$\alpha = 154{,}4$ → $T = 55\ ^0C$

$T^* = 462\ ^0C$

Mars

$\alpha = 325{,}1$ → $T = -47\ ^0C$

GÜNEŞ ENERJİSİ



$$\delta E/\delta t = \sigma\, T^4\, \pi\, r^2 / 214^2 = 1{,}75 \times 10^{17}\ \mathrm{W}$$

$1{,}372\ \mathrm{kW/m^2} \approx 0{,}20\ \mathrm{kW_e/m^2}$

$$175\ \mathrm{PW} \approx \sum_i (\mathrm{GNP})_i$$

1 saatlık Güneş enerjisi Dünyada kullanılan toplam1 yıllık enerji kadardır.

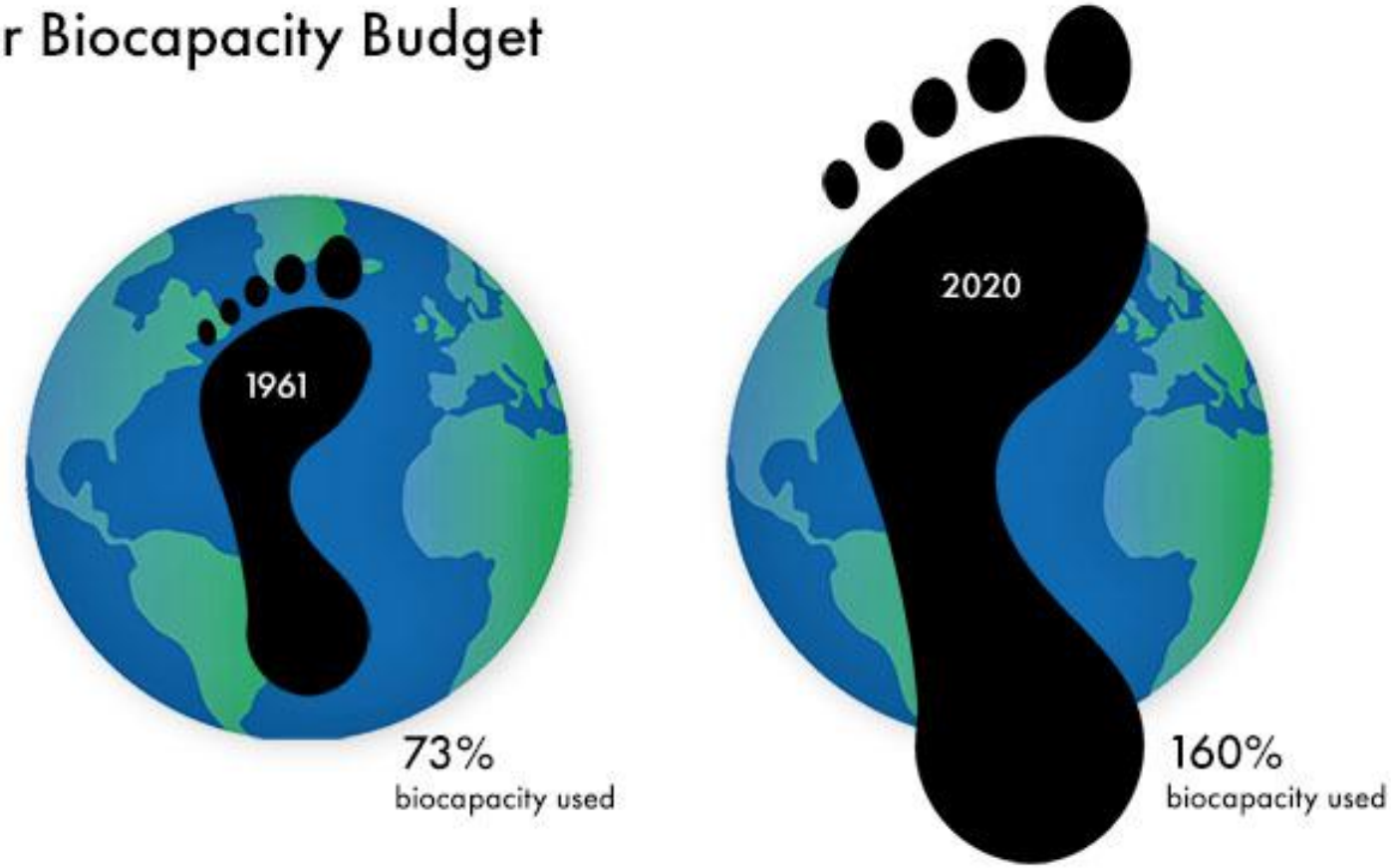
Karbon ayak izi

MAVİ GEZEGEN

DÜNYA ‘SINIR AŞIM’ GÜNÜ

Earth Overshoot Day’2021 : **27.July**

Busting our Biocapacity Budget



2050
240 %

Global Footprint Network®
Advancing the Science of Sustainability

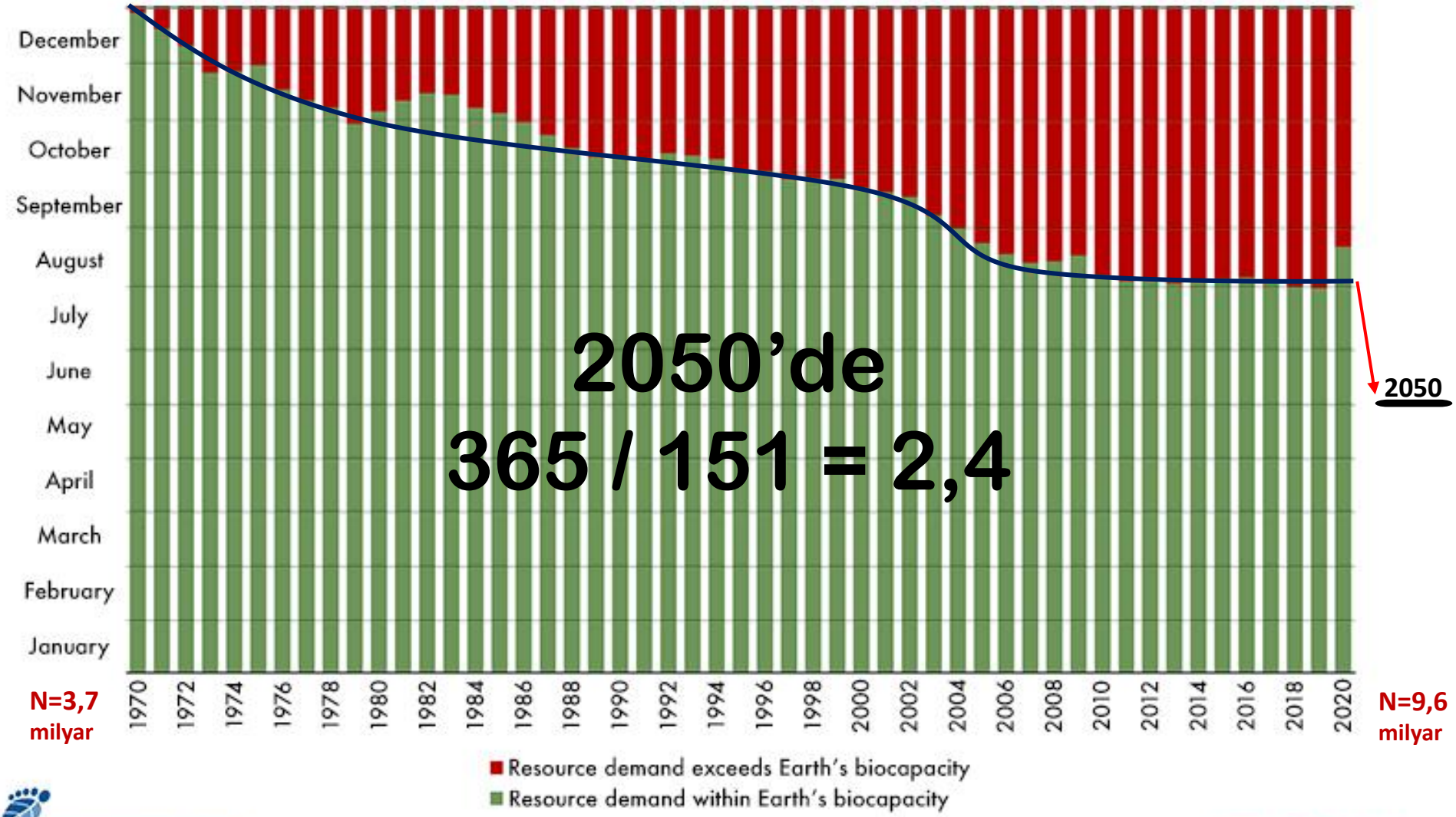
Source: Global Footprint Network, National Footprint & Biocapacity Accounts 2019 Edition
data.footprintnetwork.org

EARTH OVERSHOOT DAY

Earth Overshoot Day
1970 - 2020

1 Earth

1.6 Earths -> 2,4



Global Footprint Network®
Advancing the Science of Sustainability

Source: Global Footprint Network National Footprint and Biocapacity Accounts 2019 Edition
data.footprintnetwork.org

EARTH OVERSHOOT DAY

Country Overshoot Days 2020

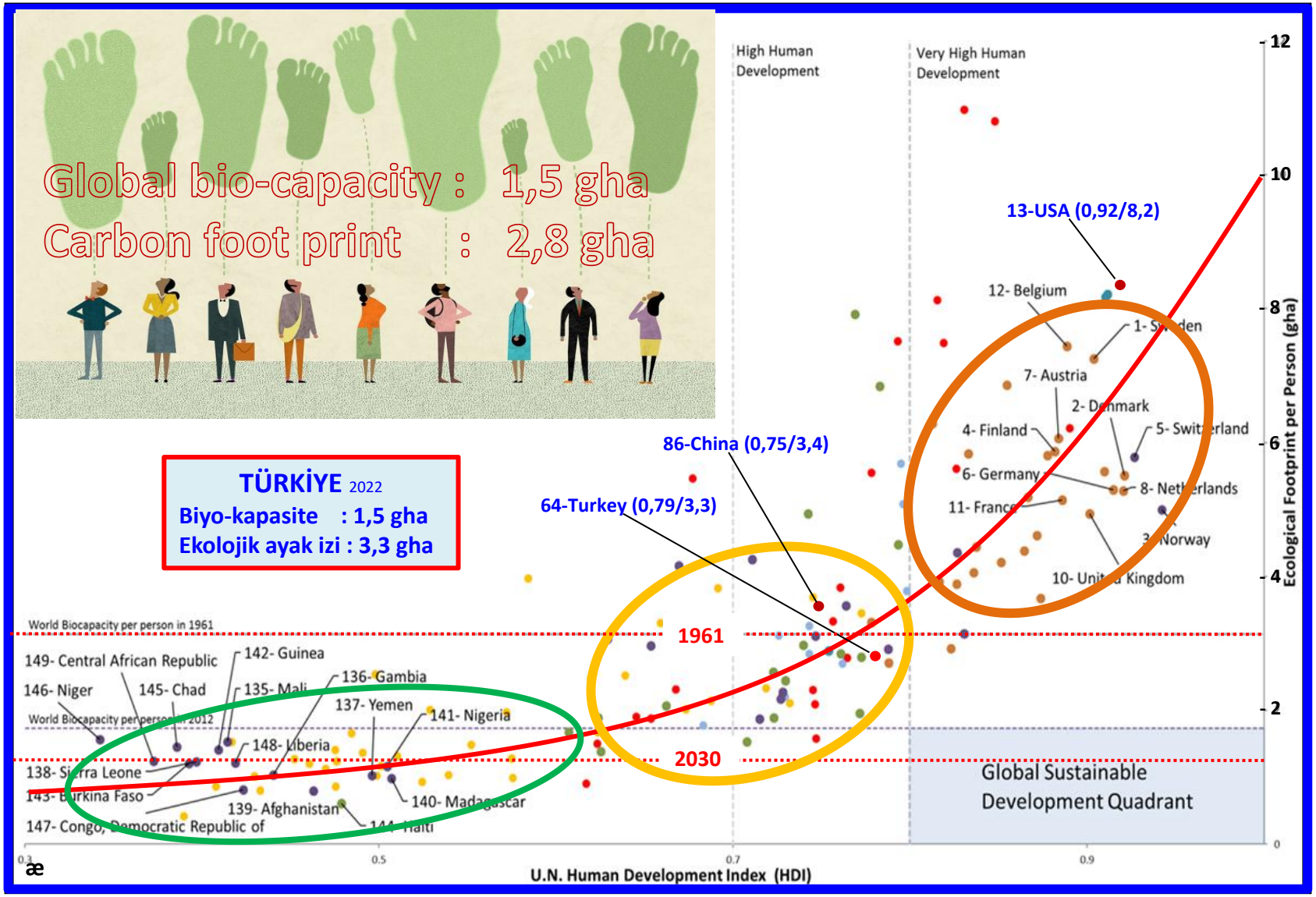
When would Earth Overshoot Day land if the world's population lived like...

EARTH OVERSHOOT DAY

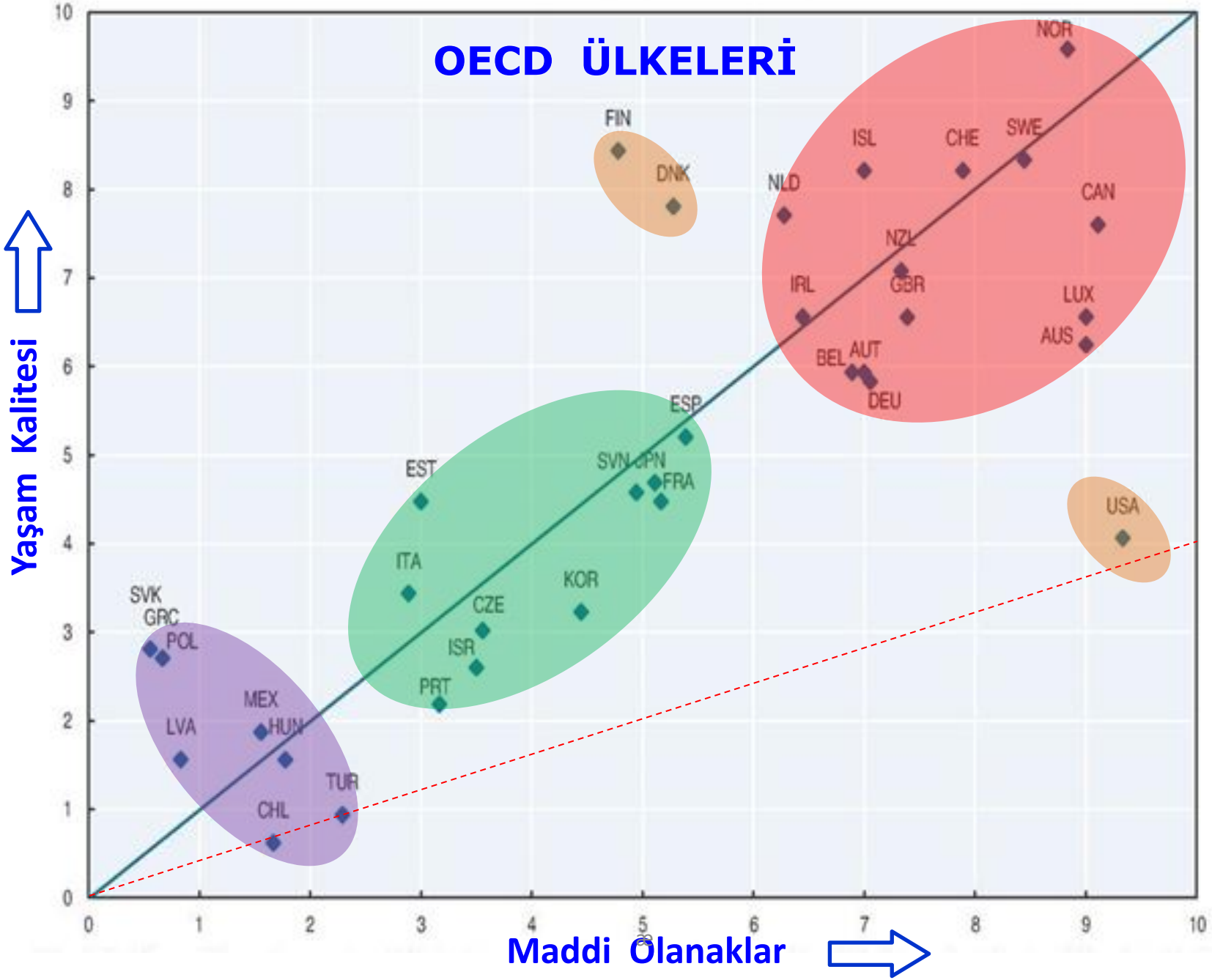
Source: Global Footprint Network National Footprint

Global Footprint Network
Advancing the Science of Sustainability

Adam başına ekolojik ayak izi (gha) →



İnsani gelişmişlik (?) indeksi (HDI) →


OECD ÜLKELERİ
Yaşam Kalitesi
Maddi Olanaklar
NOR
FIN
DNK
ISL
CHE
SWE
NLD
CAN
NZL
IRL
GBR
LUX
AUS
BEL
AUT
DEU
ESP
EST
SVN
JPN
FRA
USA
ITA
KOR
SVK
GRC
CZE
POL
ISR
PRT
MEX
LVA
HUN
TUR
CHL
0
1
2
3
4
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6
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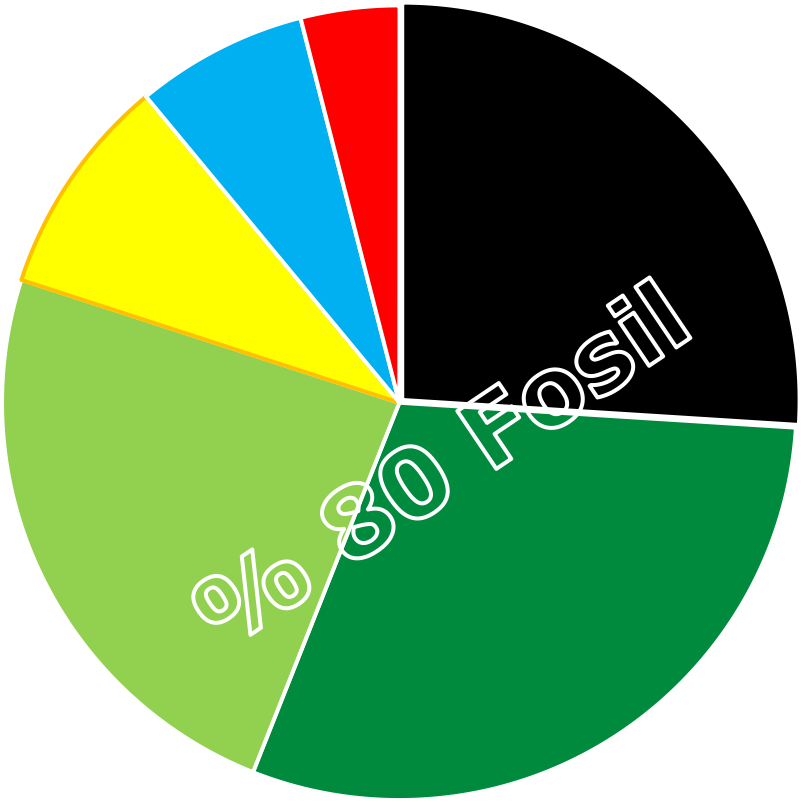
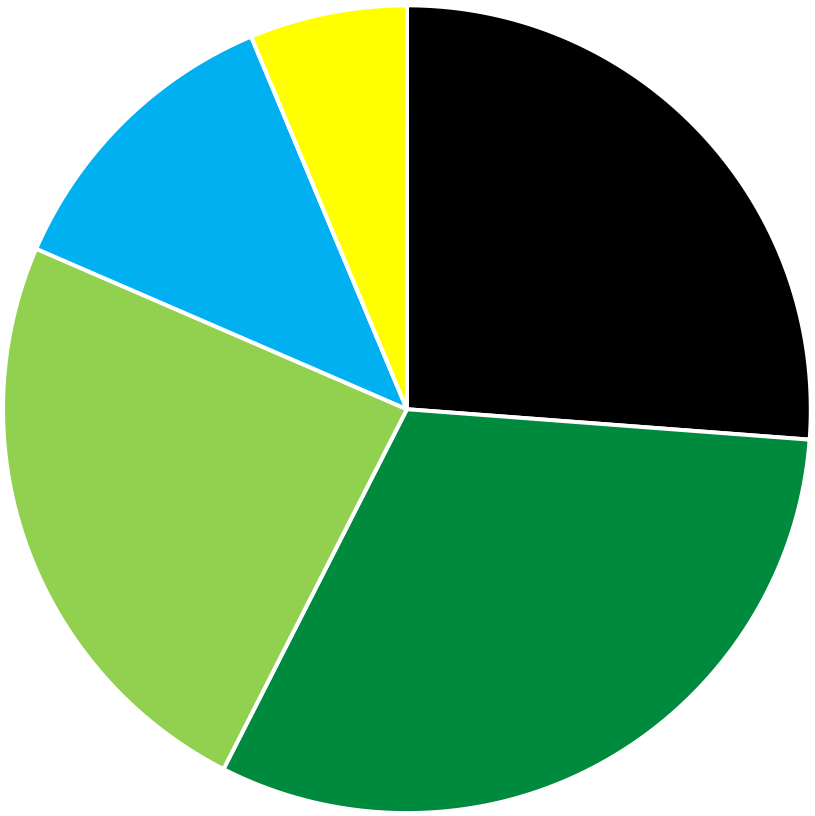
8
9
10

Enerji - Ekoloji ilişkisi
Enerji kaynakları

Dünya toplam Enerji kullanımı ~600 EJ



Türkiye toplam Enerji kullanımı ~6,6 EJ



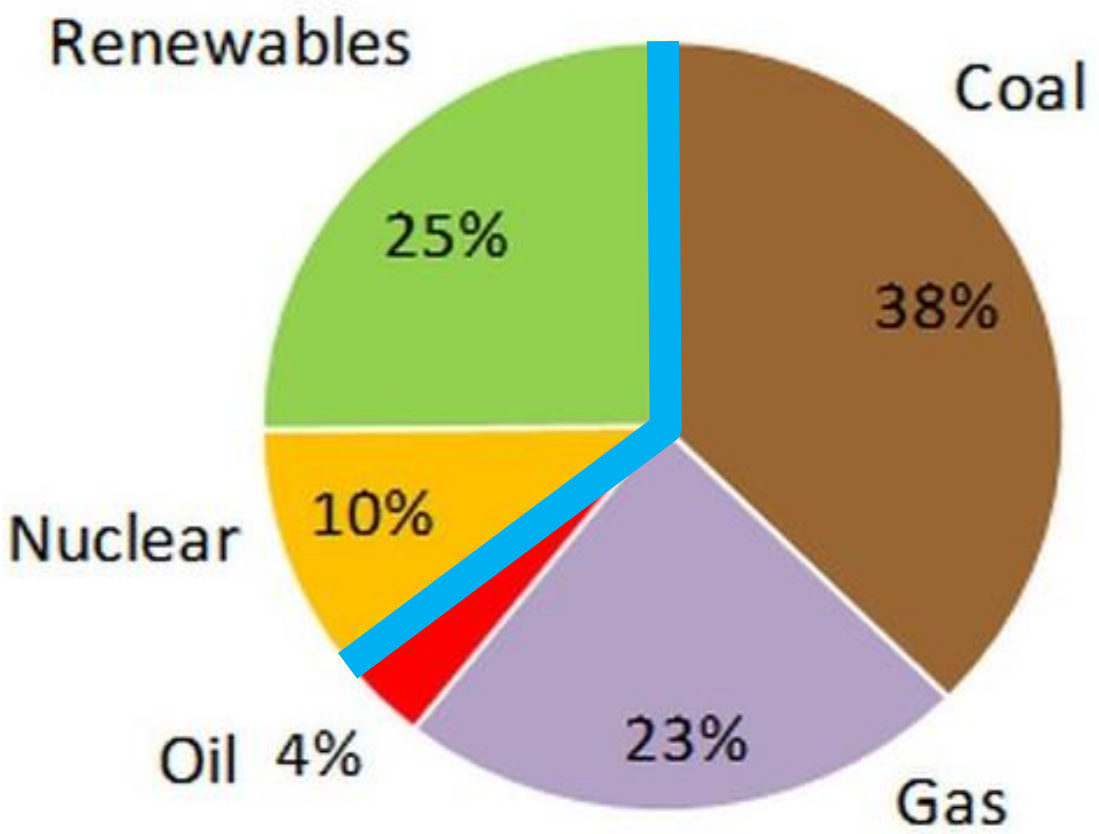
■ Kömür ■ Petrol ■ D. Gaz ■ Gün/Rüz ■ Hidro ■ Nük.

DÜNYADA ELEKTRİK ÜRETİMİ

~ 0,45 x Toplam Enerji x 3/8

Toplam 28000 Twh → ~ 3500 kWh/adam.yıl

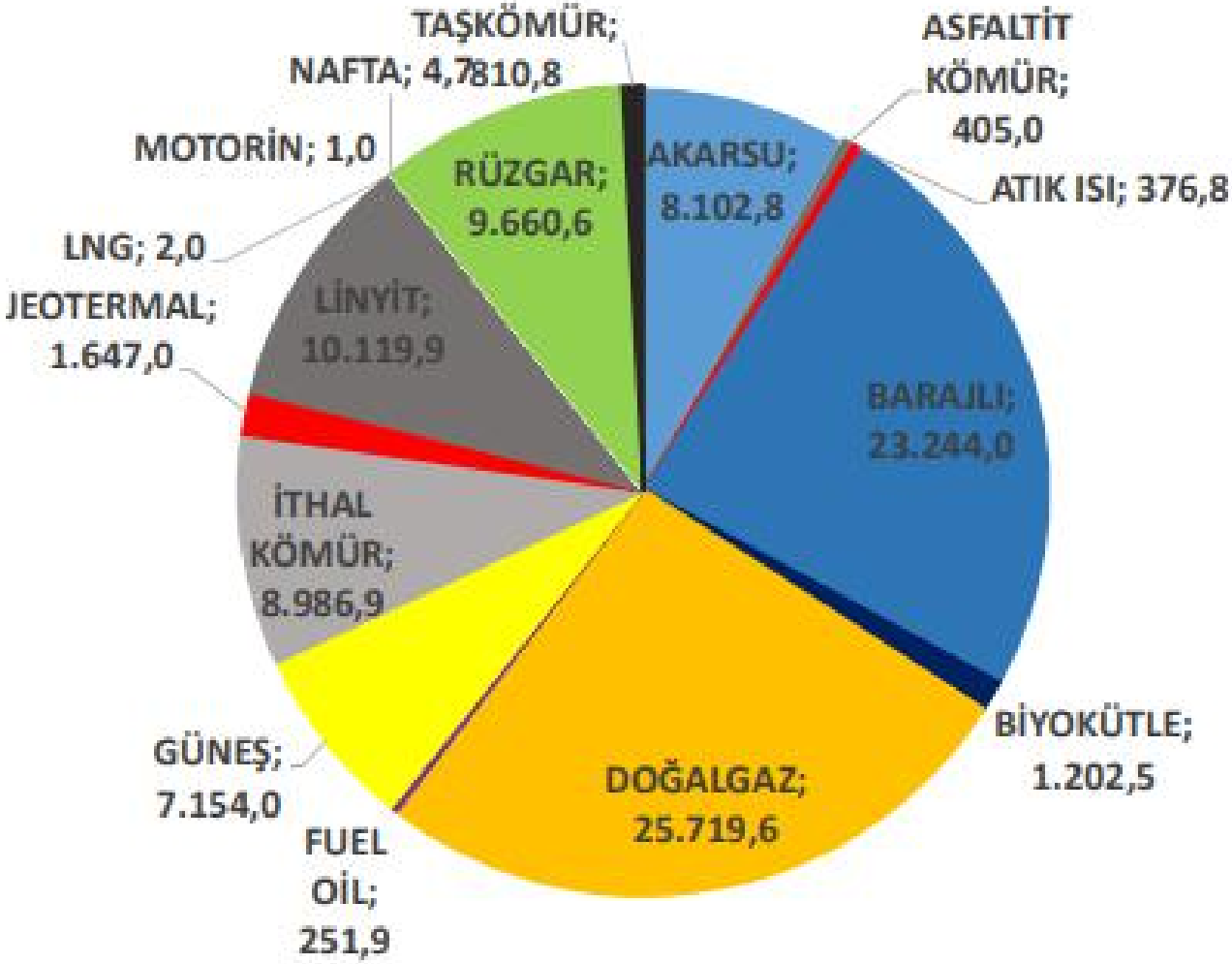
%35



% 65

Türkiye'de Elektrik enerjisi

Türkiye'de kurulu Güç 97,3 GWe

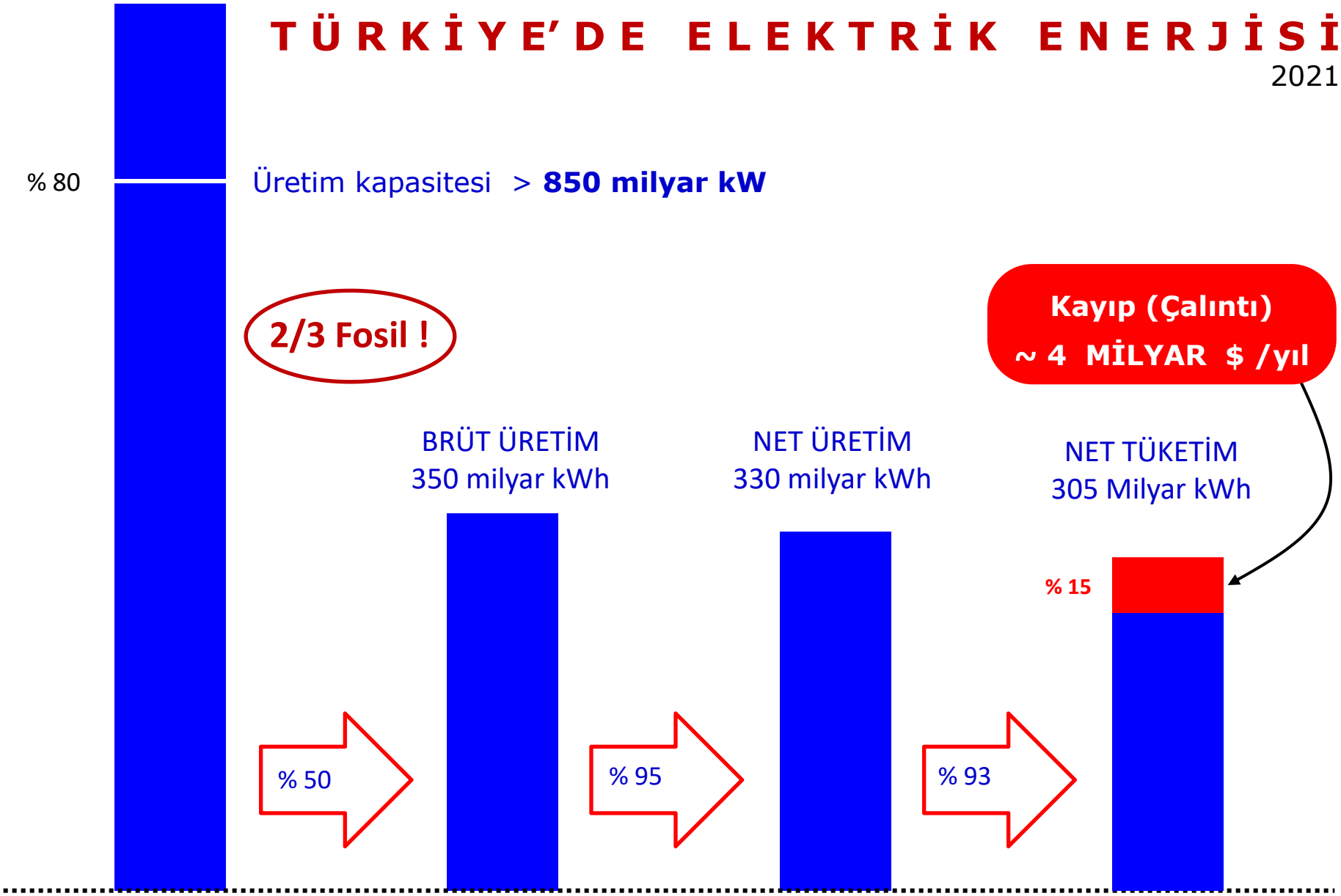


~ % 50 YENİLENEBİLİR KAYNAKLAR !?

KURULU GÜÇ 97 GW

TÜRKİYE'DE ELEKTRİK ENERJİSİ

2021



KAYIP ELEKTRİK ORANLARI

MARDİN % 73
ŞIRNAK % 71
BATMAN % 67
DİYARBAKIR % 65
HAKKARİ % 64

.....
.....
.....

ortalama % 15 kayıp

MUĞLA % 3,4
ÇANAKKALE % 3,3
BİLECİK % 2,9
KARABÜK % 2,1
DENİZLİ % 1,3

YENİLENMEYEN E N E R J İ KAYNAKLARI

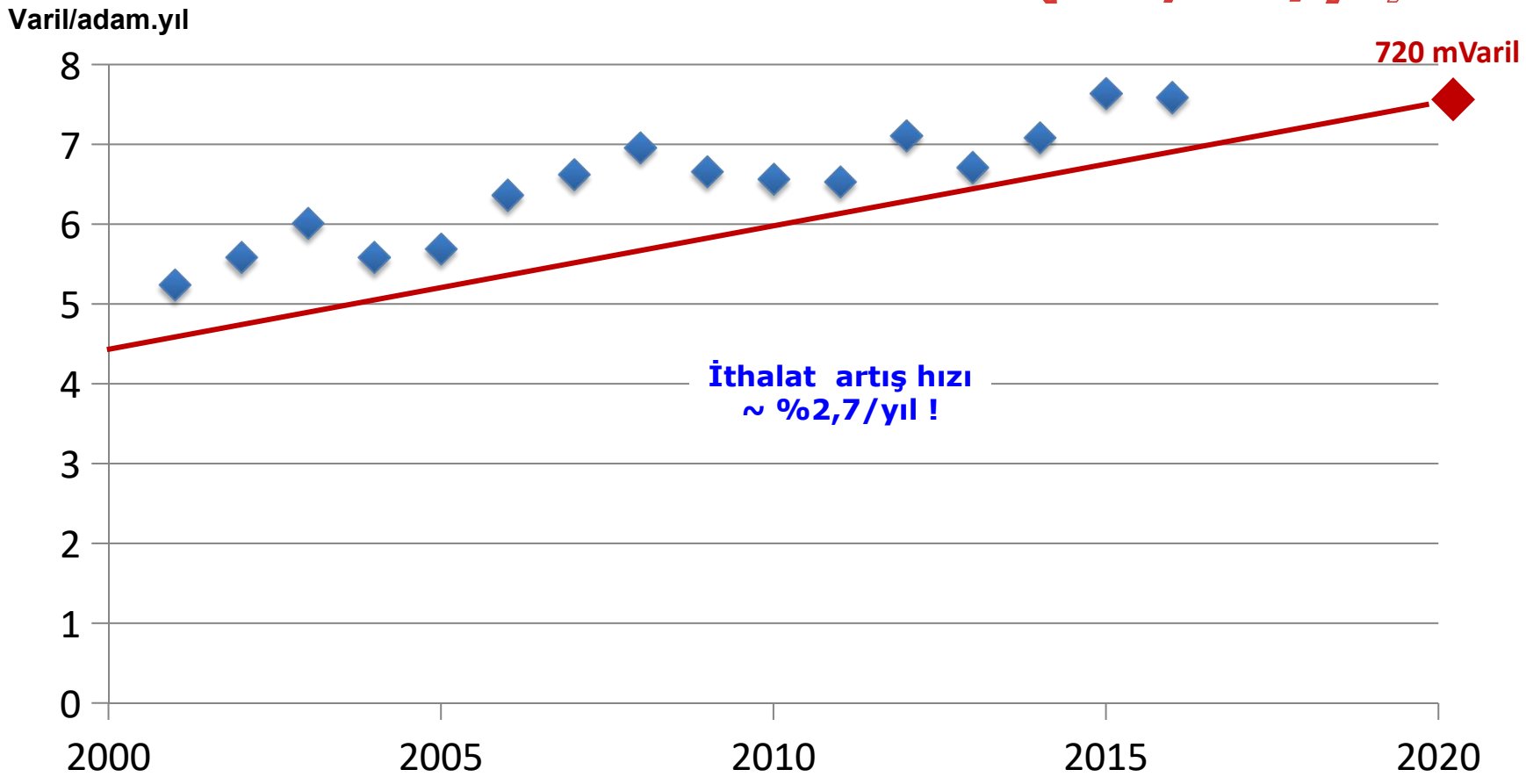
		DÜNYA		TÜRKİYE
KÖMÜR	(10^9 ton)	750		1,500
LİNYİT	(10^9 ton)	300		12,000
PETROL	(10^9 ton)	250		0,300
D.GAZ	(10^{12} m^3)	200		0,400
URANYUM	(10^6 ton)	8		0,007
Toplam	Exa Joule	~ 44 000	x 0,005	~ 250
		(~ 70 yıl)		(~ 40 yıl)

Toplam enerji kaynakları rezervinin ~ %10 u Uranyumdur.

1 kg. Th232 / U235 ~ 2000 tep

Th232/U238 oranı ~ 4

TÜRKİYE'NİN ENERJİ İTHALATI (~ 4,1 EJ/yıl)

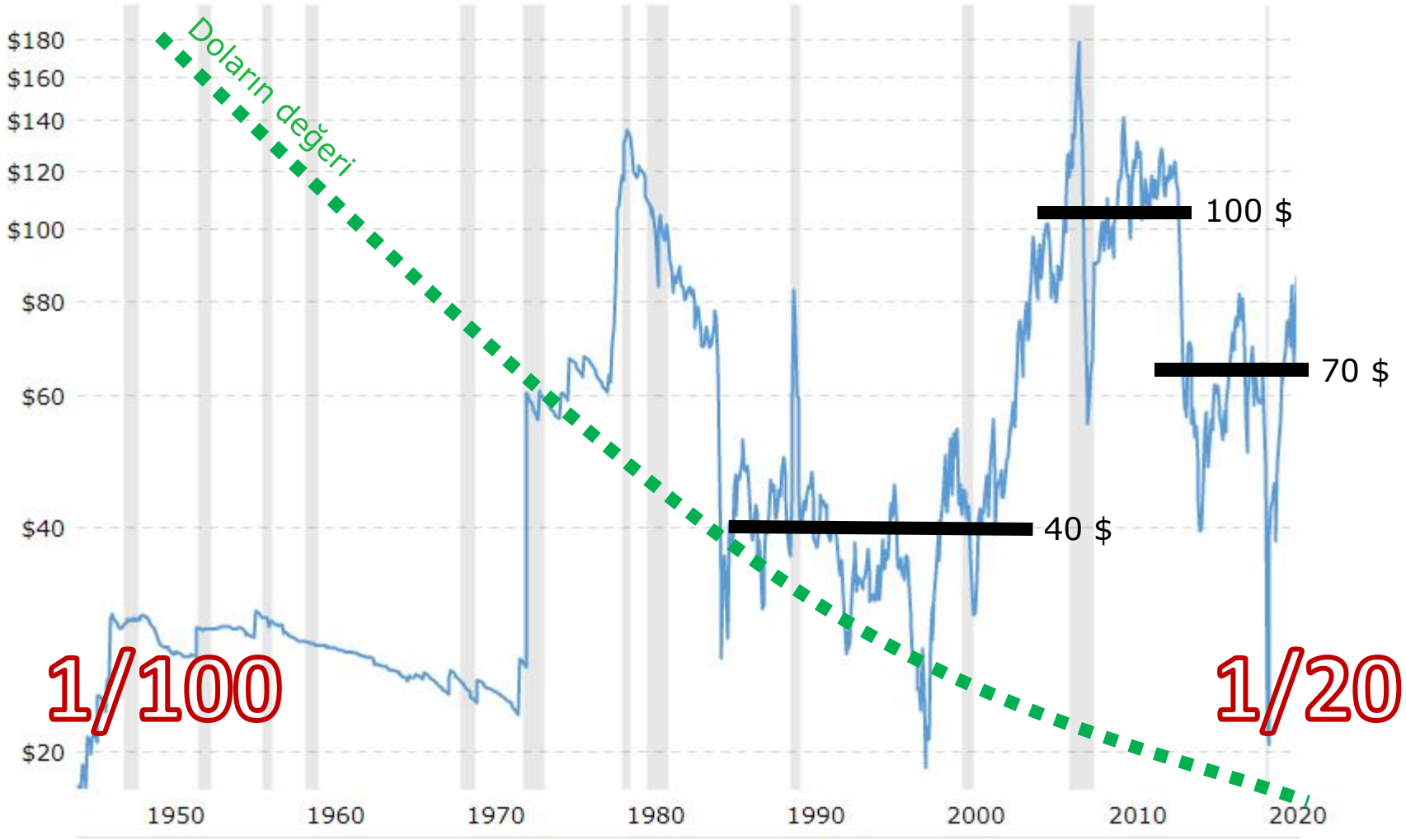


1 toe = 41,9 GJ 7,3 varil = 1 ton

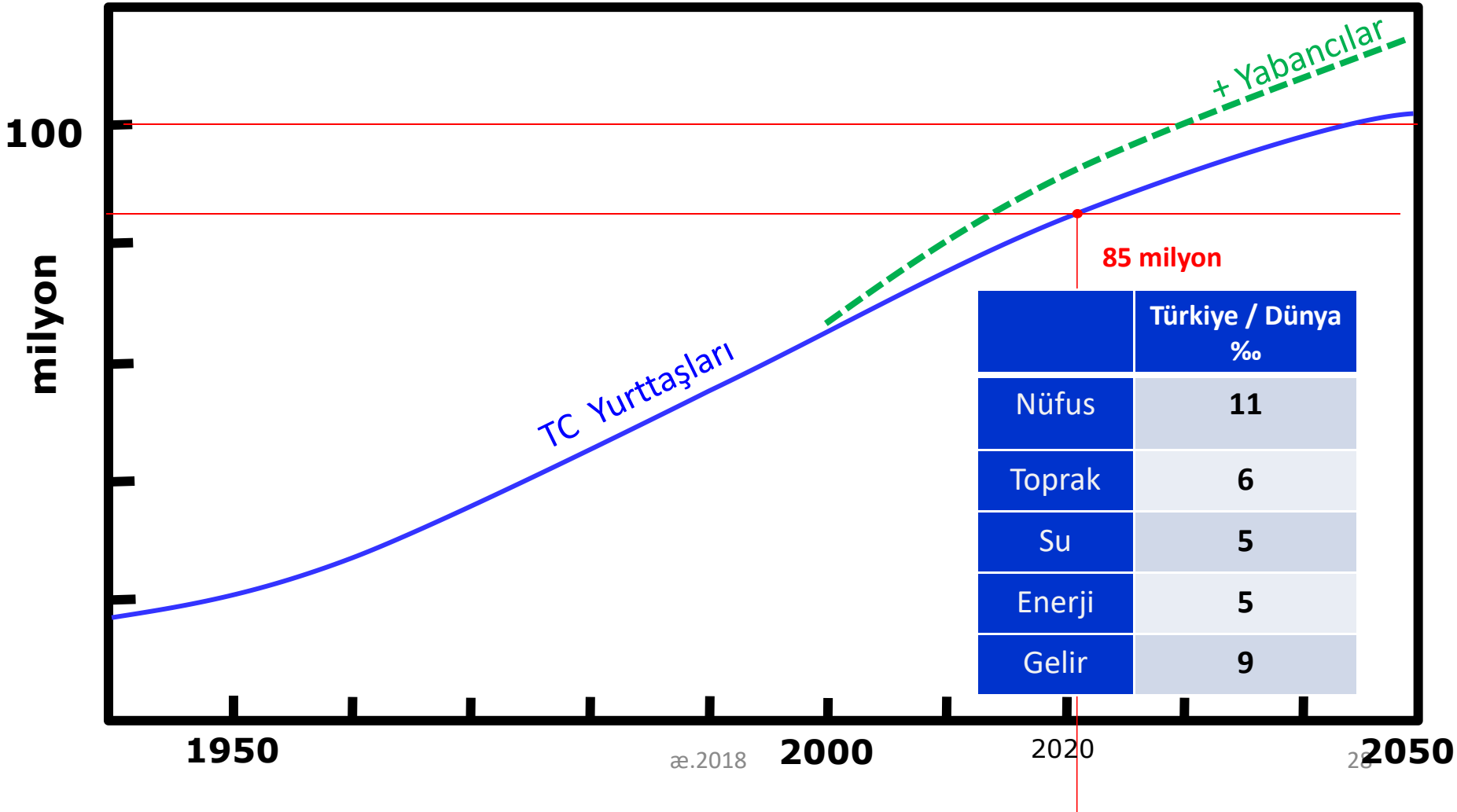
1 m3 NG = 37,68 MJ 1 bbl = 159 lt = 137 kg

1 bbl = 5,74 GJ d = 0,86 **1 bbl Oil = 1-2 g Gold**

PETROL FİYATI ($/bbl)



TÜRKİYE'NİN NÜFUSU



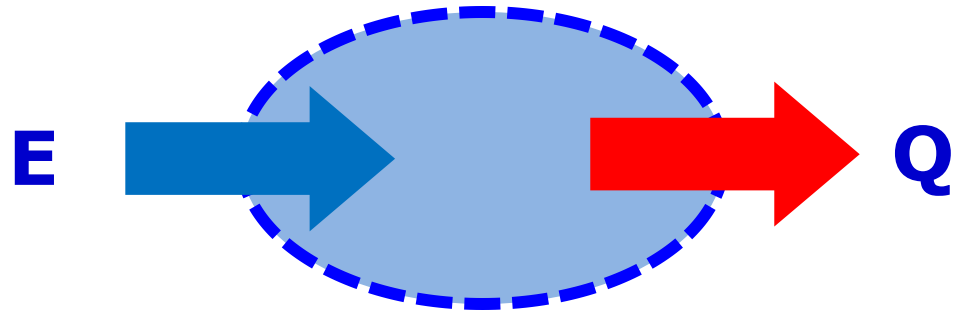
	Türkiye / Dünya ‰
Nüfus	11
Toprak	6
Su	5
Enerji	5
Gelir	9

Enerji – İklim ilişkisi

EVRENSEL ENERJİ YASASI

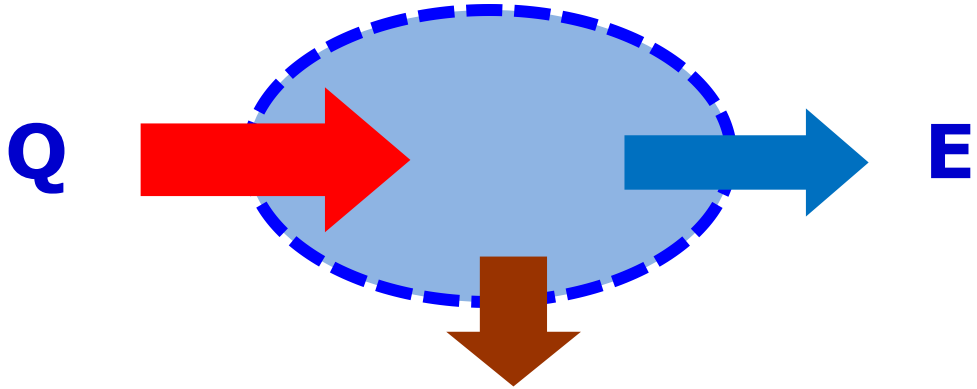
1.

HAREKET ENERJİSİ



ISI ENERJİSİ

2.

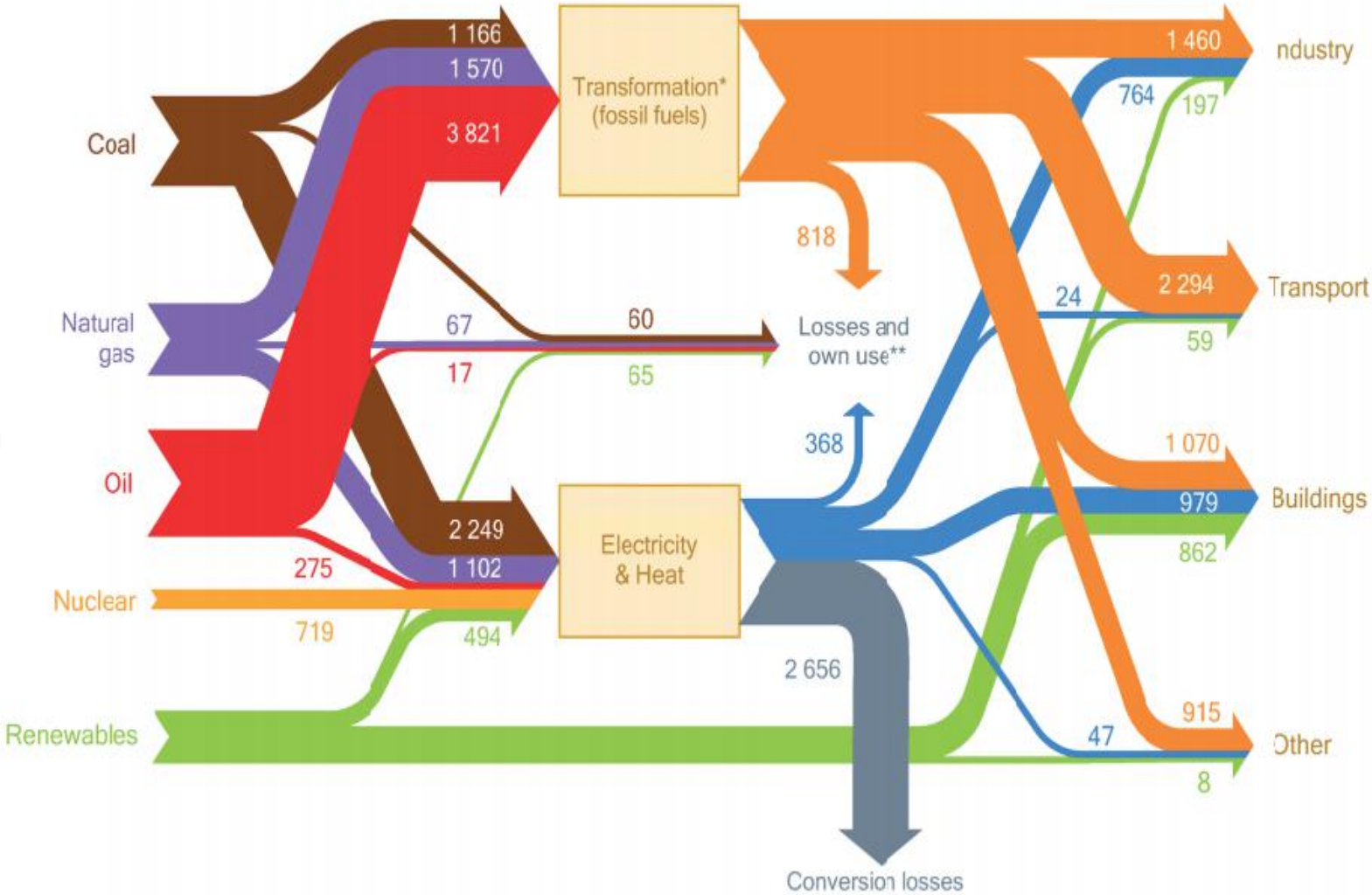


ATIK ENERJİ

sistem verimi

$E / Q < 1$

Figure 2.8 ▷ The global energy system, 2010 (Mtoe) **535 Exa Joules**



3

2

ENERJİ TÜKETİM SANTRALLARI

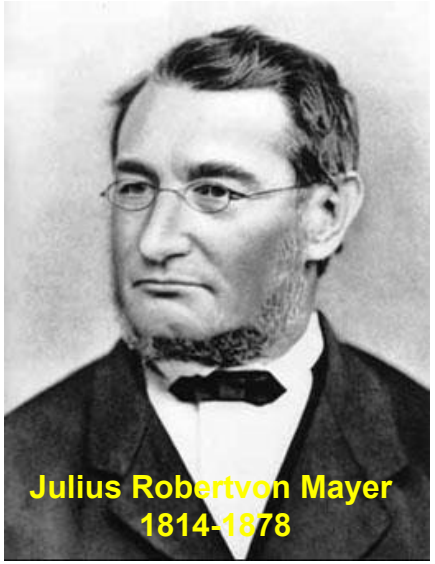
8

3

Enerji = Isı – İş

$\Delta E = \Delta Q - \Delta W$

$\Delta E = T\,\Delta S - p\,\Delta V$



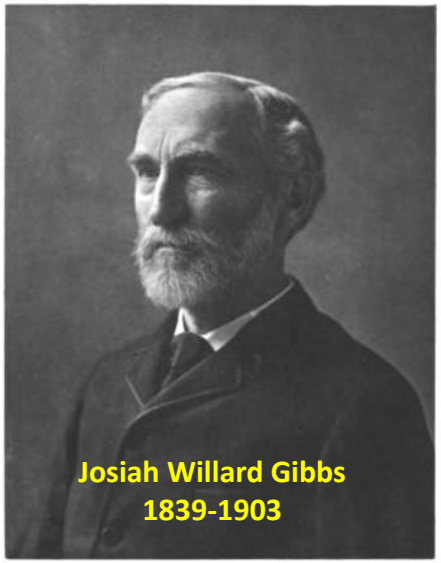
Serbest Enerji :

$\Delta G \equiv \Delta H - T\Delta S$

$\Delta G = 0 \rightarrow$ **DENGE**

$\Delta G < 0$
kendiliğinden
oluşum !
(Spontaneos)

$T \,.\, \Delta S > \Delta E$



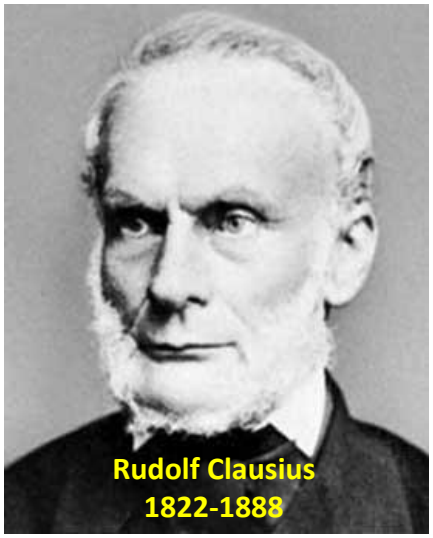
Enthalpi

$\Delta H \equiv \Delta E + p\,\Delta V$

Entropi

$\Delta S \equiv \Delta Q / T$

- Evrenin toplam **Enerji**si sabittir;
- Evrenin **Entropi'**si maksimum değerine erişim yolundadır.



$\Delta G \equiv \Delta H - T\Delta S$

	$\Delta H < 0$	$\Delta H > 0$
$\Delta S > 0$	$\Delta G < 0$ **doğal, kendiliğinden tepkileşimler** *spontenous*	T $\Delta G < 0$ Buz → Su $\Delta G > 0$
$\Delta S < 0$	T $\Delta G > 0$ Su → Buz $\Delta G < 0$	$\Delta G > 0$ **kendiliğinden olmayan, zoraki tepkileşimler**

LUDWIG BOLTZMANN

1844 – 1906

E N T R O P İ

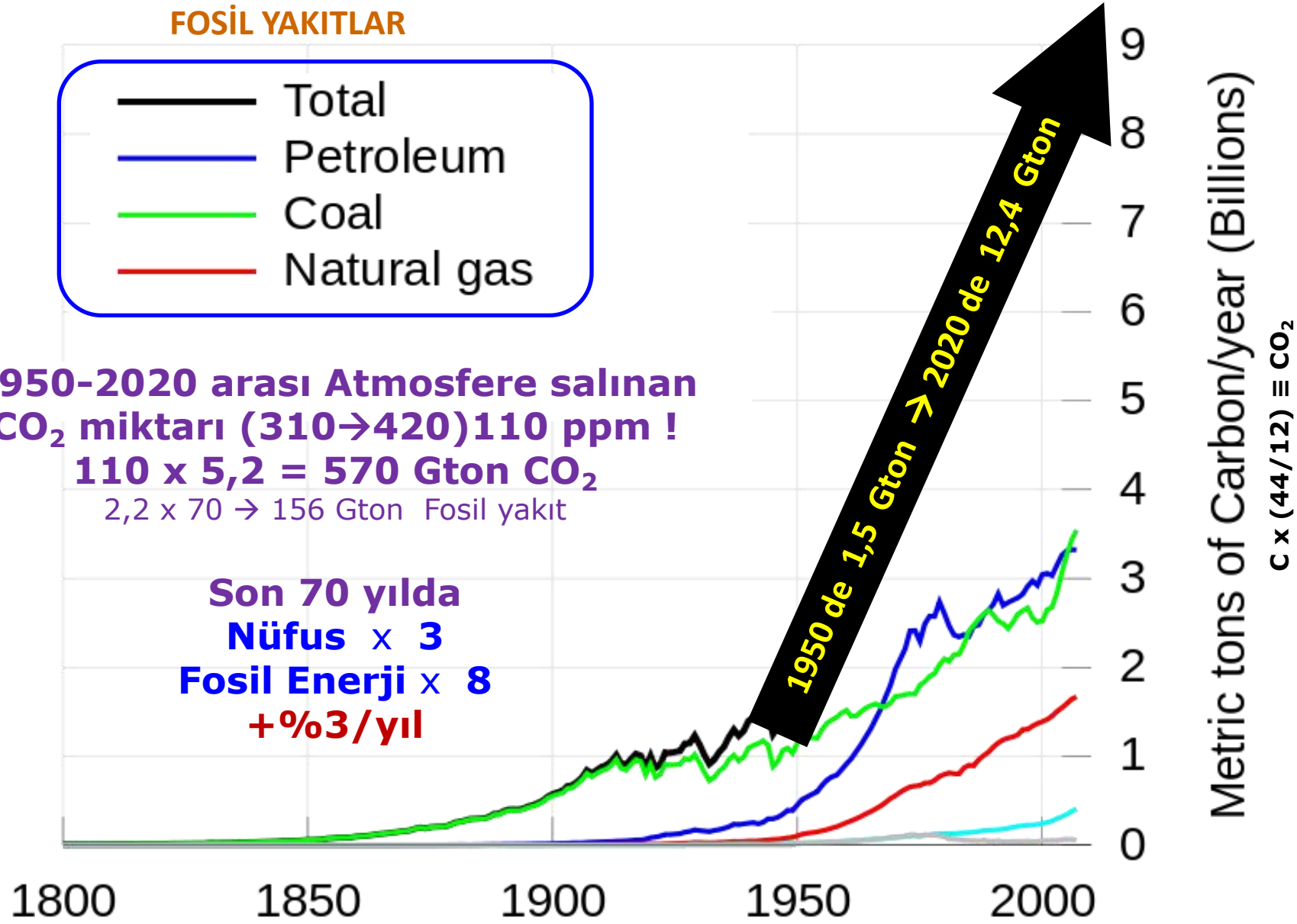
R.Clausius **S = Q/T**

L.Boltzmann S = k . $\log_e$ W

k = 1,38 10^{-23} Joule/Kelvin

C. Shannon **H(p) = - Σ p_i x $\log_2 (p_i)$**

FOSİL YAKITLAR



1950-2020 arası Atmosfere salınan CO_2 miktarı (310→420)110 ppm !

110 x 5,2 = 570 Gton CO_2

2,2 x 70 → 156 Gton Fosil yakıt

Son 70 yılda

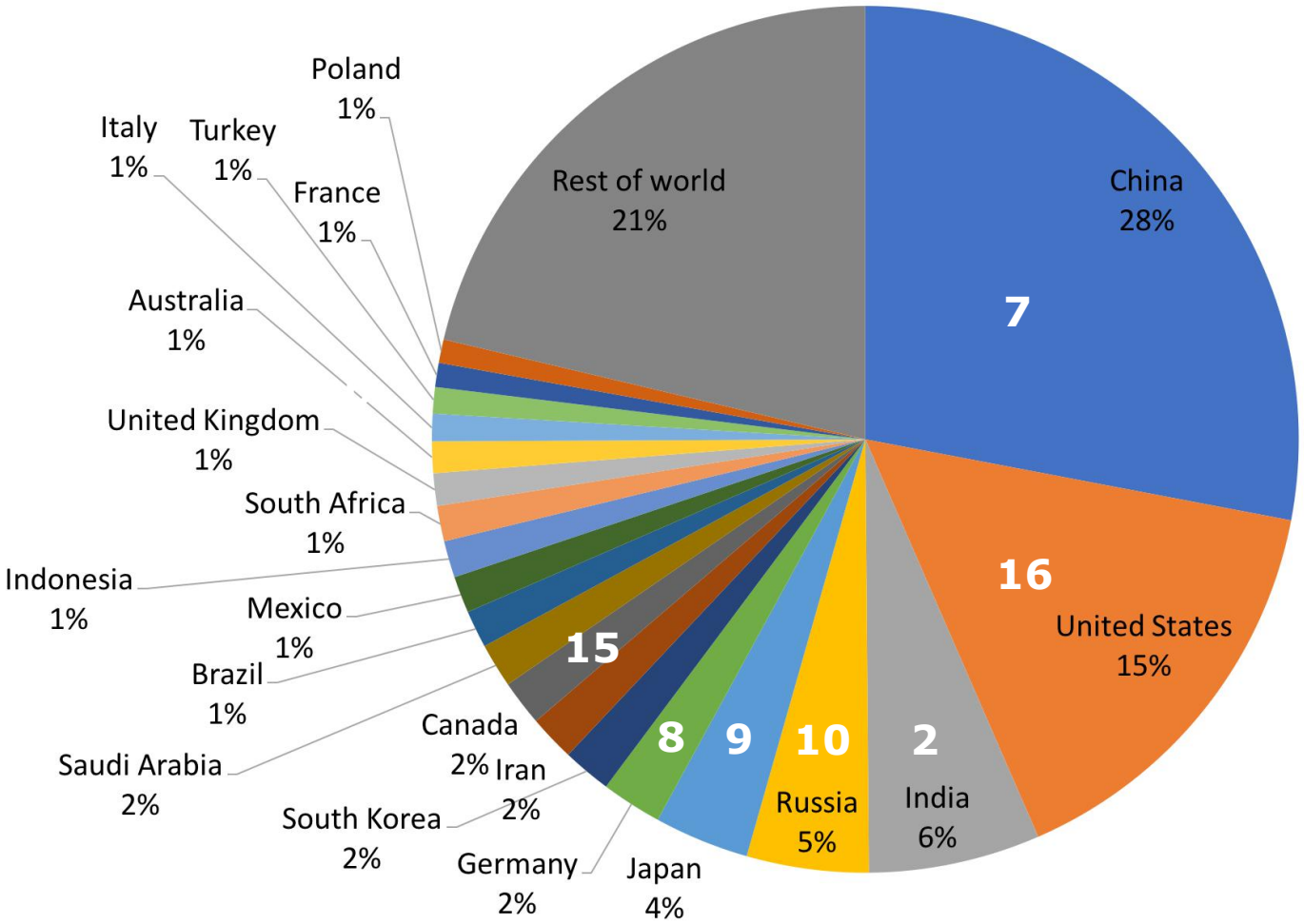
Nüfus x 3

Fosil Enerji x 8

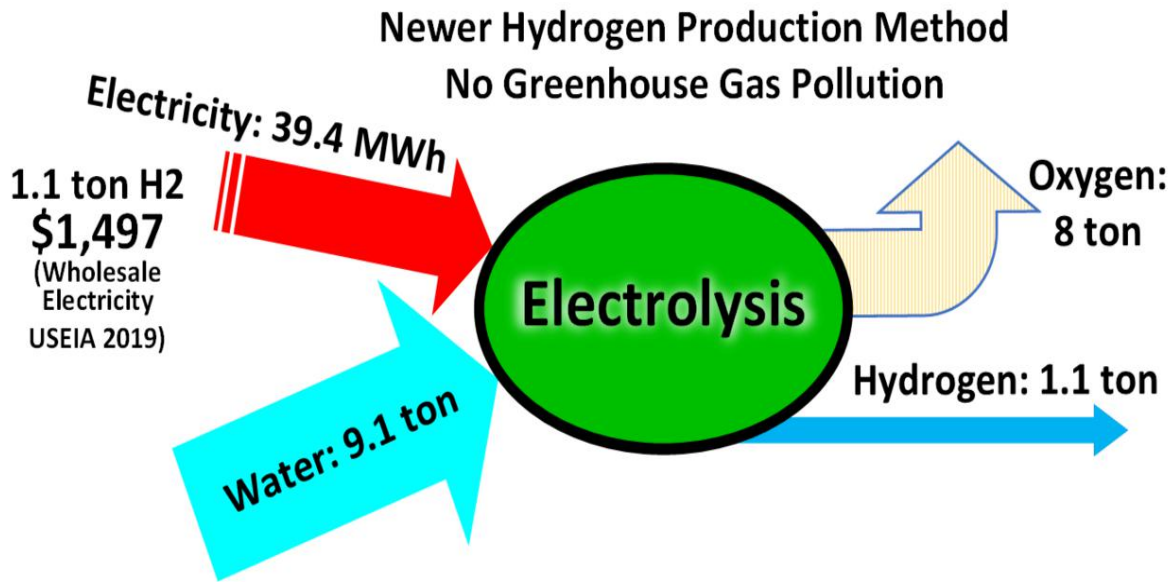
+%3/yıl

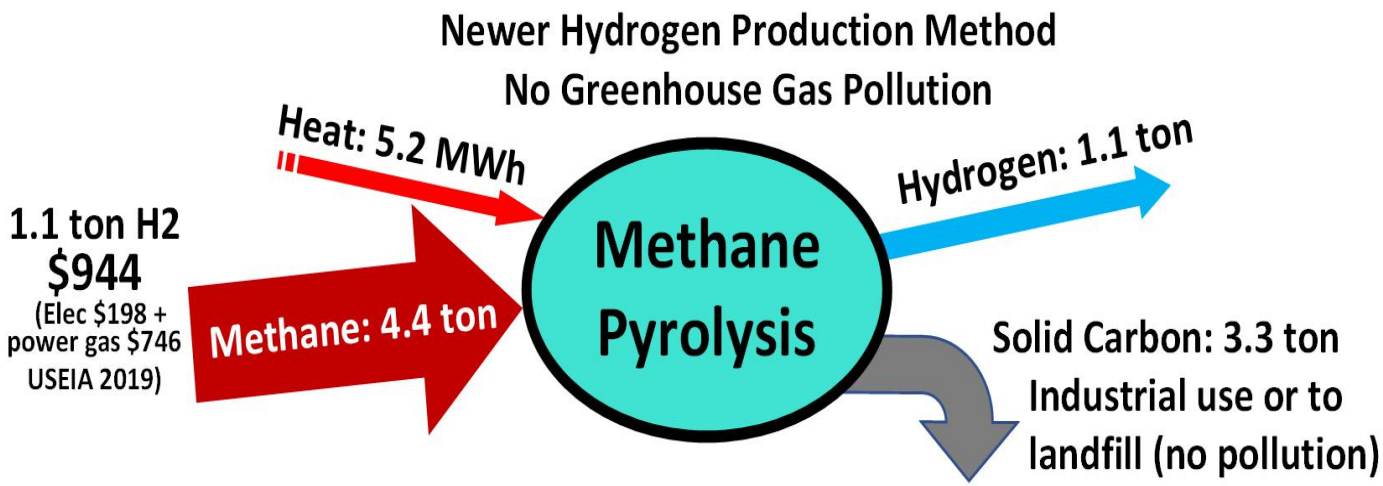
İnsan kaynaklı Küresel CO_2 salımı

36 milyar ton/yıl CO_2 … 4,5 ton/adam.yıl



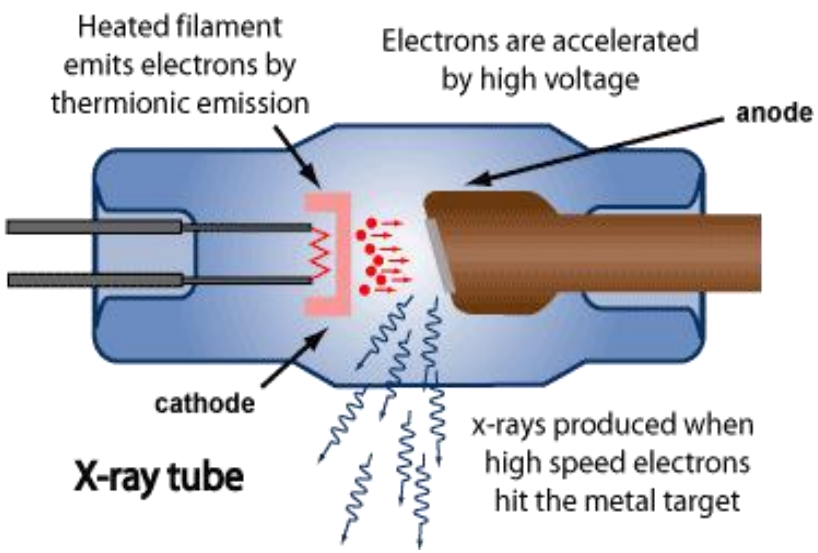
Data: IEA
Image: Union of Concerned Scientists


Newer Hydrogen Production Method
No Greenhouse Gas Pollution
Electricity: 39.4 MWh
1.1 ton H2
$1,497
(Wholesale Electricity USEIA 2019)
Water: 9.1 ton
Electrolysis
Oxygen: 8 ton
Hydrogen: 1.1 ton


Newer Hydrogen Production Method
No Greenhouse Gas Pollution
Heat: 5.2 MWh
1.1 ton H2
$944
(Elec $198 + power gas $746 USEIA 2019)
Methane: 4.4 ton
Methane Pyrolysis
Hydrogen: 1.1 ton
Solid Carbon: 3.3 ton
Industrial use or to landfill (no pollution)

TÜRKİYE YILLIK ELEKTRİK ENERJİ GEREKSİNİMİ
~ 400 milyar kWh
Güneş %25
7 GW → 30 GW Güneş PV kurulumu ~ 30 milyar $

X - IŞINLARI



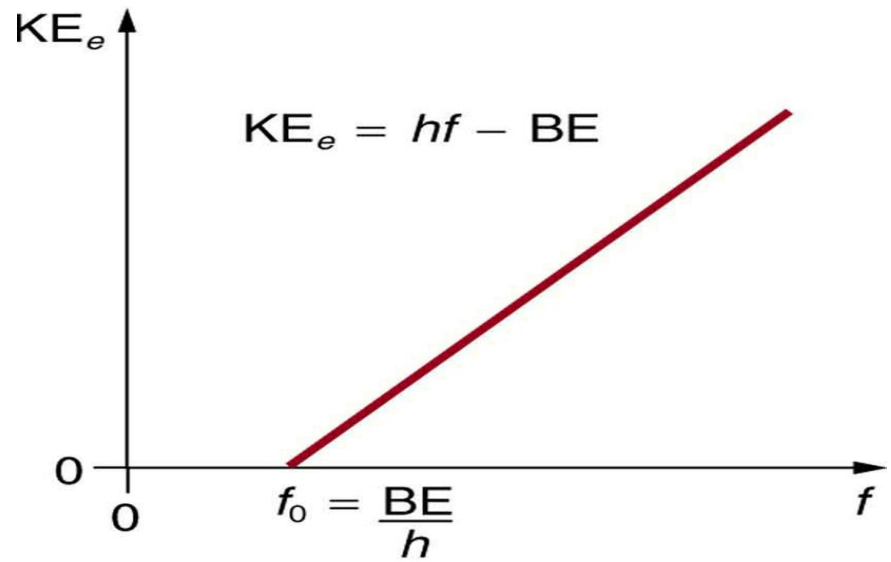
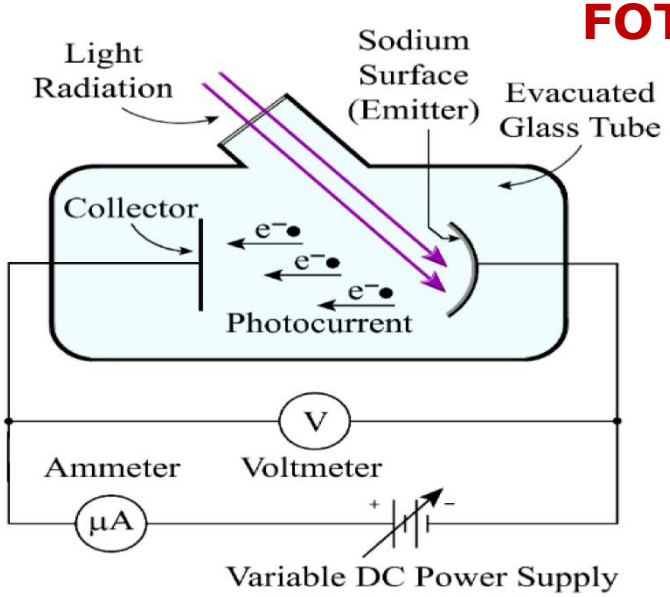
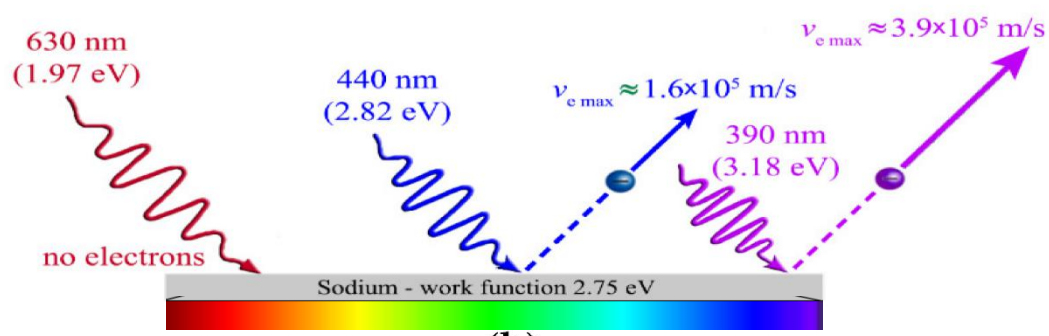


FOTO-ELEKTRİK ETKİ

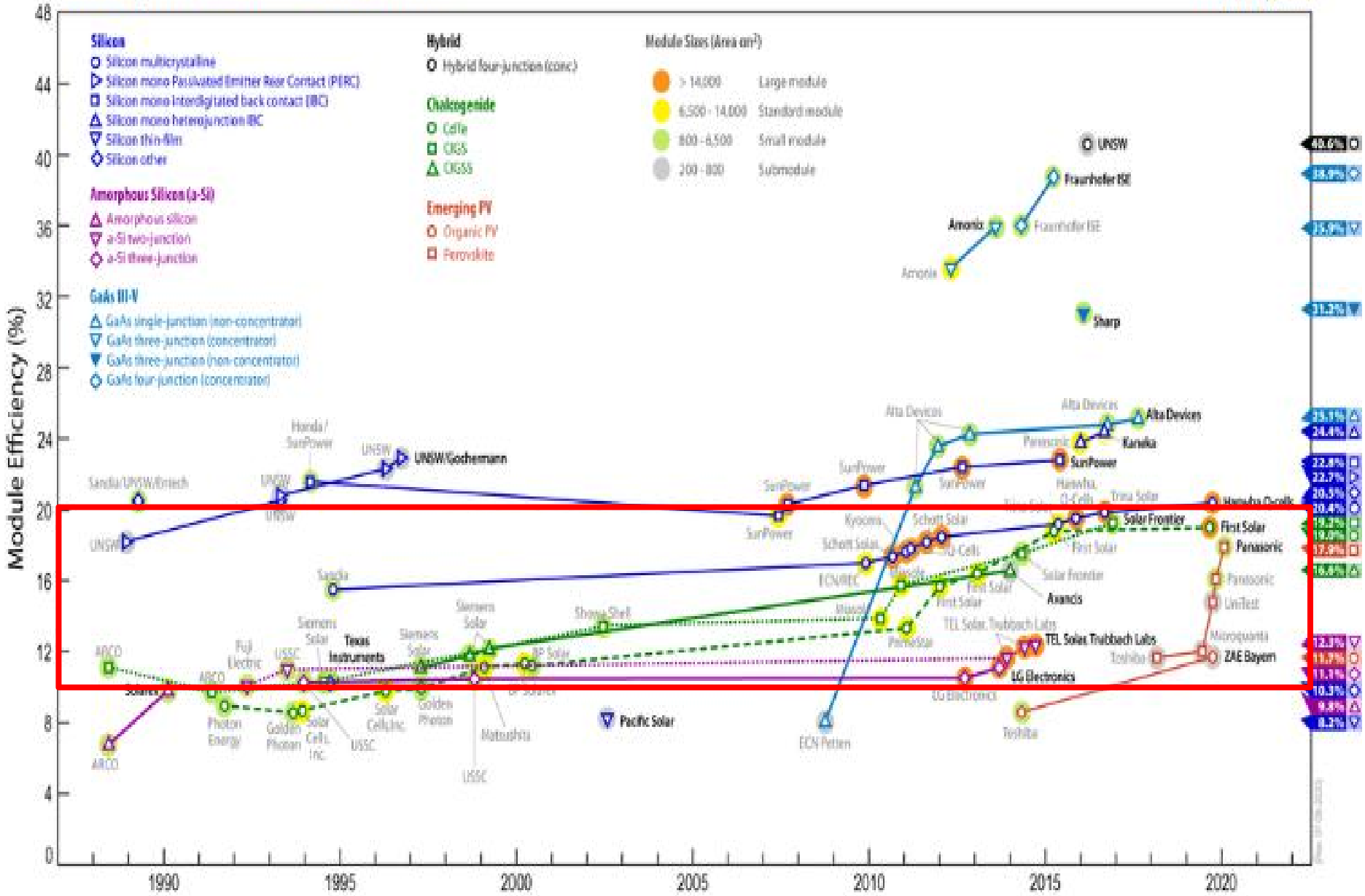


(a)



(b)

Champion Module Efficiencies

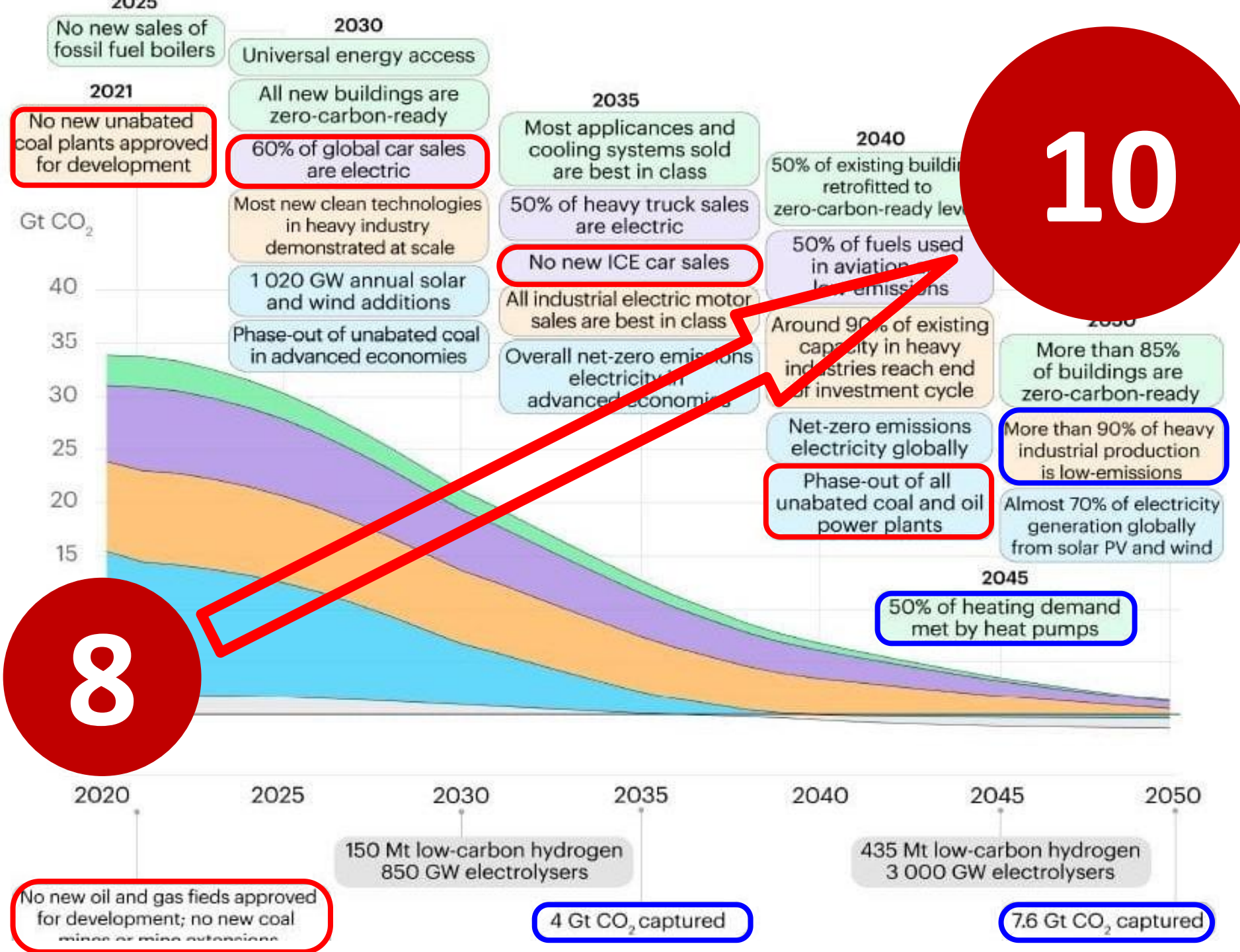


GÜNEŞ PANELİ

GÜNEŞTEN YERYÜZÜNE GELEN ENERGİ 175 PW

1,37 kWatt/m2 ~ 200 Watt(el) /m2

Panel fiyatı ~ 1 $/W ~ 200 $/m2
Ort. ömür 25 yıl

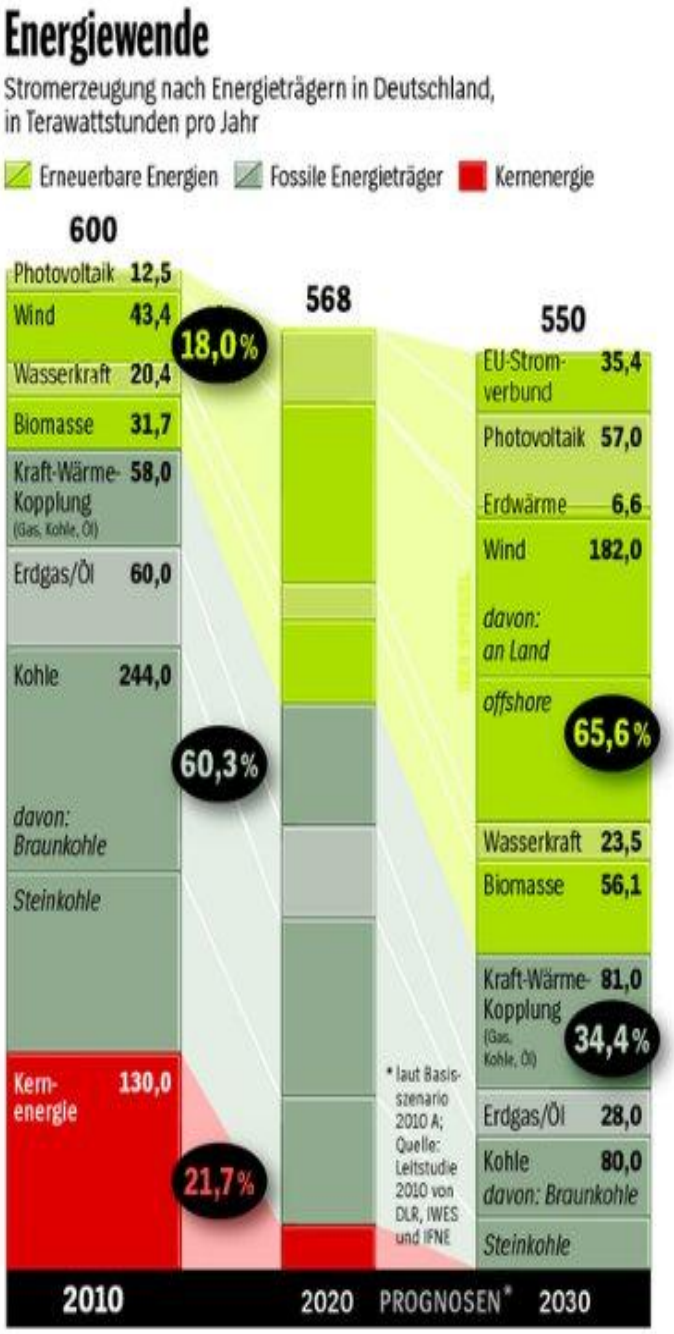

2025
No new sales of fossil fuel boilers
2030
Universal energy access
All new buildings are zero-carbon-ready
60% of global car sales are electric
Most new clean technologies in heavy industry demonstrated at scale
1 020 GW annual solar and wind additions
Phase-out of unabated coal in advanced economies
2021
No new unabated coal plants approved for development
2035
Most applicances and cooling systems sold are best in class
50% of heavy truck sales are electric
No new ICE car sales
All industrial electric motor sales are best in class
2040
50% of fuels used in aviation
Net-zero emissions electricity globally
Phase-out of all unabated coal and oil power plants
More than 85% of buildings are zero-carbon-ready
More than 90% of heavy industrial production is low-emissions
Almost 70% of electricity generation globally from solar PV and wind
2045
50% of heating demand met by heat pumps
Gt CO2
40
35
30
25
20
15
2020
2025
2030
2035
2040
2045
2050
150 Mt low-carbon hydrogen
850 GW electrolysers
435 Mt low-carbon hydrogen
3 000 GW electrolysers
No new oil and gas fieds approved for development; no new coal
4 Gt CO2 captured
7.6 Gt CO2 captured
8
10

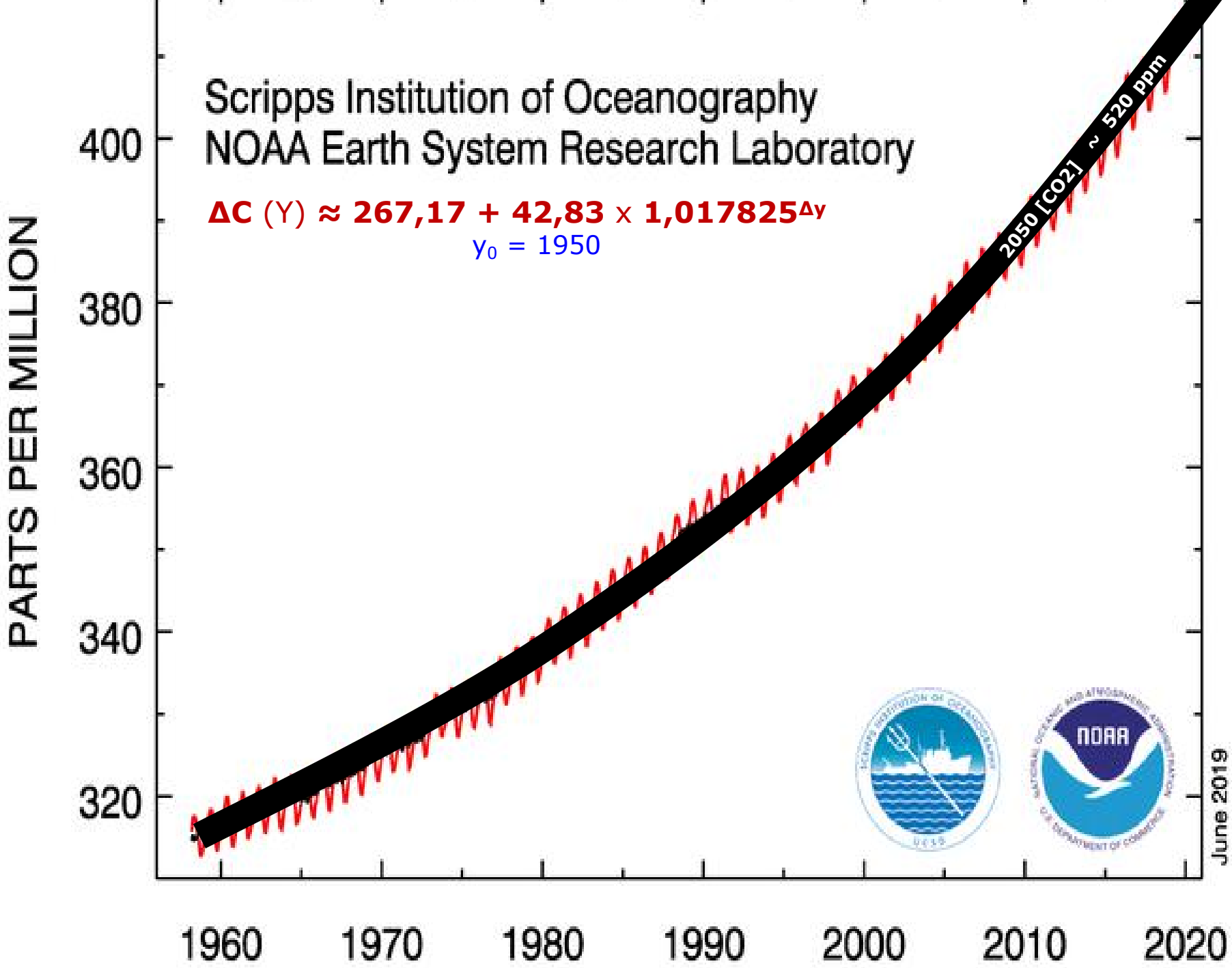
Almanya 2030 yılında elektrik üretimini 2/3 yenilenebilir kaynaklardan 1/3 fosil yakıtlardan sağlamayı planlıyor:

Elektrik üretiminin %22 sini **17 Nükleer Santral** dan karşılayan Almanya **2030** yılında Nükleer enerjiyi tamamen terk etmiş ve

Fosil yakıt kullanımını da yarıya indirmiş olacak. Enerji kullanımı düşürülecek

7500 → 6500 kWh/adam.yıl

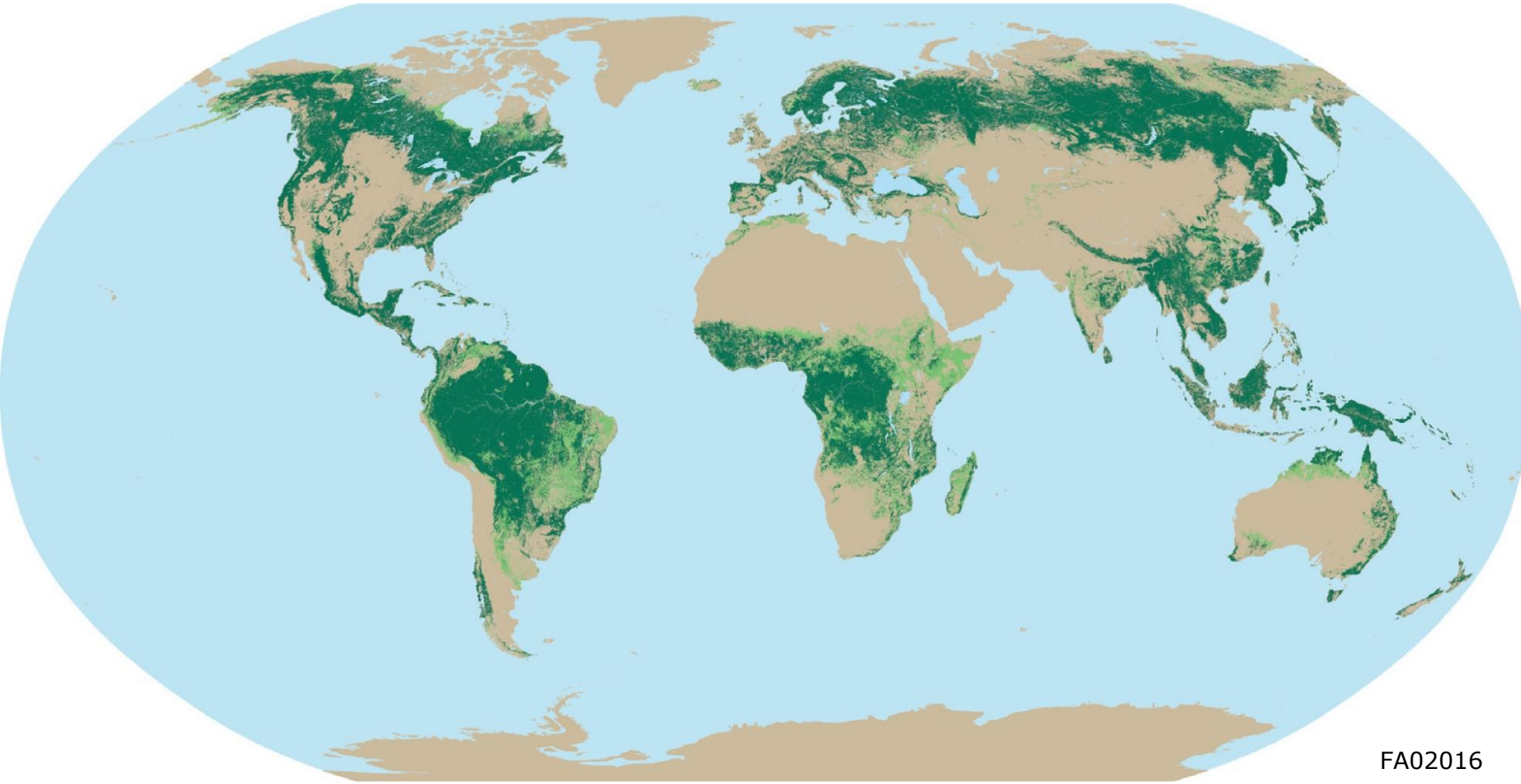



Scripps Institution of Oceanography
NOAA Earth System Research Laboratory
ΔC (Y) ≈ 267,17 + 42,83 x 1,017825^Δy
y0 = 1950
2050 [CO2] ~ 520 ppm
PARTS PER MILLION
400
380
360
340
320
1960
1970
1980
1990
2000
2010
2020
June 2019

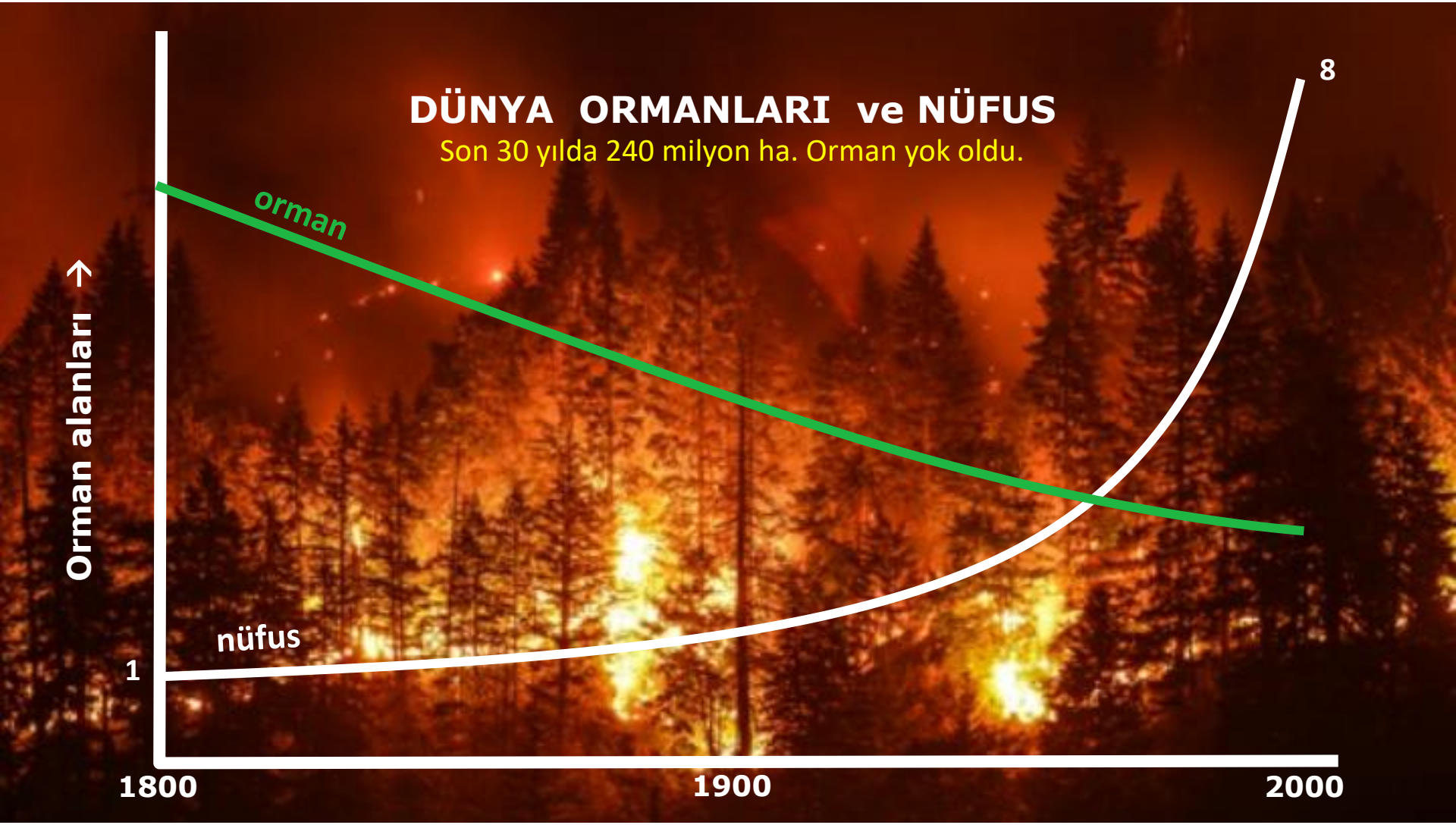
1950 sonrası Atmosferde biriken CO2 : 570 GTon !

Dünyada mevcut ~ 4 milyar ha orman
- Sıfır CO2 emisyonu ile -
bu birikimi ancak 10 yılda temizleyebilir; karbon dengesi için ayrıca 1-2 milyar ha Orman gerekli
1 ha ~ 600 Ağaç ~ 12 ton/yıl CO2 emilimi

DÜNYA ORMANLARI

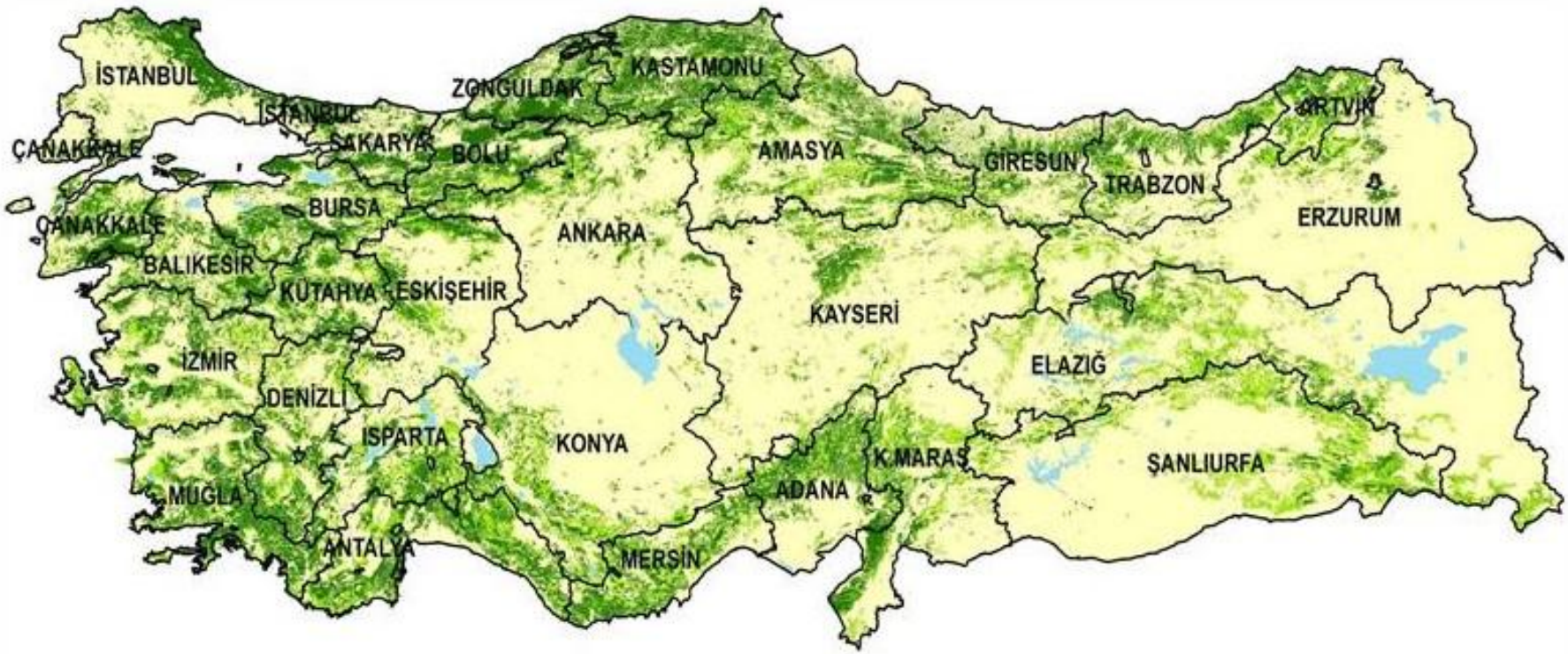


2000-2020 arasında Dünya ormanlarının %10 u kayboldu;
mevcut durum ~ 4 milyar hektar


DÜNYA ORMANLARI ve NÜFUS
Son 30 yılda 240 milyon ha. Orman yok oldu.
orman
nüfus
8
1
Orman alanları →
1800
1900
2000

Orman yangınlarının %95'i
insan kaynaklıdır !

TÜRKİYE ORMAN ALANLARI-2020



Toplam alan : 78,3 milyon hektar
Toplam Ormanlık alanı : 22 milyon hektar
Orman alanı : 12,5 milyon hektar (%16)
Sulak alanlar : 0,3 milyon hektar (%0,4)

1 Hektar = 100 m x 100 m = 10 bin m^2
1 km^2 = 100 ha

2000-2020 döneminde yaklaşık **50 bin** orman yangınında **500 bin hektar** (%4) orman yandı
1,4 milyon hektar Orman arazisi (2B) Devlet mülkiyetinden şahıslara devredildi.

Küresel Isınım

Atmosfer (Troposfer)

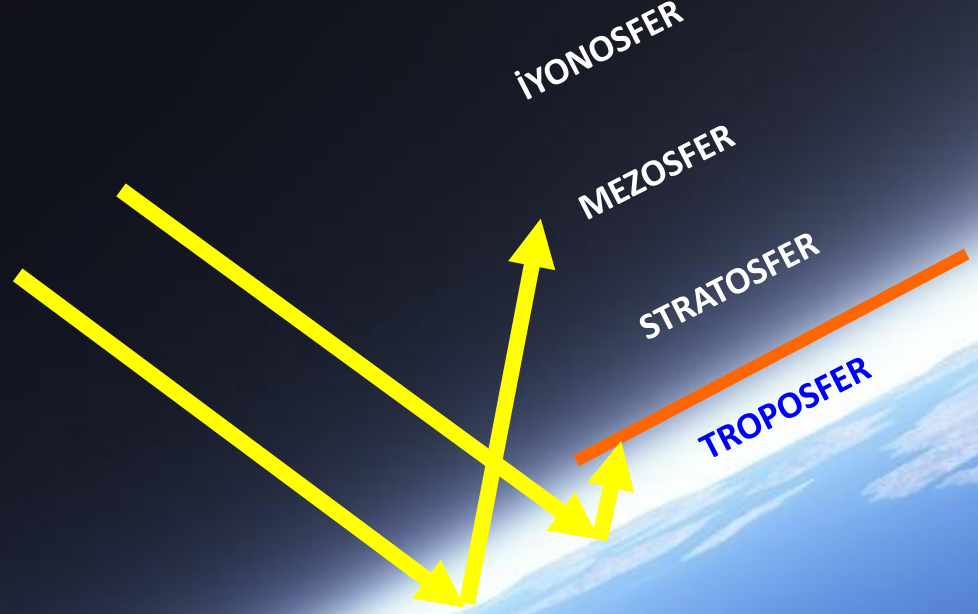
%79 N_2 + %21 O_2

CO_2 ~ % 0,0420

H ≈ 10 km

ρ ≈ 1,3 kg/m^3

M ≈ 5,2 10^{18} kg.

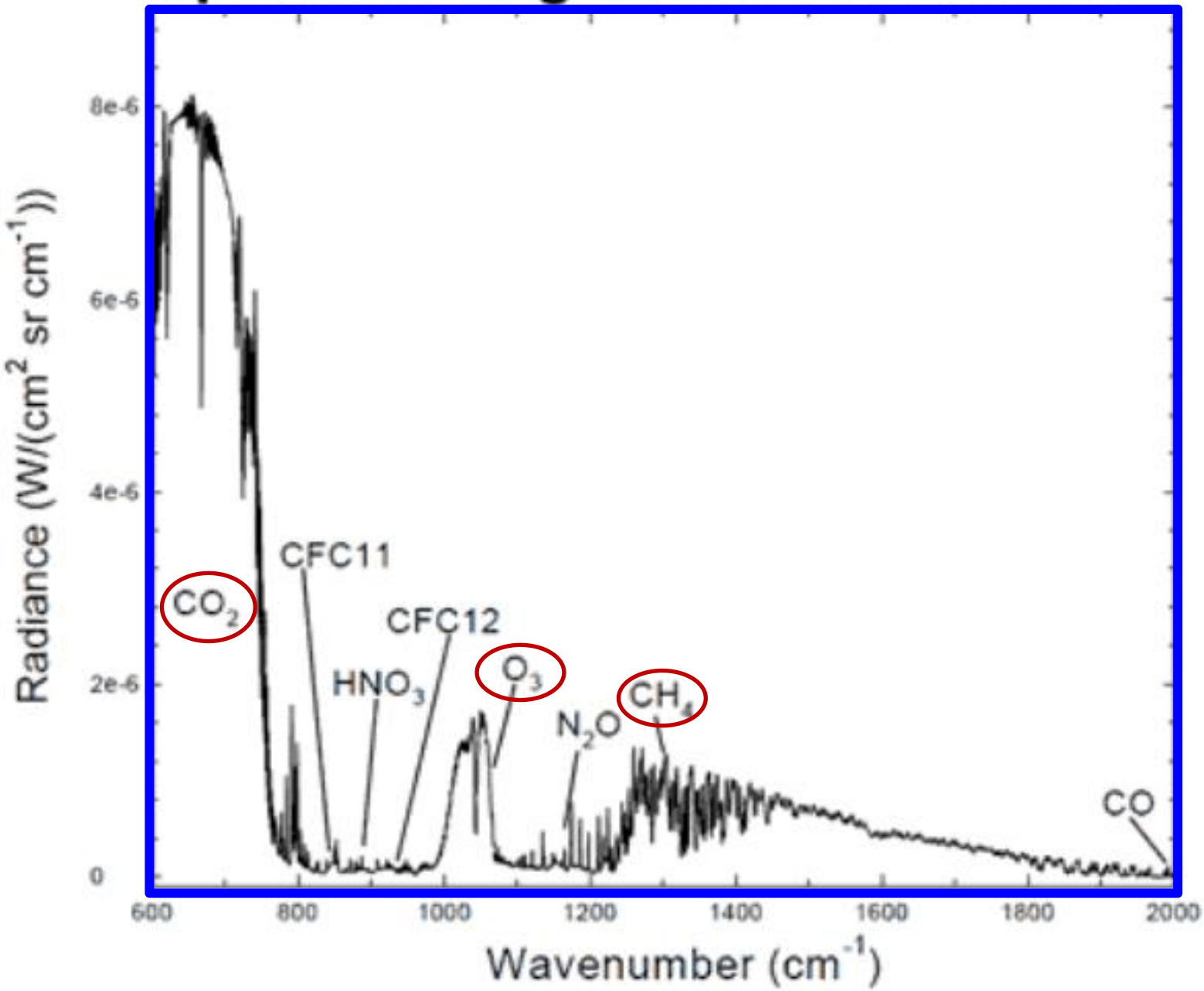


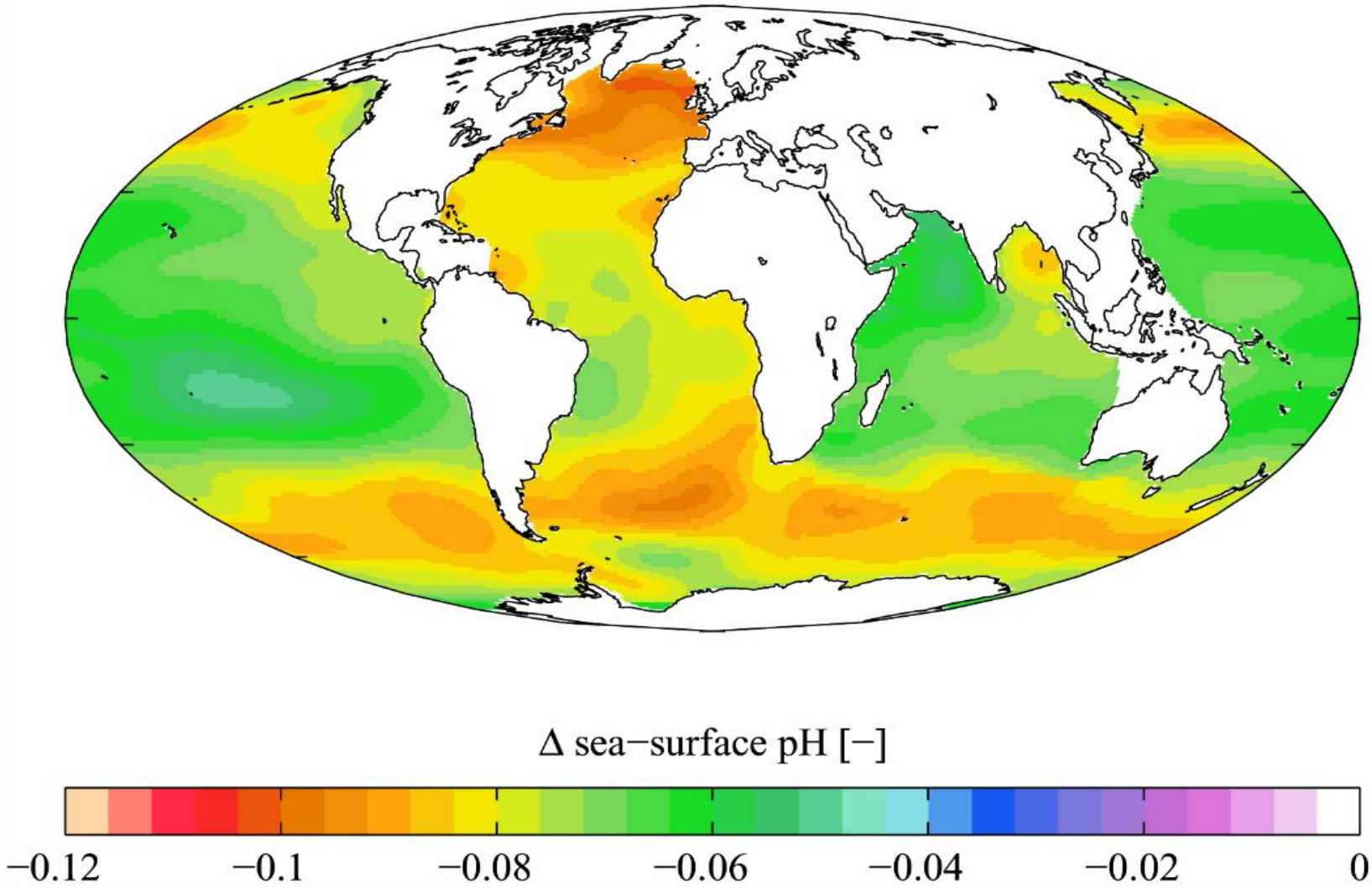
100
50

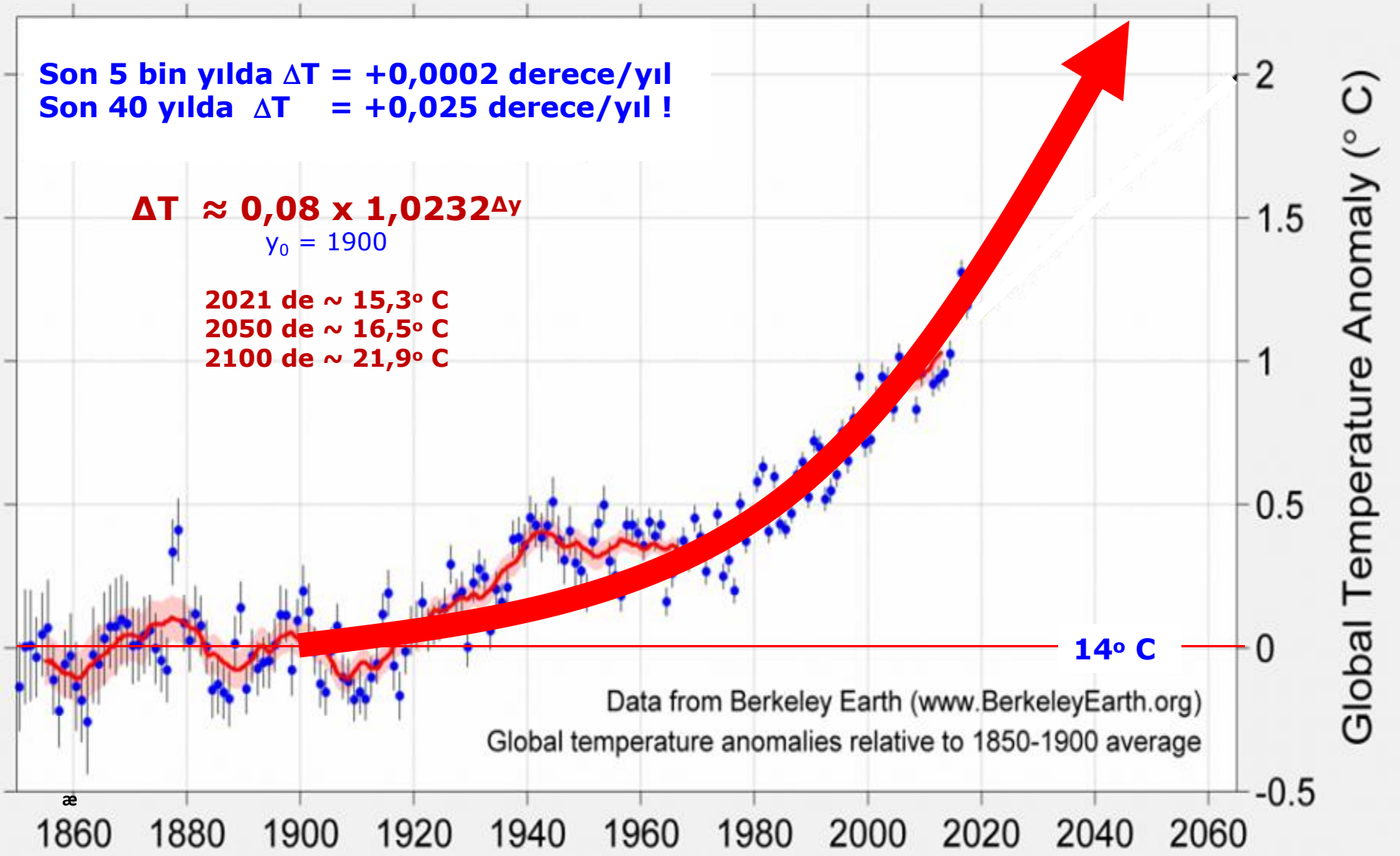
$$CO_2 + H_2O \rightarrow H_2CO3 \rightarrow H^+ + CO_3^- \rightarrow CaCO_3$$

pH ~ 8,05

Spectrum of greenhouse radiation

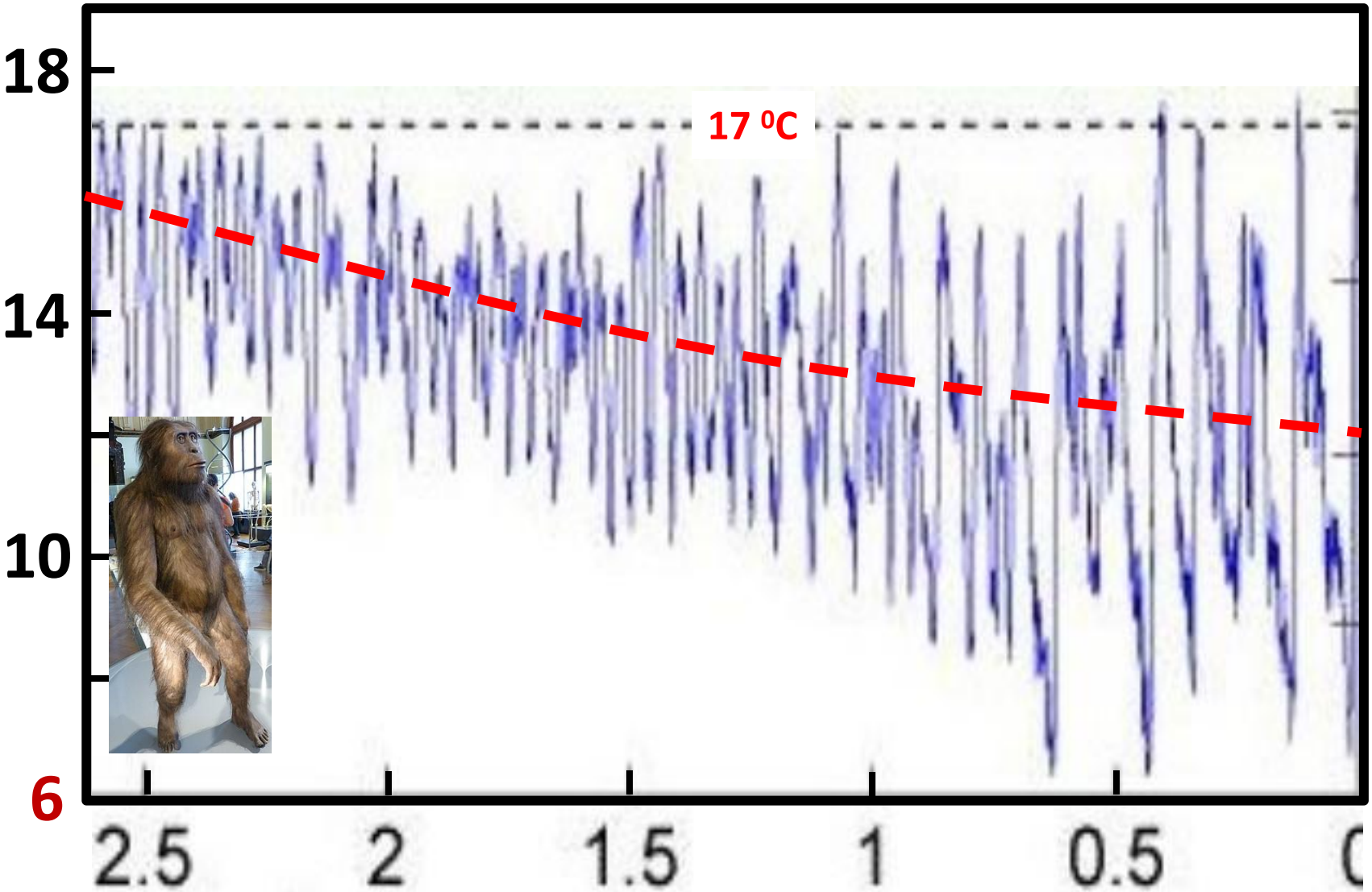



Δ sea−surface pH [−]
−0.12
−0.1
−0.08
−0.06
−0.04
−0.02
0


Son 5 bin yılda ΔT = +0,0002 derece/yıl
Son 40 yılda ΔT = +0,025 derece/yıl !
ΔT ≈ 0,08 x 1,0232^Δy
y0 = 1900
2021 de ~ 15,3° C
2050 de ~ 16,5° C
2100 de ~ 21,9° C
14° C
Data from Berkeley Earth (www.BerkeleyEarth.org)
Global temperature anomalies relative to 1850-1900 average
Global Temperature Anomaly (° C)
2
1.5
1
0.5
0
-0.5
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040
2060

KÜRESEL ORTALAMA SICAKLIK (^{0}C)

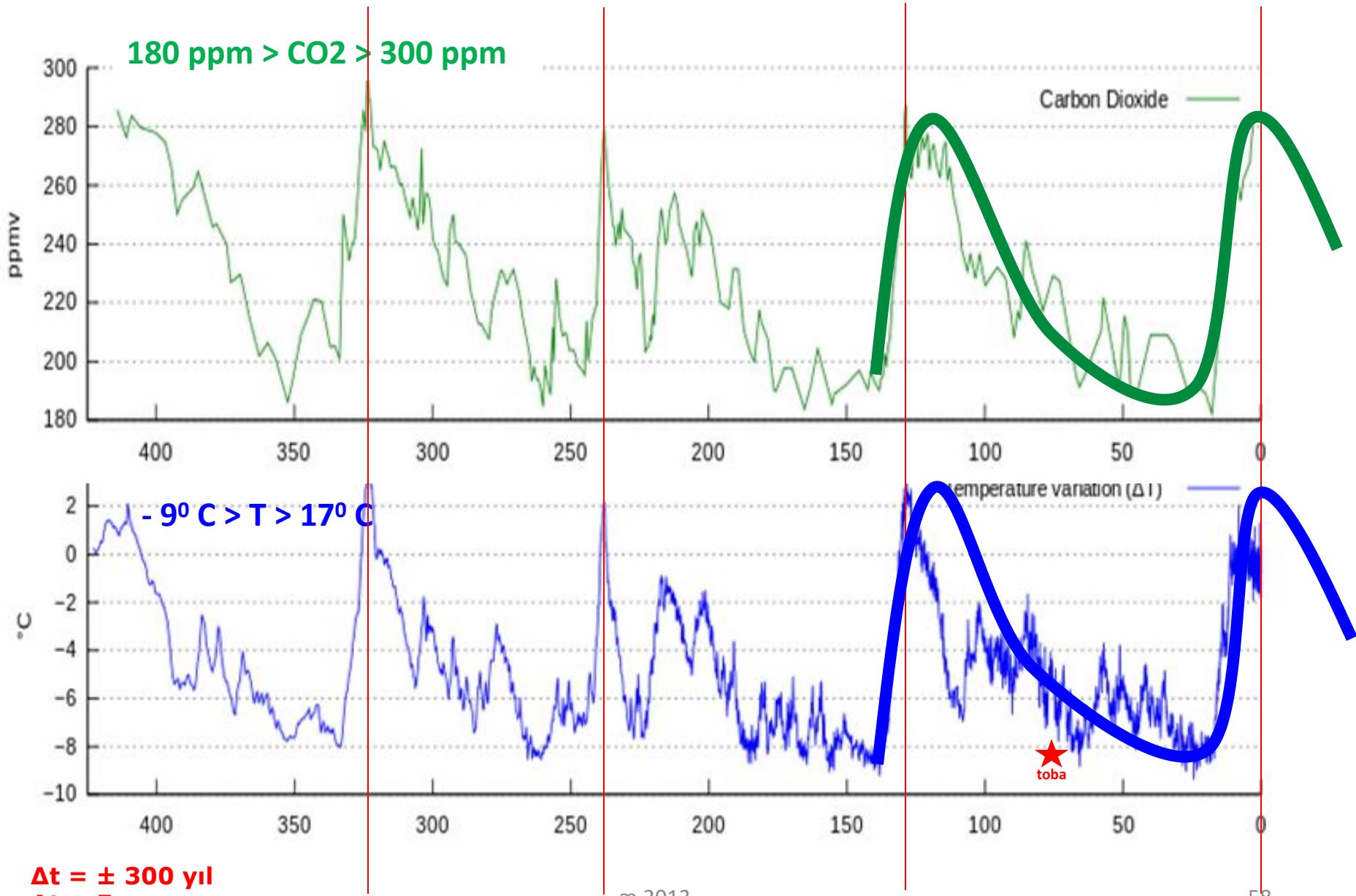
M. Milankowitsch cycles



$\Delta t/t \approx$ ‰ 2

← milyon yıl

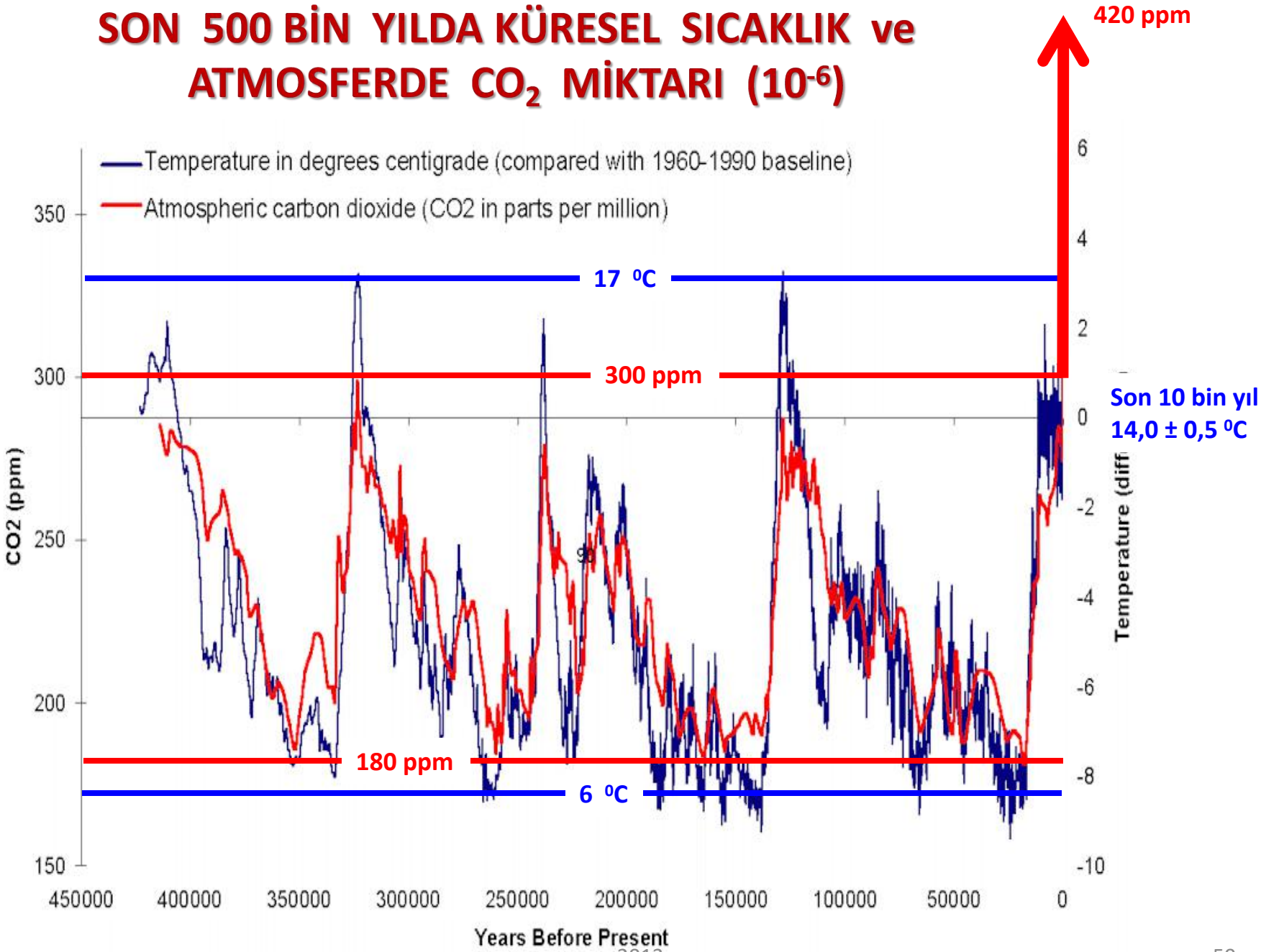
şimdi



Δt = ± 300 yıl
Δt ~ 5 ppm

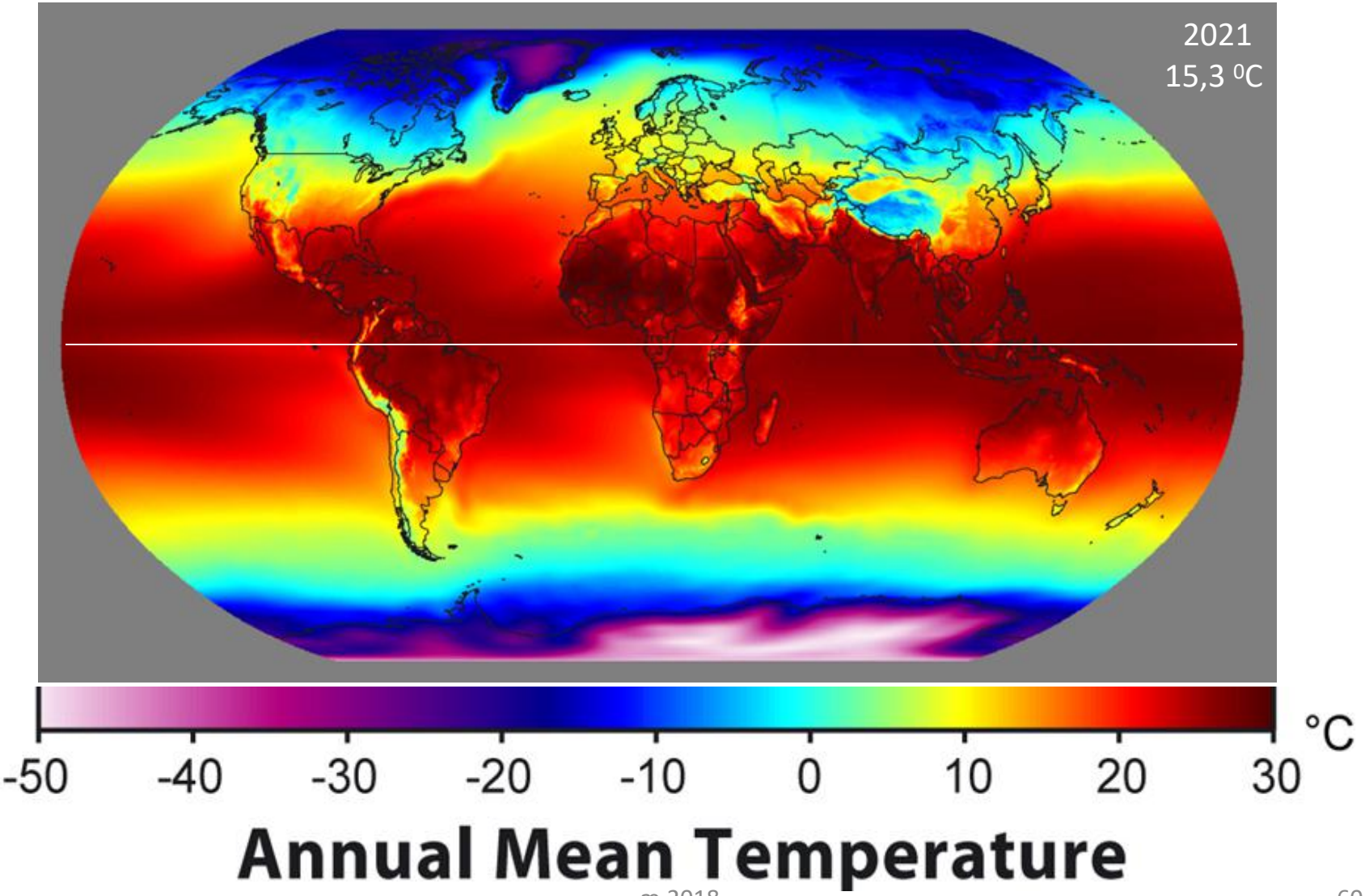
324 by **238 by** **129 by**

SON 500 BİN YILDA KÜRESEL SICAKLIK ve ATMOSFERDE CO_2 MİKTARI (10^{-6})

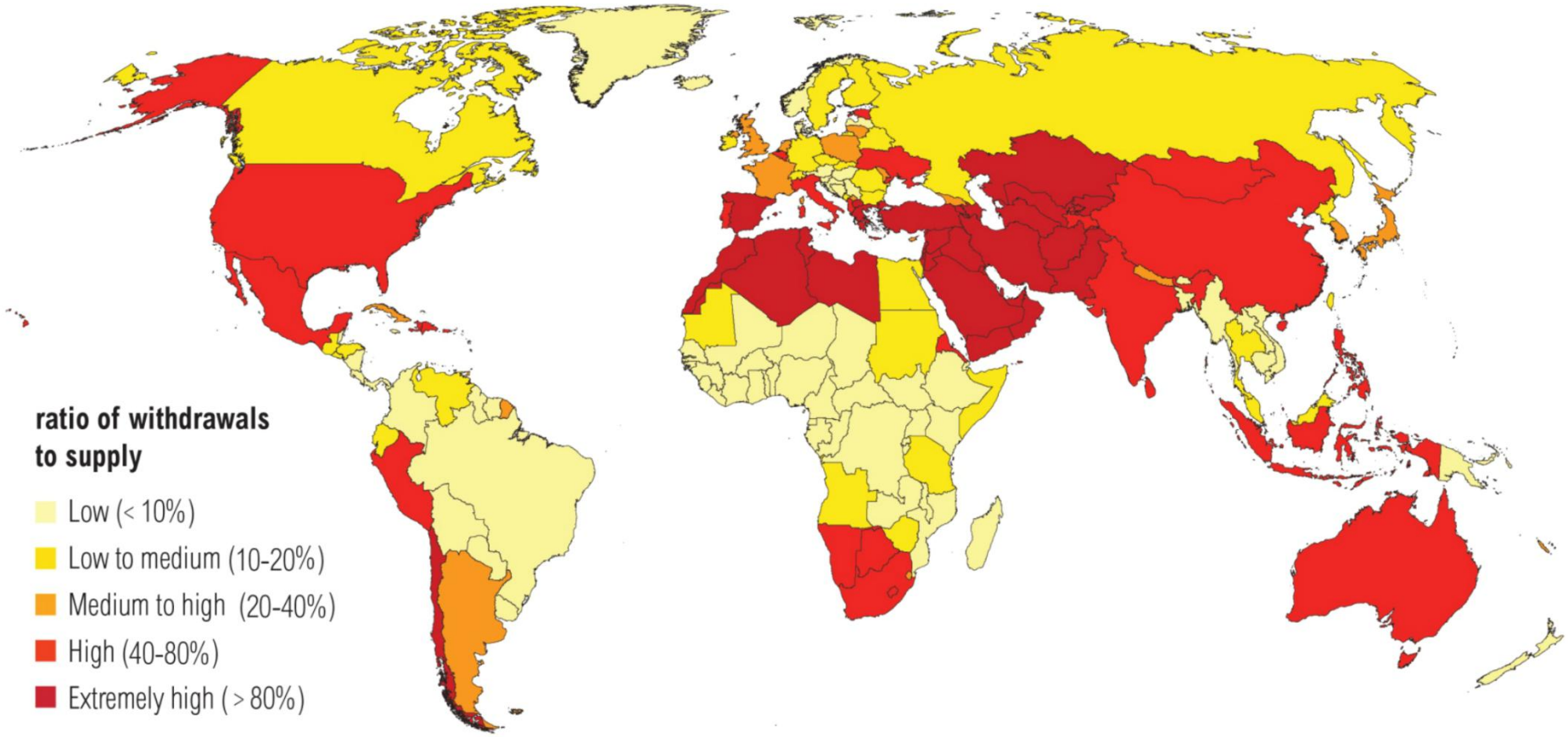


+10 ppm ≡ +1 derece

YÜZEY SICAKLIĞI ORTALAMASI

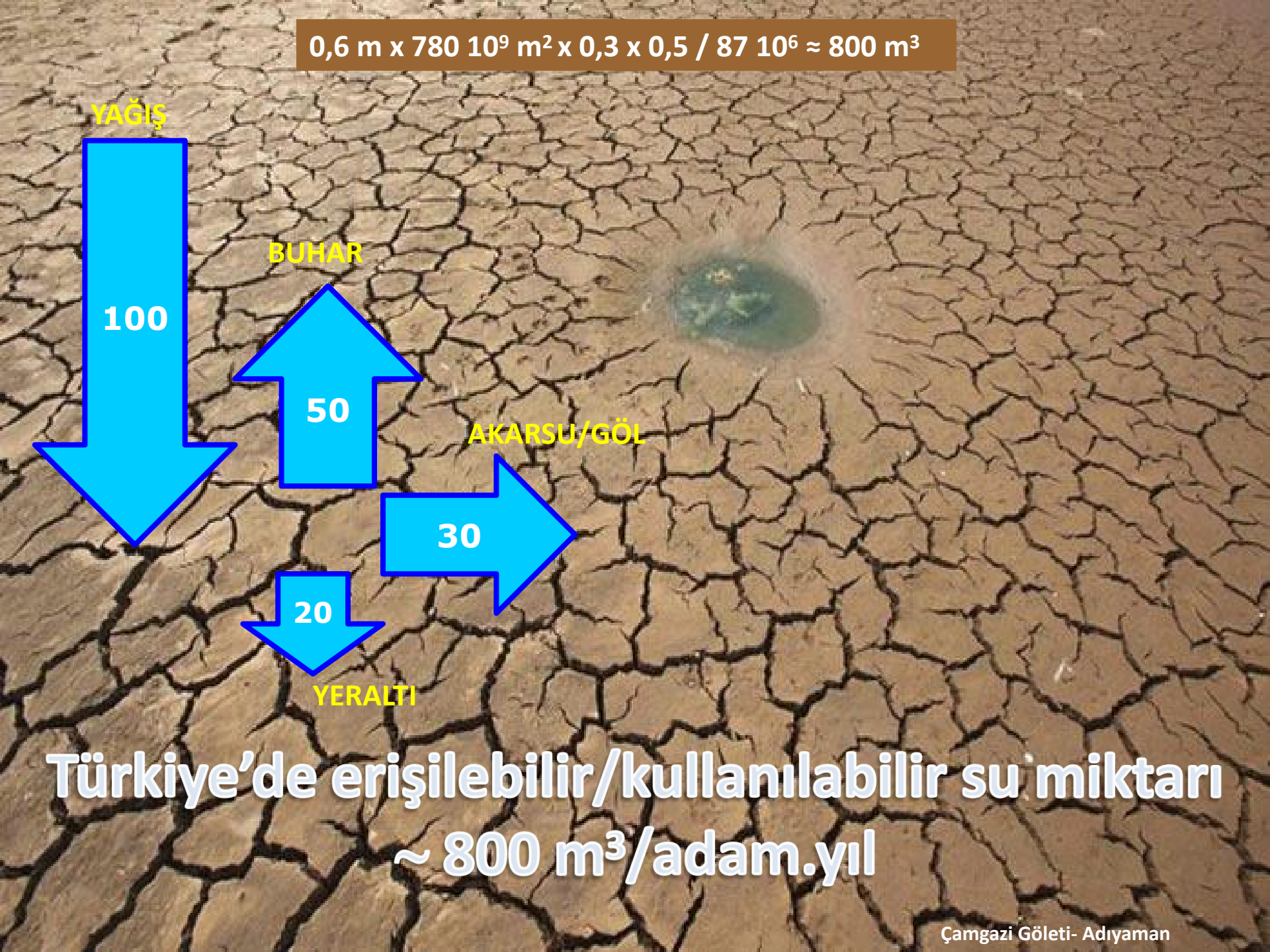


Water Stress by Country: 2040



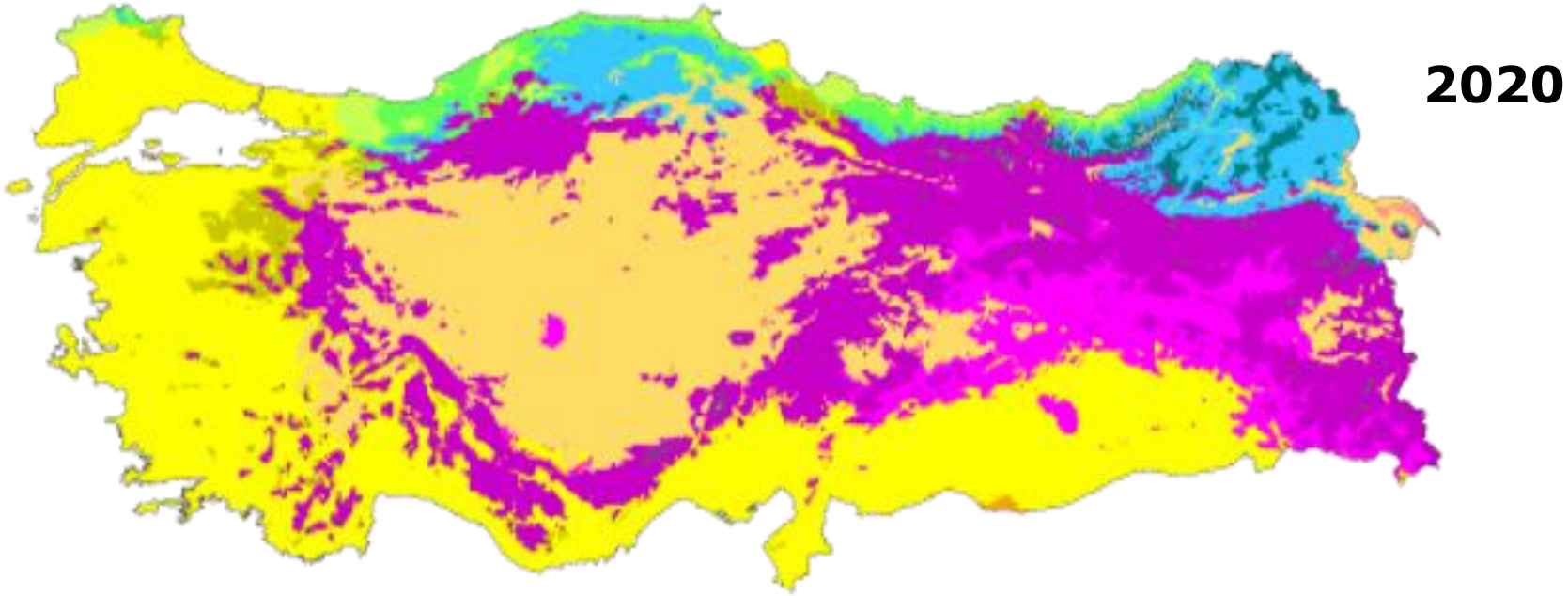
NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

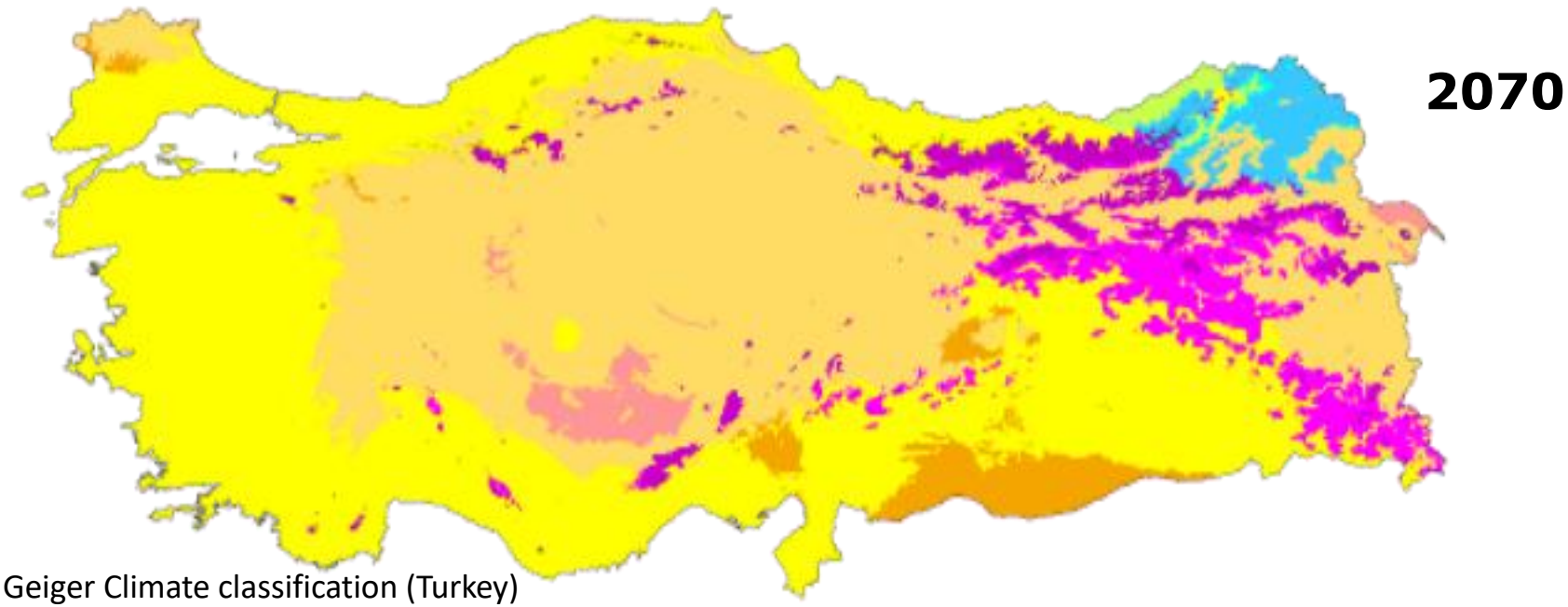
$0{,}6\ m \times 780\ 10^9\ m^2 \times 0{,}3 \times 0{,}5 / 87\ 10^6 \approx 800\ m^3$



Türkiye'de erişilebilir/kullanılabilir su miktarı ~ 800 m³/adam.yıl

Çamgazi Göleti- Adıyaman

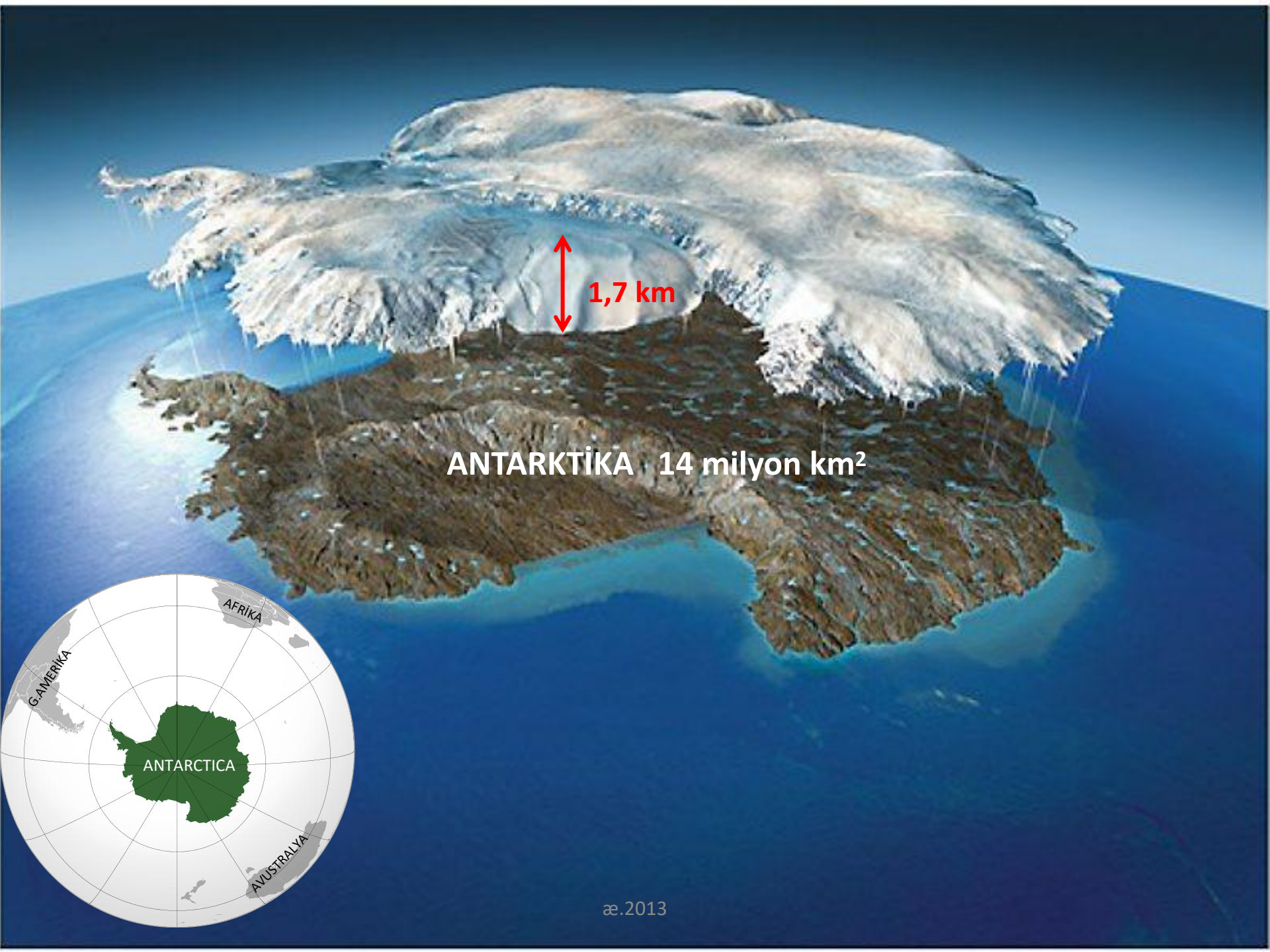


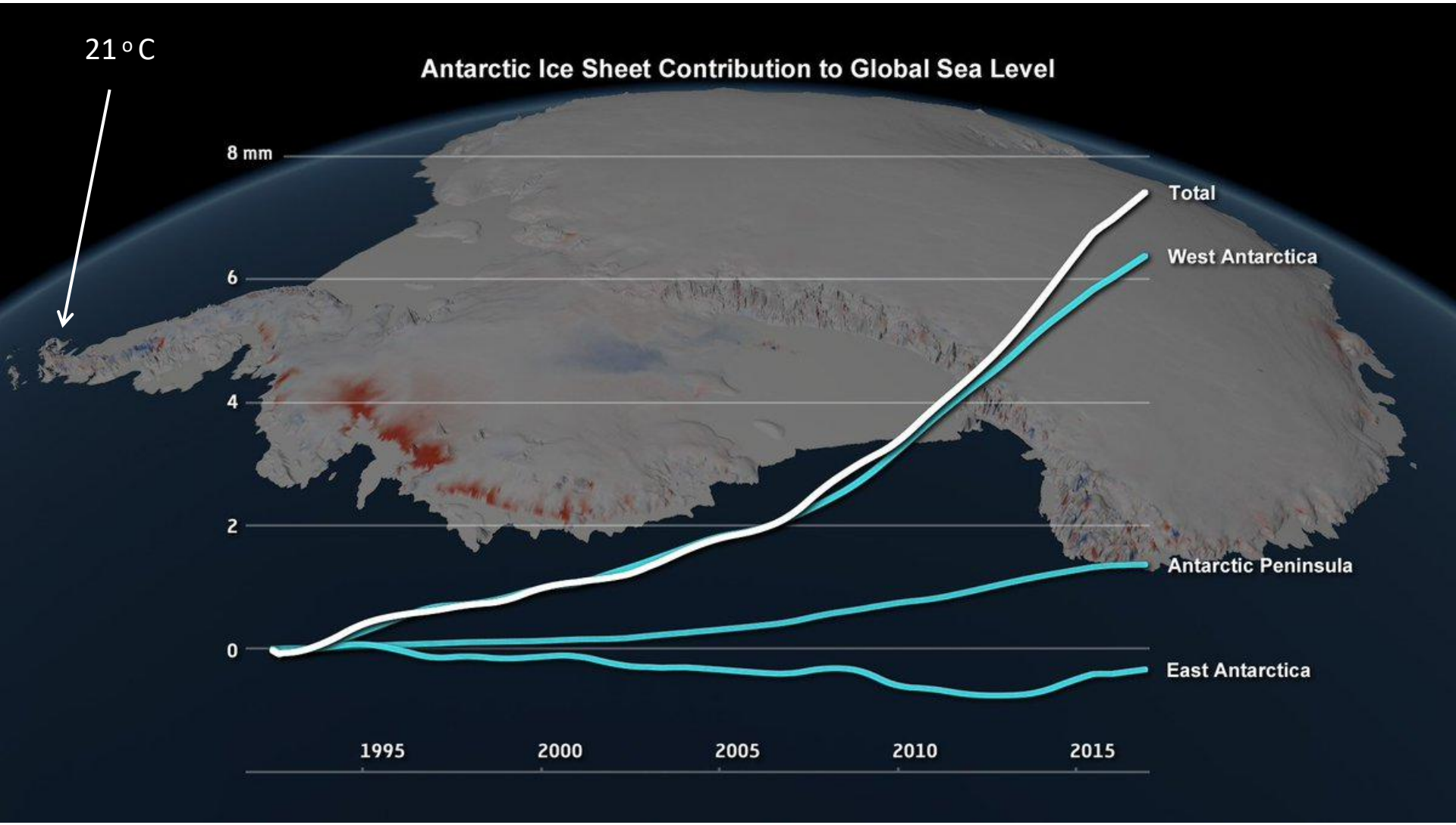


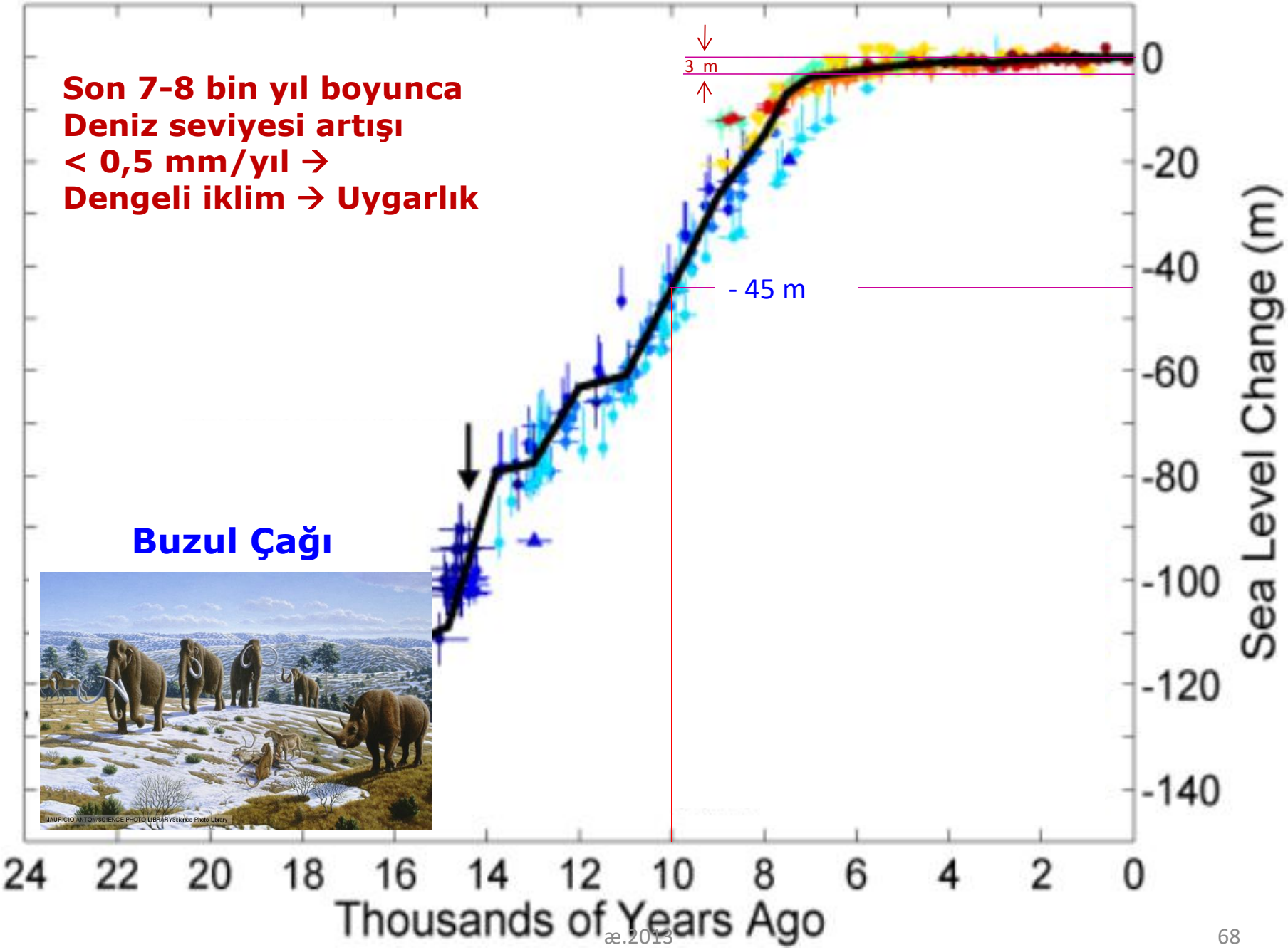
Köppen – Geiger Climate classification (Turkey)

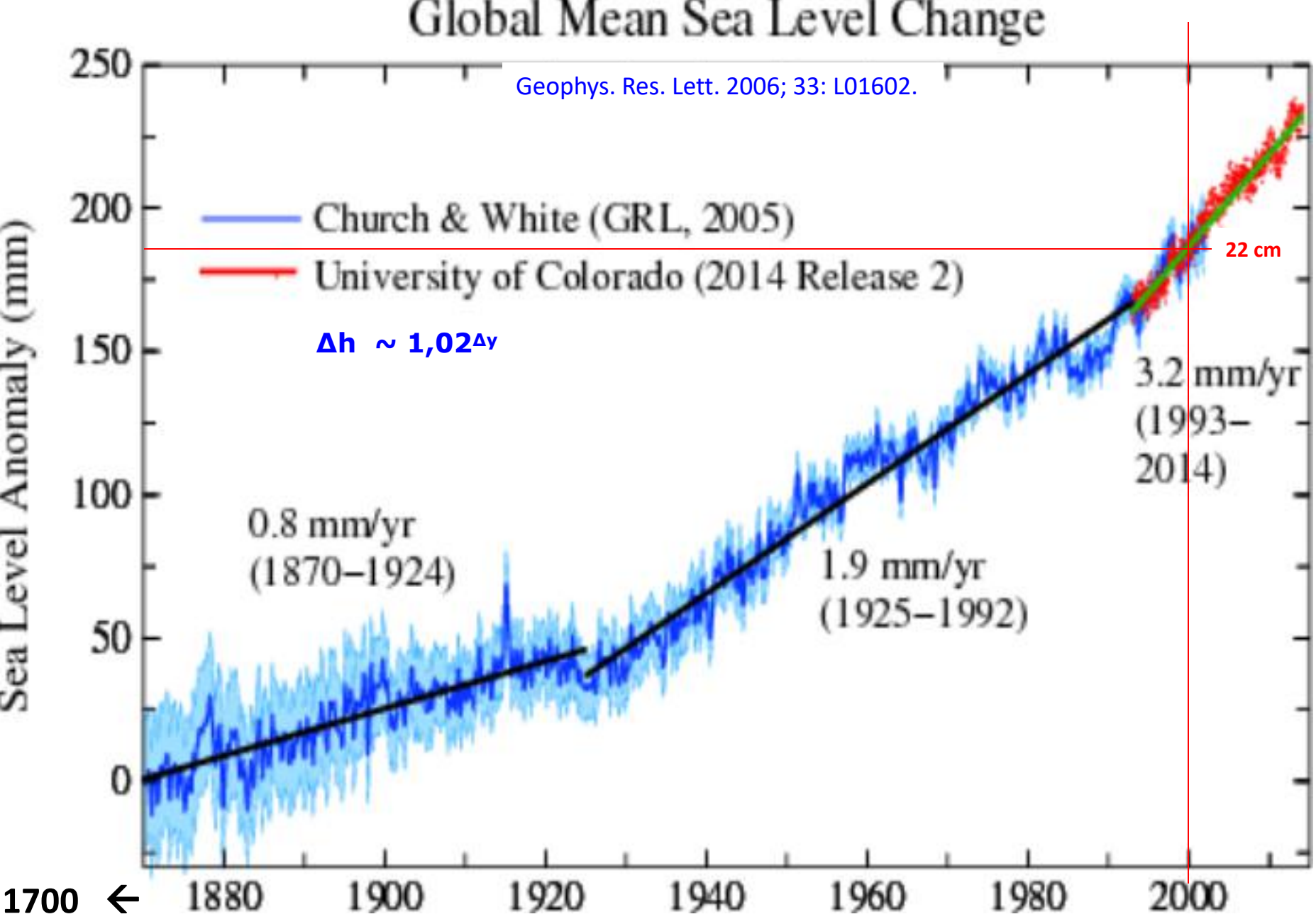
BUZULLAR ERİYOR !

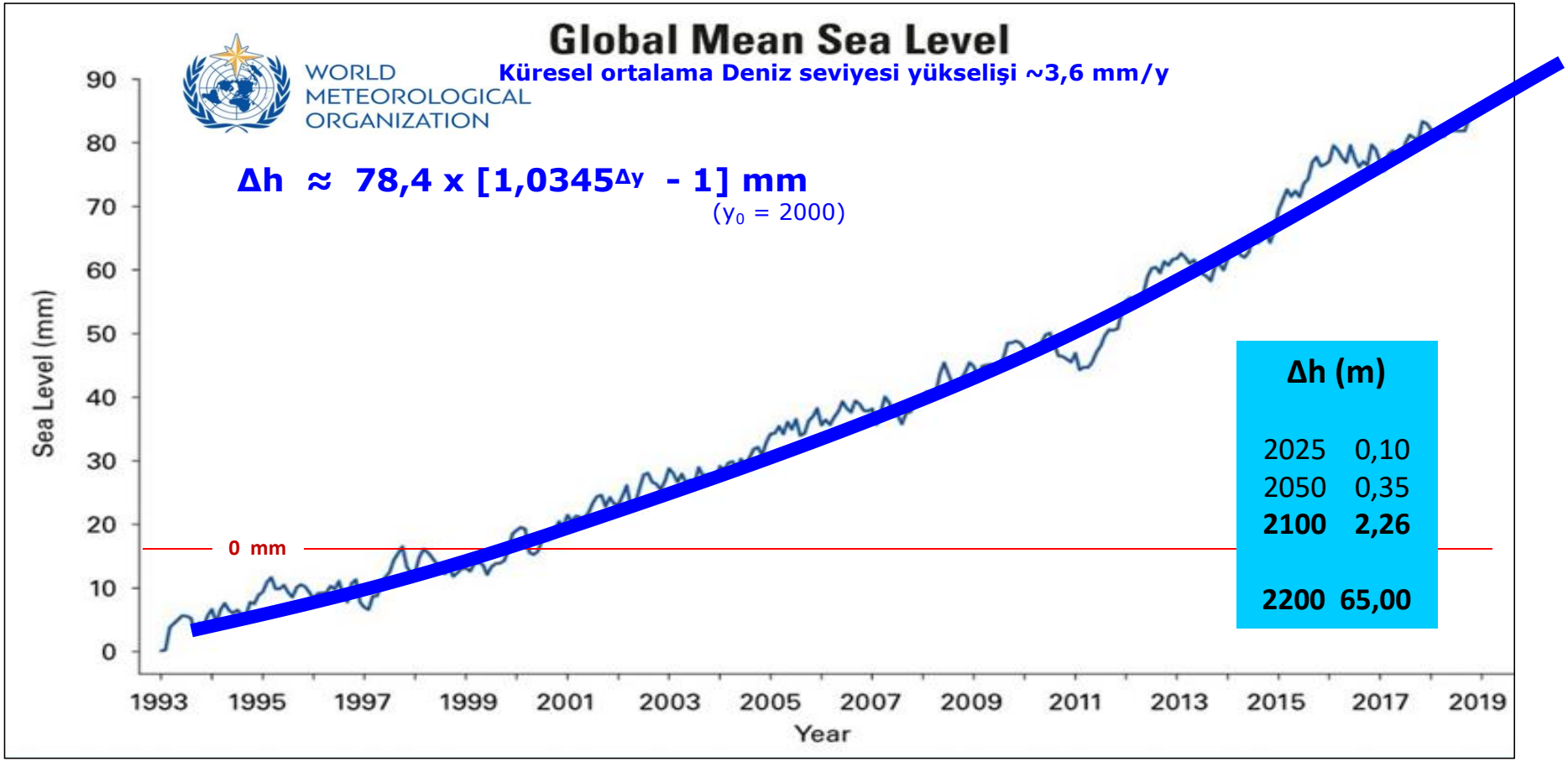
Kuzey Kutup Deniz buzul alanı her yıl ~50 bin km2 küçülüyor !


1,7 km
ANTARKTİKA 14 milyon km²
AFRİKA
G.AMERİKA
ANTARCTICA
AVUSTRALYA

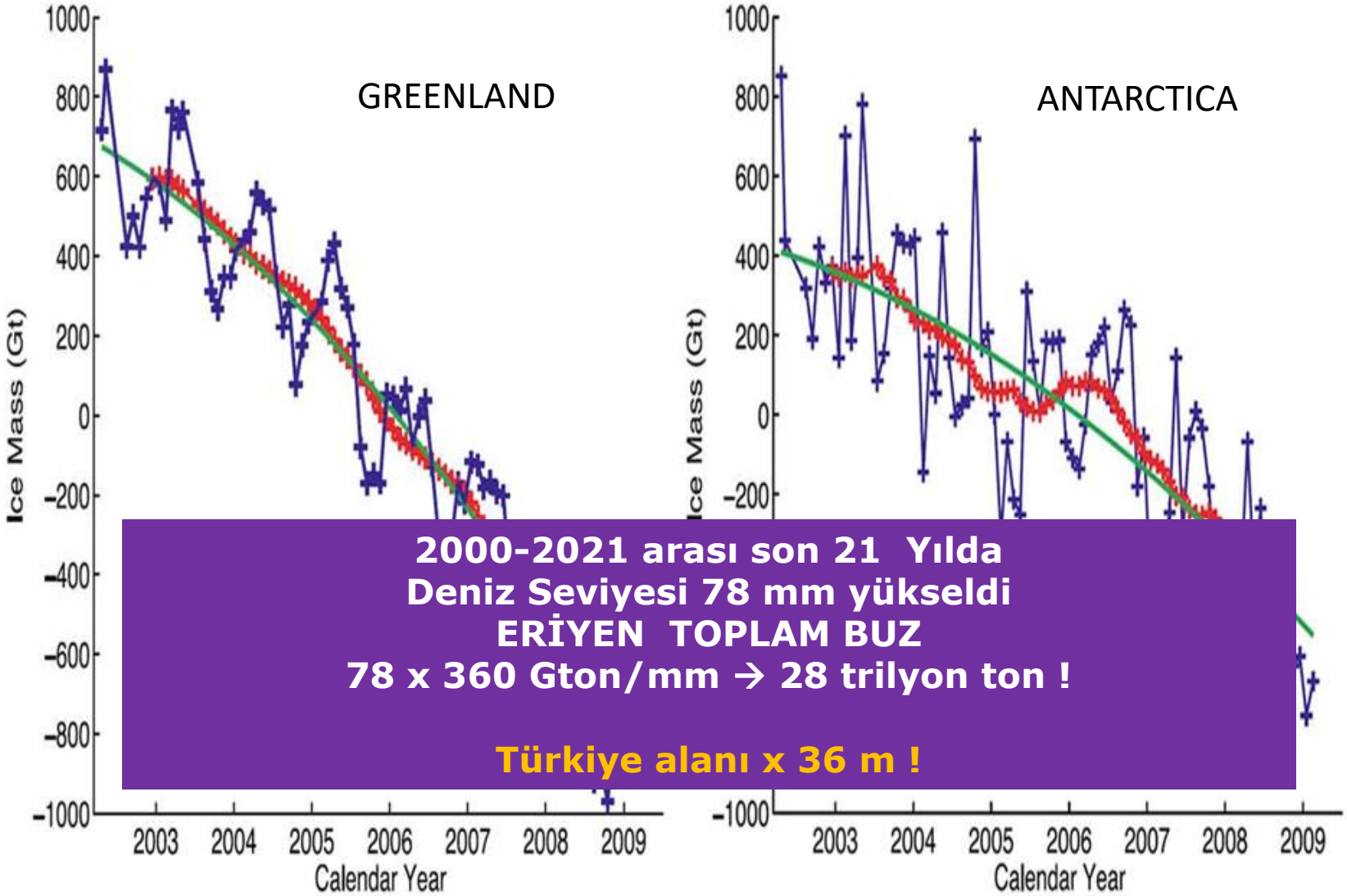

21 o C
Antarctic Ice Sheet Contribution to Global Sea Level
8 mm
6
4
2
0
1995
2000
2005
2010
2015
Total
West Antarctica
Antarctic Peninsula
East Antarctica


Son 7-8 bin yıl boyunca
Deniz seviyesi artışı
< 0,5 mm/yıl →
Dengeli iklim → Uygarlık
3 m
- 45 m
Buzul Çağı
MAURICIO ANTON/SCIENCE PHOTO LIBRARY/Science Photo Library
0
-20
-40
-60
-80
-100
-120
-140
Sea Level Change (m)
24
22
20
18
16
14
12
10
8
6
4
2
0
Thousands of Years Ago


Global Mean Sea Level Change
Geophys. Res. Lett. 2006; 33: L01602.
Church & White (GRL, 2005)
University of Colorado (2014 Release 2)
Δh ~ 1,02Δy
22 cm
3.2 mm/yr
(1993–
2014)
0.8 mm/yr
(1870–1924)
1.9 mm/yr
(1925–1992)
Sea Level Anomaly (mm)
250
200
150
100
50
0
1700 ←
1880
1900
1920
1940
1960
1980
2000

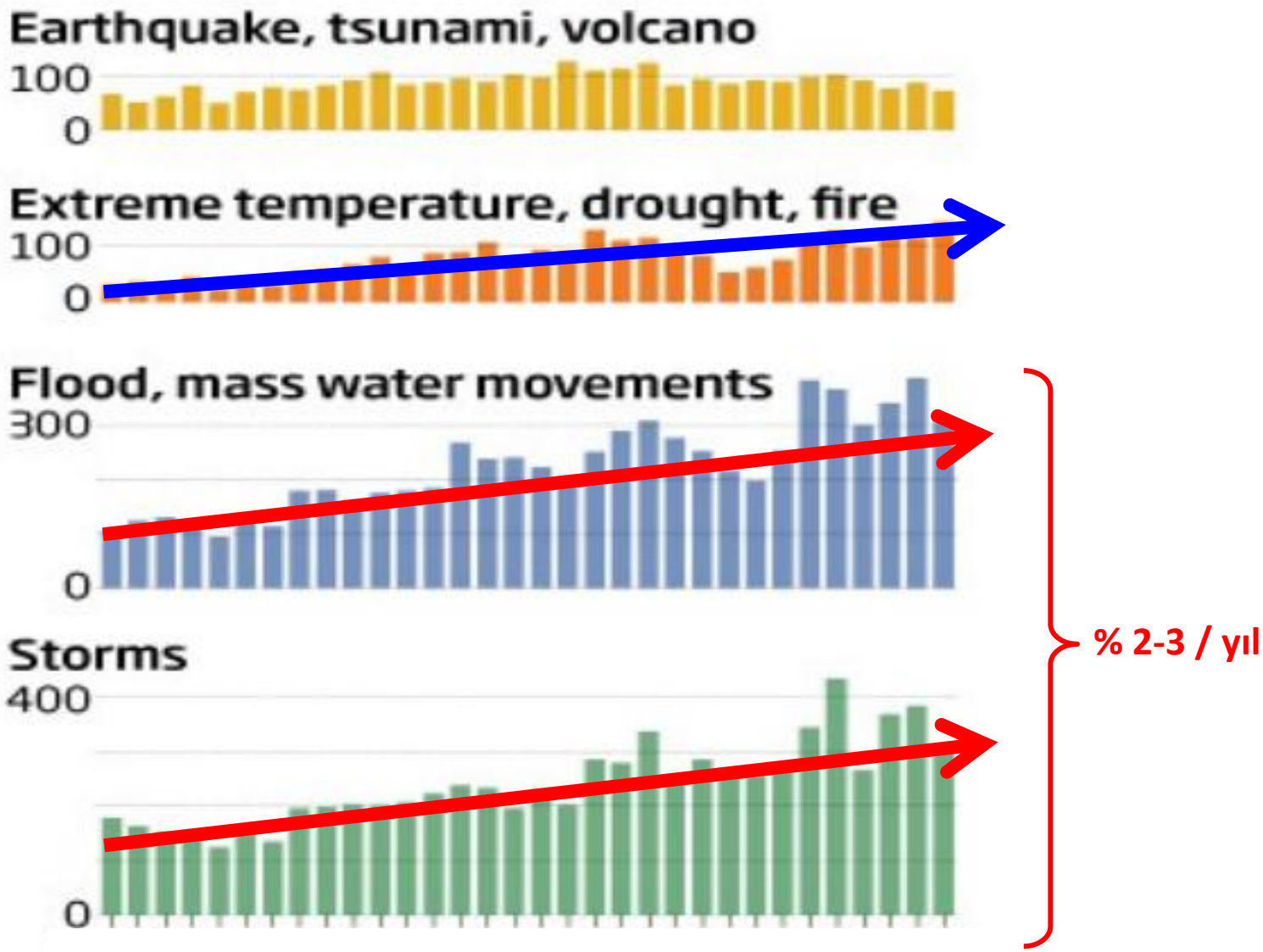

Global Mean Sea Level
WORLD METEOROLOGICAL ORGANIZATION
Küresel ortalama Deniz seviyesi yükselişi ~3,6 mm/y
Δh ≈ 78,4 x [1,0345^Δy - 1] mm
(y0 = 2000)
0 mm
Δh (m)
2025 0,10
2050 0,35
2100 2,26
2200 65,00
Sea Level (mm)
Year
0
10
20
30
40
50
60
70
80
90
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019

KUTUPLARDA BUZULLARIN ERİYİŞİ (GTon)

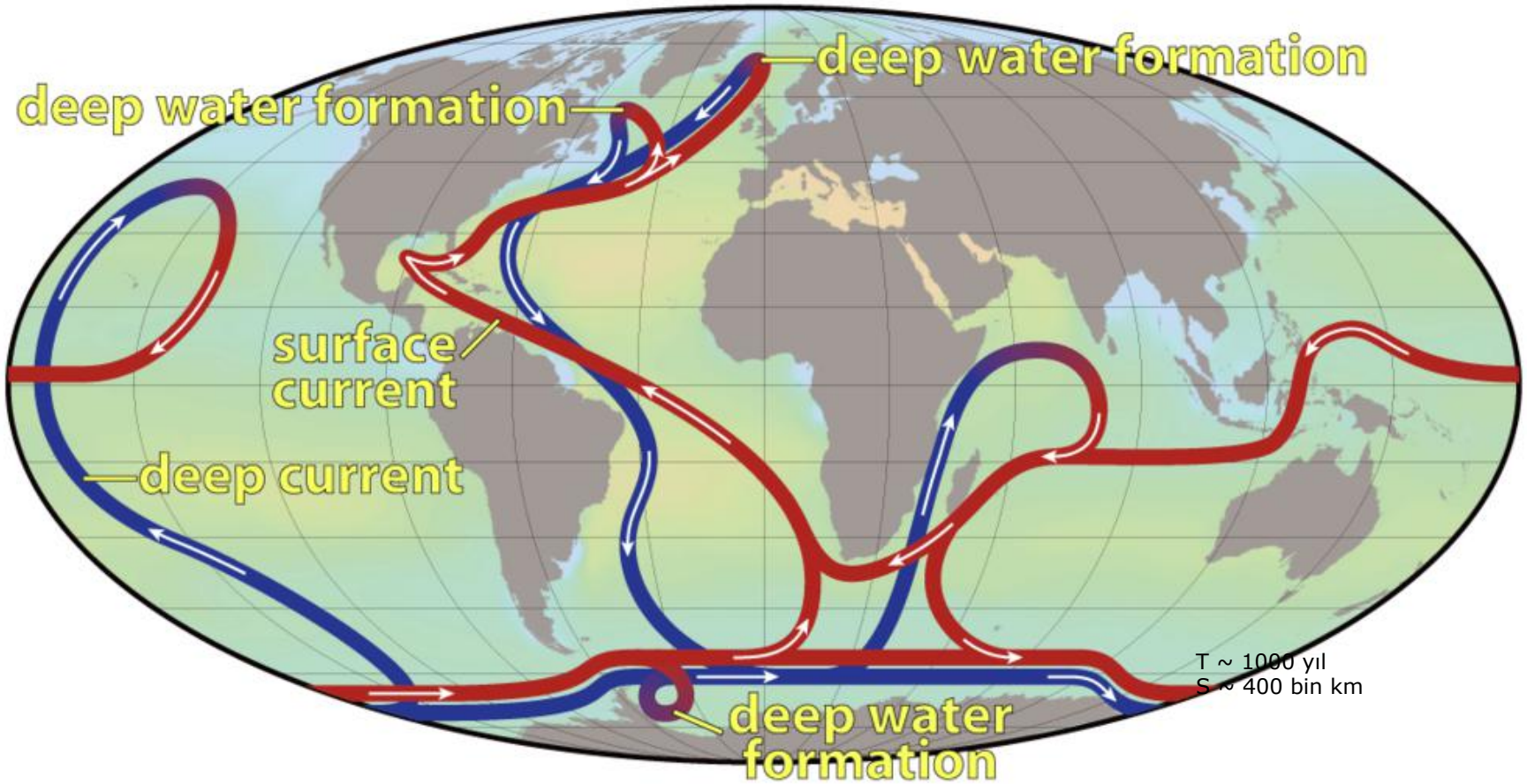


2000-2021 arası son 21 Yılda
Deniz Seviyesi 78 mm yükseldi
ERİYEN TOPLAM BUZ
78 x 360 Gton/mm → 28 trilyon ton !

Türkiye alanı x 36 m !


Earthquake, tsunami, volcano
100
0
Extreme temperature, drought, fire
100
0
Flood, mass water movements
300
0
Storms
400
0
% 2-3 / yıl

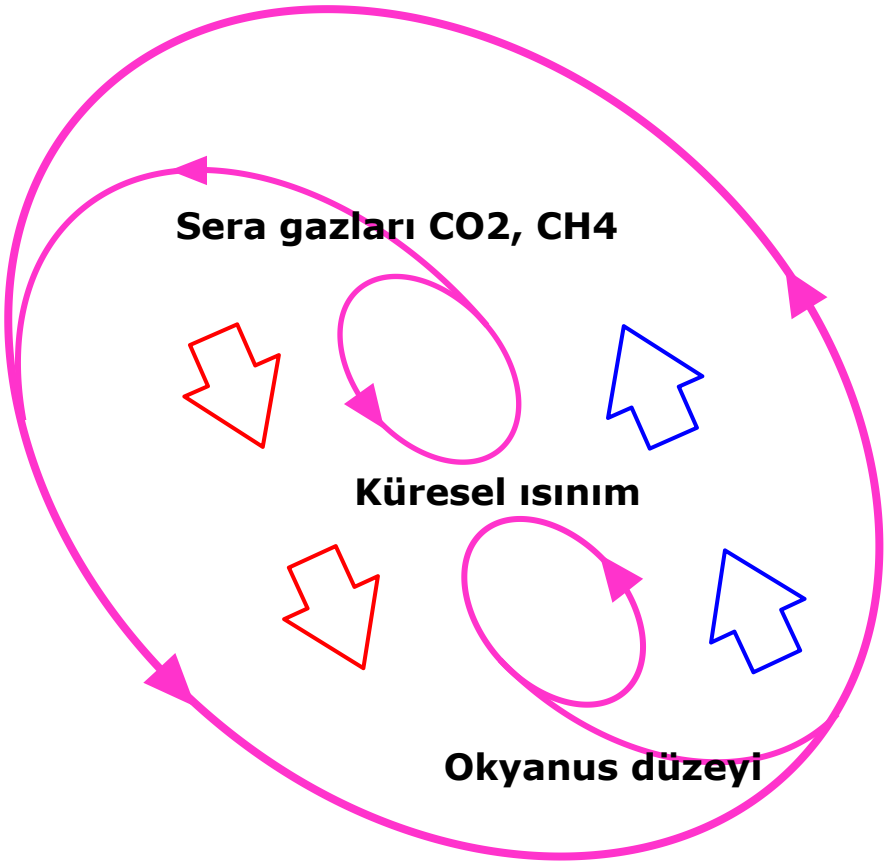
Thermohaline Circulation



İklim değişikliği , küresel ısınım sonucunda eriyen buzulların ortam sıcaklığını, tuz oranını ve yoğunluğu değiştirerek okyanuslardaki sıcak (kırmızı) ve soğuk (mavi) akıntı düzenini bozmasından kaynaklanıyor…

DOMİNO ETKİSİ

pos. feed back



$$dy/dt + Q(t).y = f(t)$$

$$d^2y/dt^2 + P(t).dy/dt + Q(t).y = f(t)$$

YIKICI, GEREKSİZ

ÜRETİM

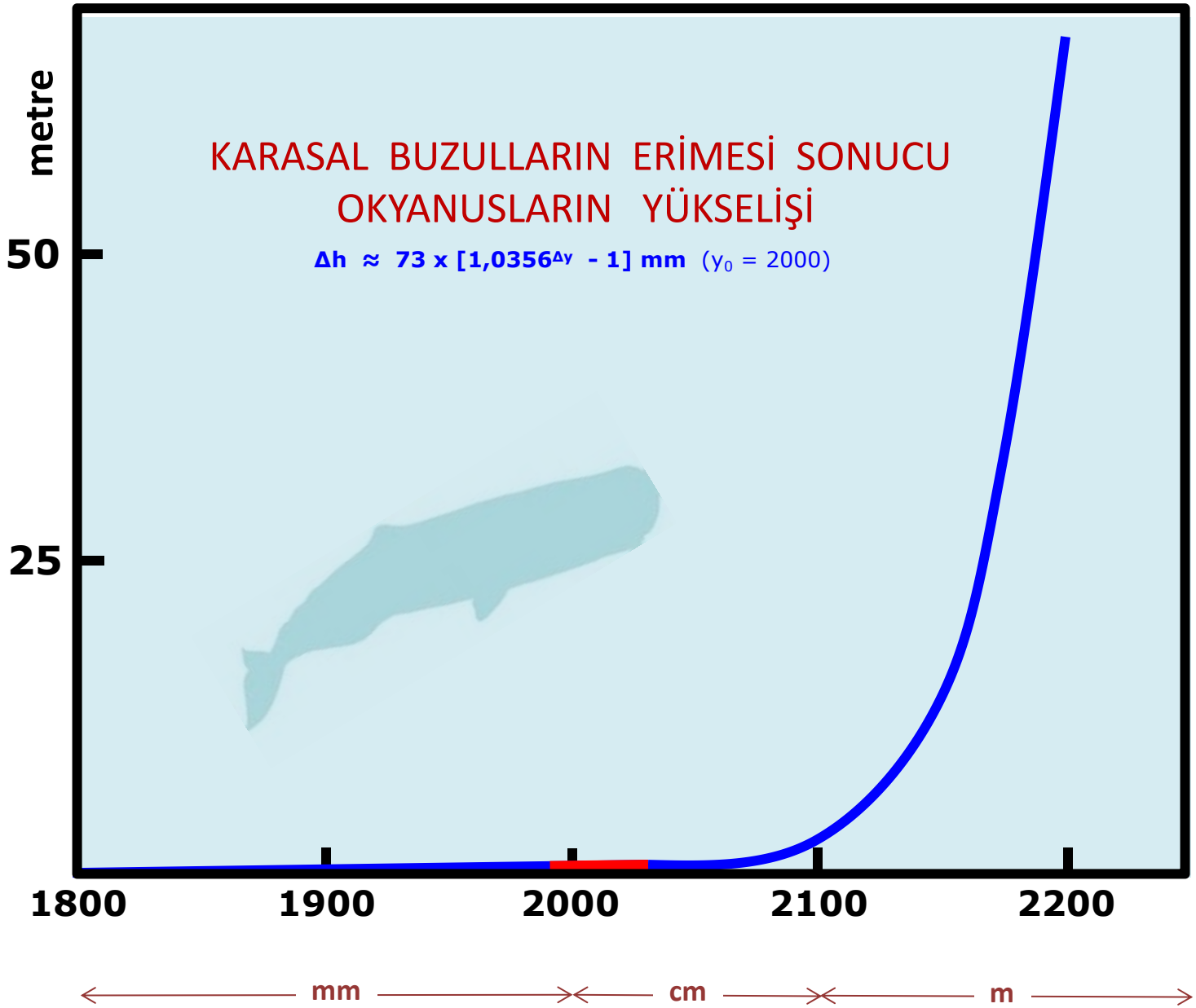
ADİL OLMAYAN

PAYLAŞIM

BİLİNÇSİZ, SAVURGAN

TÜKETİM

Dünyanın haritası değişiyor


metre
50
25
KARASAL BUZULLARIN ERİMESİ SONUCU
OKYANUSLARIN YÜKSELİŞİ
Δh ≈ 73 x [1,0356^Δy - 1] mm (y0 = 2000)
1800
1900
2000
2100
2200
mm
cm
m

2^{64} = 18 446 744 073 709 551 616 →

SATRANÇ TAHTASINDAKİ TOPLAM BUĞDAY MİKTARI

8 16 24 32 40 48 56 56 64

K A R E L E R (n)

Present-day
shoreline

~ 4 milyon km2
permafrost

Caspian
Sea
Odesa
Black Sea
Istanbul
Baghdad
Beirut
Kuwait City

NATIONAL GEOGRAPHIC TÜRKİYE
Δh = 20 m.
GALATA KULESİ
FATİH CAMİİ
SÜLEYMANİYE CAMİİ
BOZDOĞAN KEMERİ
KAPALIÇARŞI
TOPKAPI SARAYI
AYASOFYA CAMİİ
SULTAN AHMET CAMİİ
YENİKAPI İSKELESİ
Marmara Denizi
Tarihi Yarımada ve Risk Altındaki Kıyılar
İklim değişikliği sonucu buzulların erimesiyle deniz düzeyindeki yükselme, İstanbul'da, Tarihi Yarımada'nın kıyılarını da etkileyecek. Önümüzdeki 100 yıl içinde deniz düzeyinin 2,6 metreye yükselmesi durumunda, su altında kalma riski olan alanları (0–10 metre yükselti arasındaki) gösteren harita modellemesi, Yenikapı sahillerinden girecek tuzlu suların neredeyse Aksaray'a kadar ulaşabileceğine işaret ediyor.
İstanbul kıyıları sular altında
İstanbul kıyılarının sular altında kalması, Terkos ve Küçükçekmece Gölü gibi kentin tatlı su kaynaklarının önemli bölümünün tuzlu suyun istilasına uğraması anlamına geliyor. Harita, deniz düzeyinde 2,6 metrelik bir yükselmenin sonuçlarını gösteriyor.
BÜYÜTÜLMÜŞ ALAN
Tuzlanan akiferler
Deniz düzeyindeki yükselme, yeraltı su kaynaklarını da tehdit ediyor. Denizler yükseldikçe, akiferlerde bulunan tuzlu su düzeyi de yükseliyor ve temiz yeraltı suyu kaynakları tuzlu suyla dolmaya başlıyor.
Yeraltı su düzeyi
Kara düzeyi
Yükselmiş deniz düzeyi
Deniz düzeyi
Tatlı su
Deniz tabanı
Tuzlanan tatlı su akiferi
Tuzlu su
æ.2013

2050 SENARYOSU p ~ 0,9 BÜYÜK ÇÖKÜŞ

- Nüfus 10 milyarı aşmış,
- Petrol 'eko-teknik' anlamda bitmiş, enerji krizi (!)
- Atmosferde [CO_2] > 500 ppm ,
- Gezegende ortalama sıcaklık > 16^0 C
- Deniz seviyesi yükseliyor, pH < 8
- İklimde aşırı olumsuz değişimler,
- Ormanlar % 20 azalmış,
- Çölleşme artmış, ~ 100 tür yok olmuş,
- ~ 1 milyar insan göç halinde.... olacak

p ~ 0,5

Sonuç

Orman katliamı,
Sera Gazları,
Kuraklık, Sel baskınları
Açlık, Susuzluk,
Salgın Hastalıklar…

Deniz kirliliği
Plastik vebası
Hava, Su ve Toprak zehirlenişi
Genetik bozukluklar

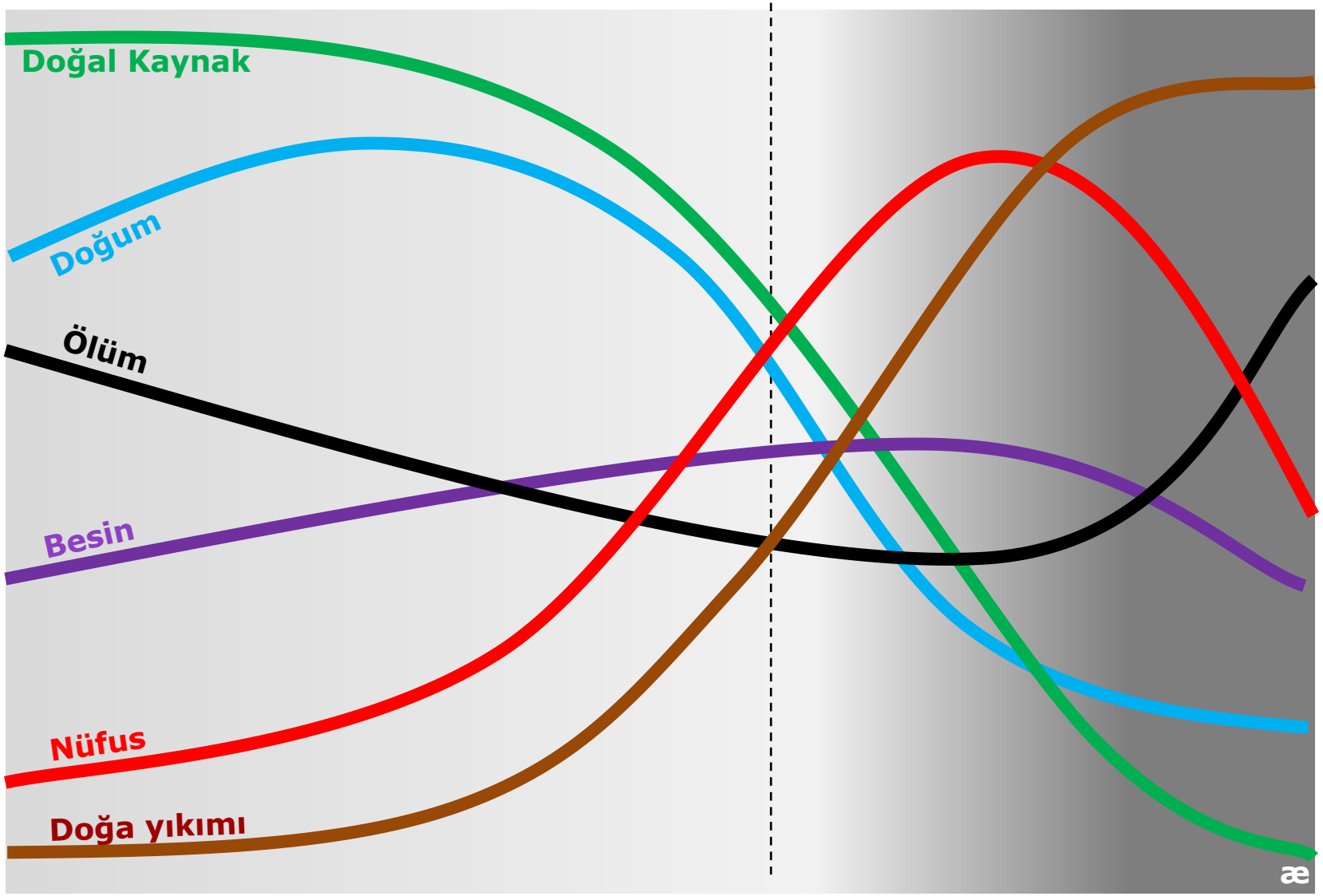
Enerji (petrol) krizi
Ekonomik kriz,
Ekolojik çöküş,

Sosyal depremler
Mini Devletler,

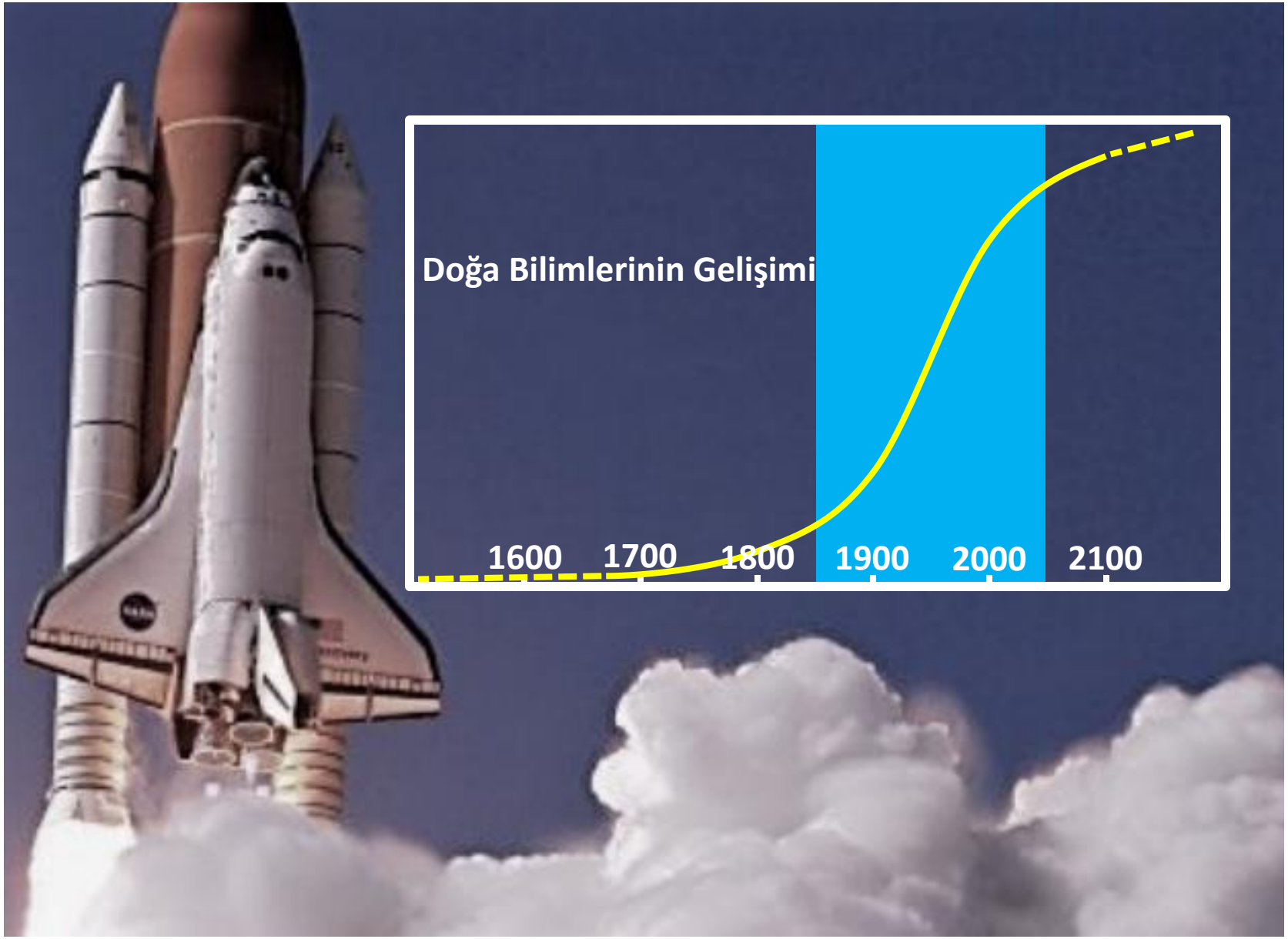
Radikalizm,Fanatizm,
Despotizm...

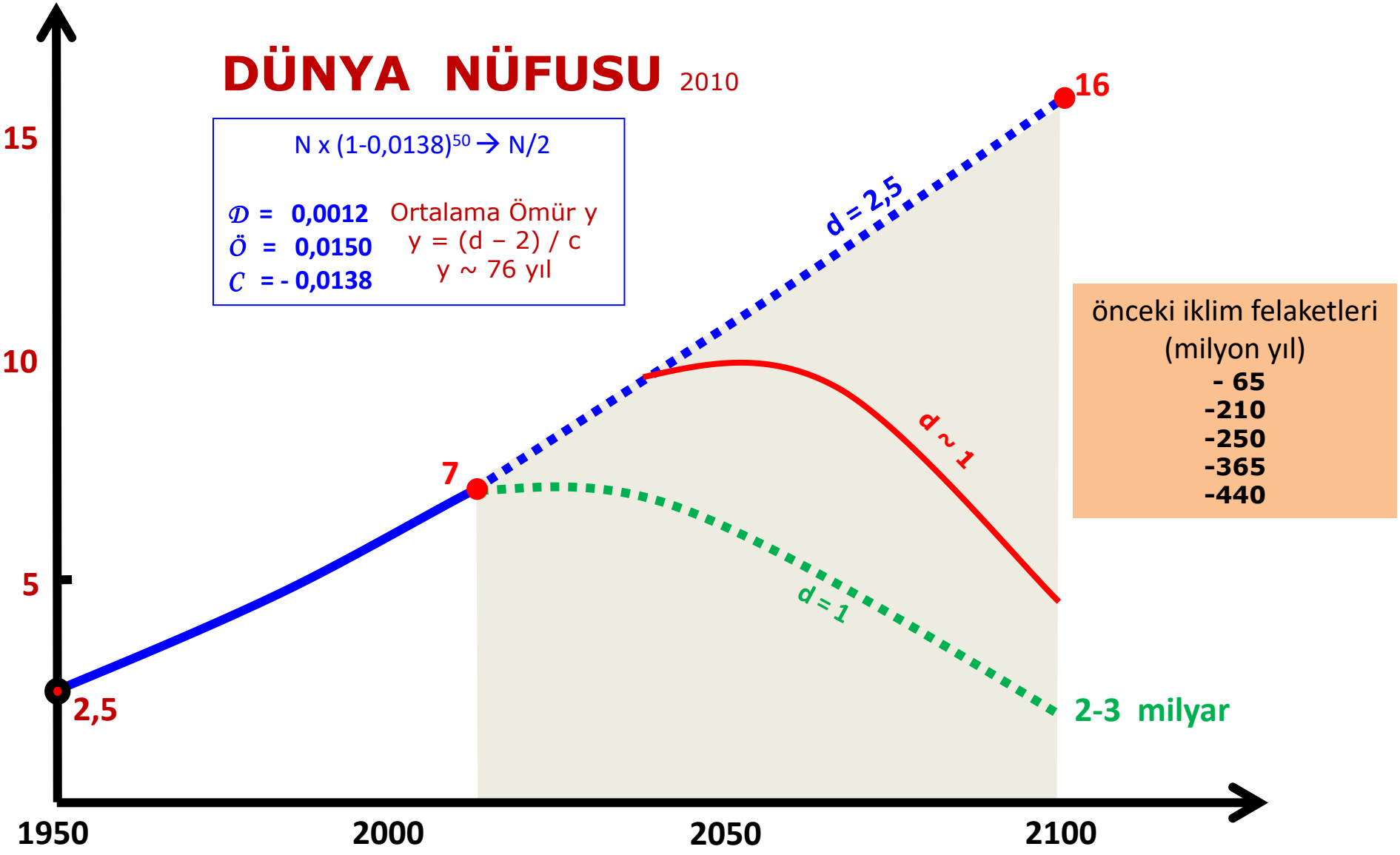
Kitlesel Göçler
Terör, Savaş,
Küresel Kargaşa,
vee...
Kitlesel Ölümler !

GEZEGENİN GİDİŞATI



1900 1950 2000 2050 2100


Doğa Bilimlerinin Gelişimi
1600
1700
1800
1900
2000
2100


DÜNYA NÜFUSU 2010
N x (1-0,0138)50 → N/2
𝒟 = 0,0012
Ö = 0,0150
𝒞 = - 0,0138
Ortalama Ömür y
y = (d – 2) / c
y ~ 76 yıl
15
10
5
2,5
7
16
d = 2,5
d ~ 1
d = 1
2-3 milyar
önceki iklim felaketleri
(milyon yıl)
- 65
-210
-250
-365
-440
1950
2000
2050
2100

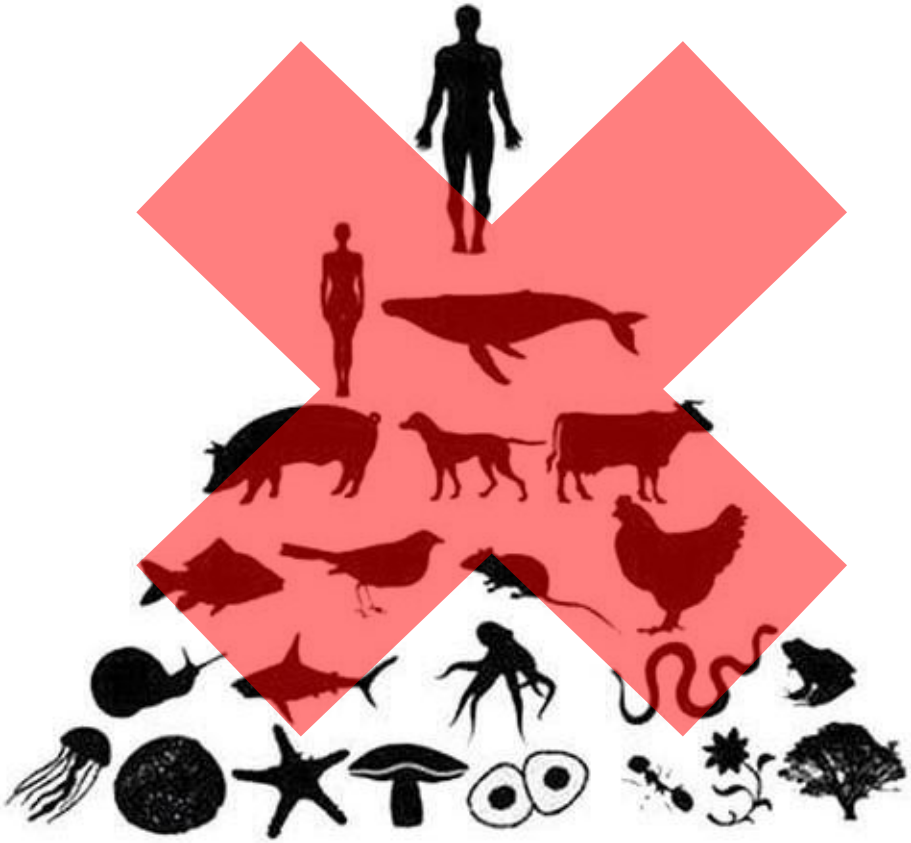
Ne yapmalı ?

Doğa'nın bakış açısından

Homo sapiens
Gezegen üzerindeki
en tehlikeli, en yıkıcı,
en ölümcül parazittir ! æ

Y E N İ B İ L İ N Ç

küresel kültür devrimi



İNSAN EŞREF-İ MAHLÛK DEĞİLDİR ! DOĞANIN BİR PARÇASIDIR !

Zaman daralıyor !
21. Yüzyılı esenlikle atlatabilmek (?) için

1.Nüfus artışını durdurun !

"kadın başına bir çocuk"

2.Çevrenizi ağaçlandırın !

"Adam başına 1/2 hektar orman"

3.Yaşam tarzınızı değiştirin !

"Az tüketim, doğal yaşam"

4.Enerji savurganlığı yapmayın !

"Fosilden uzak, etkin kullanım"

5.Güneş enerjisi kullanın !

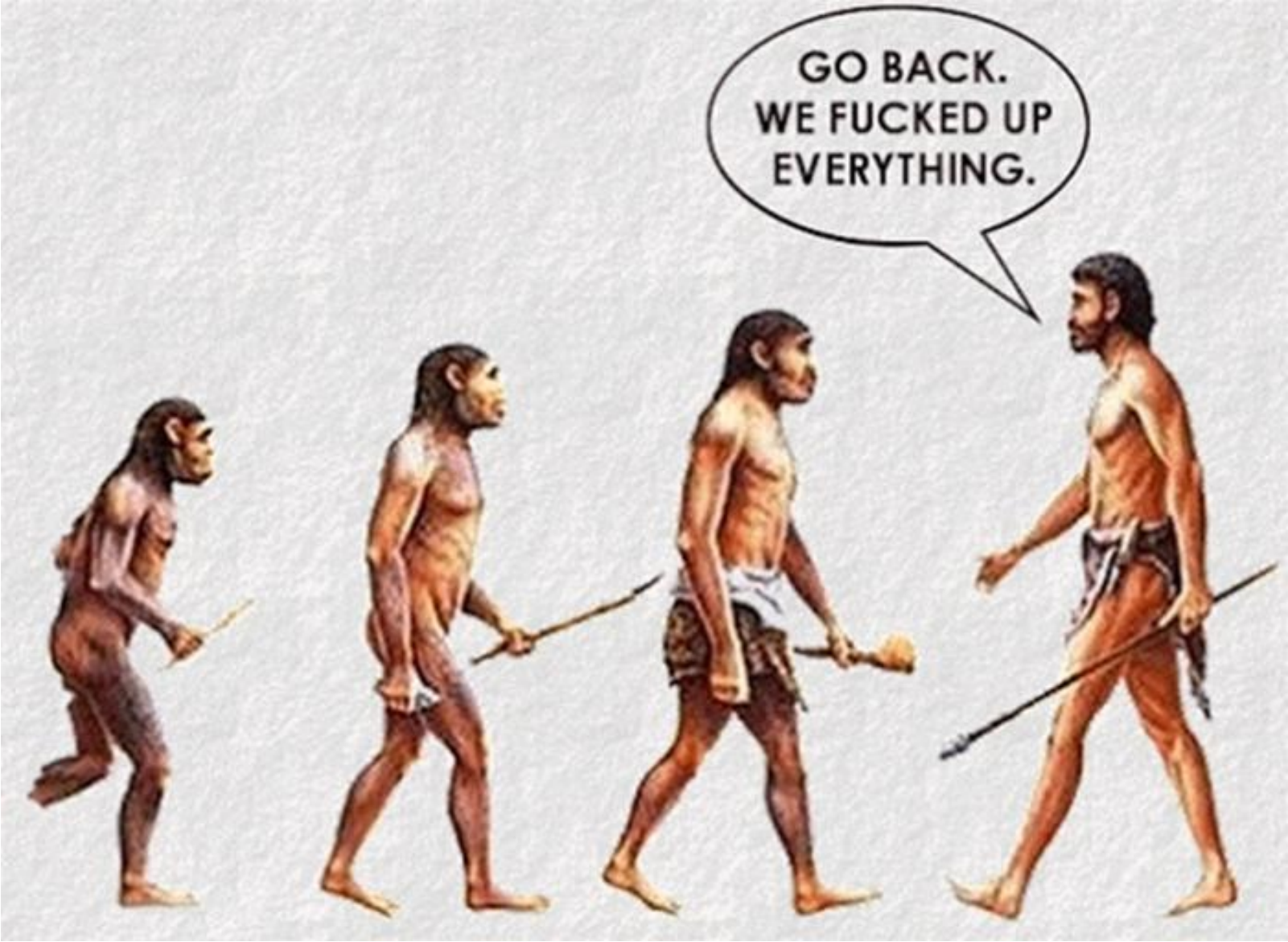
"ısıl, kinetik ve foto voltaik"

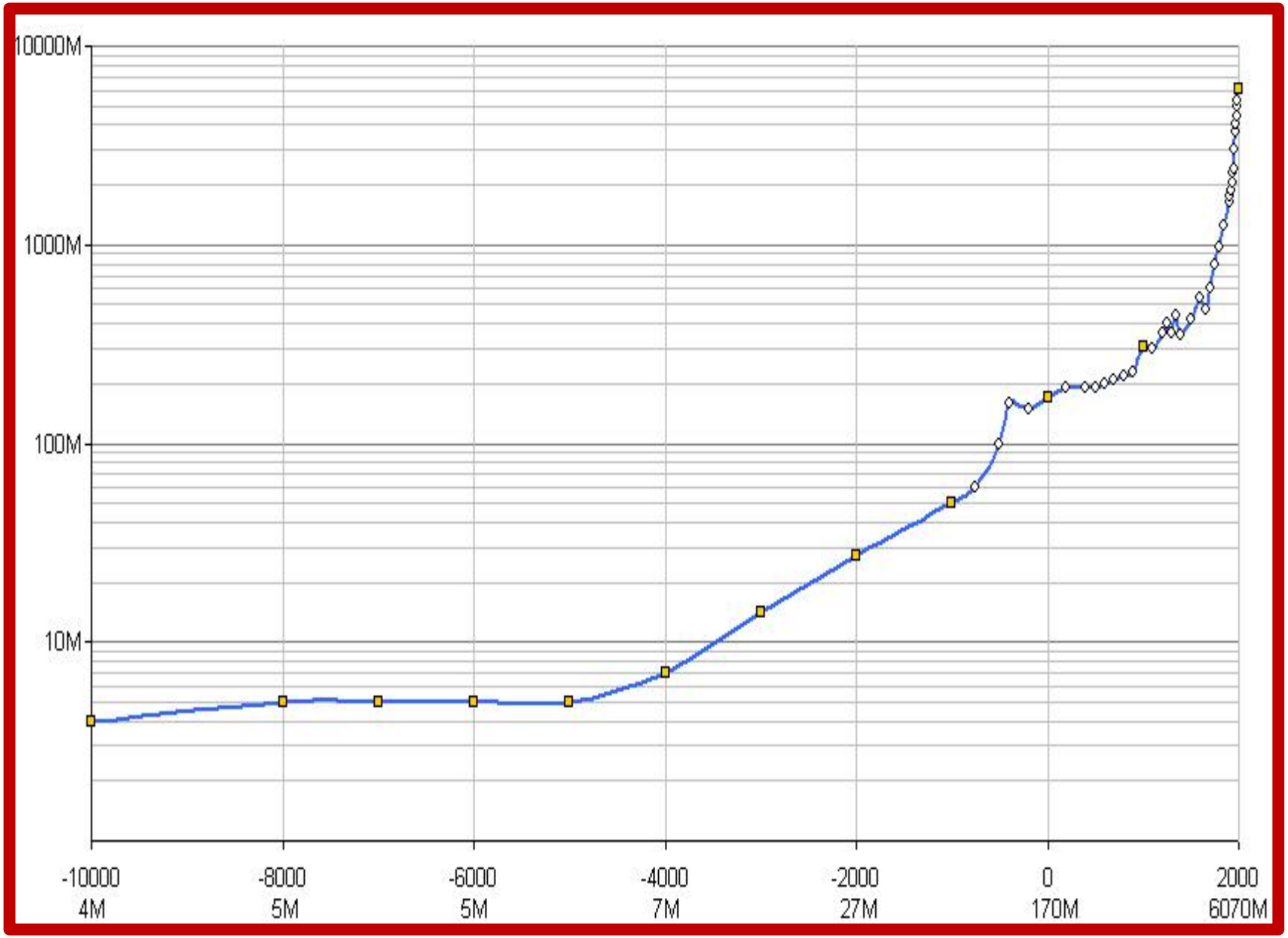
Evrende trilyonlarca Gezegen var, ama...

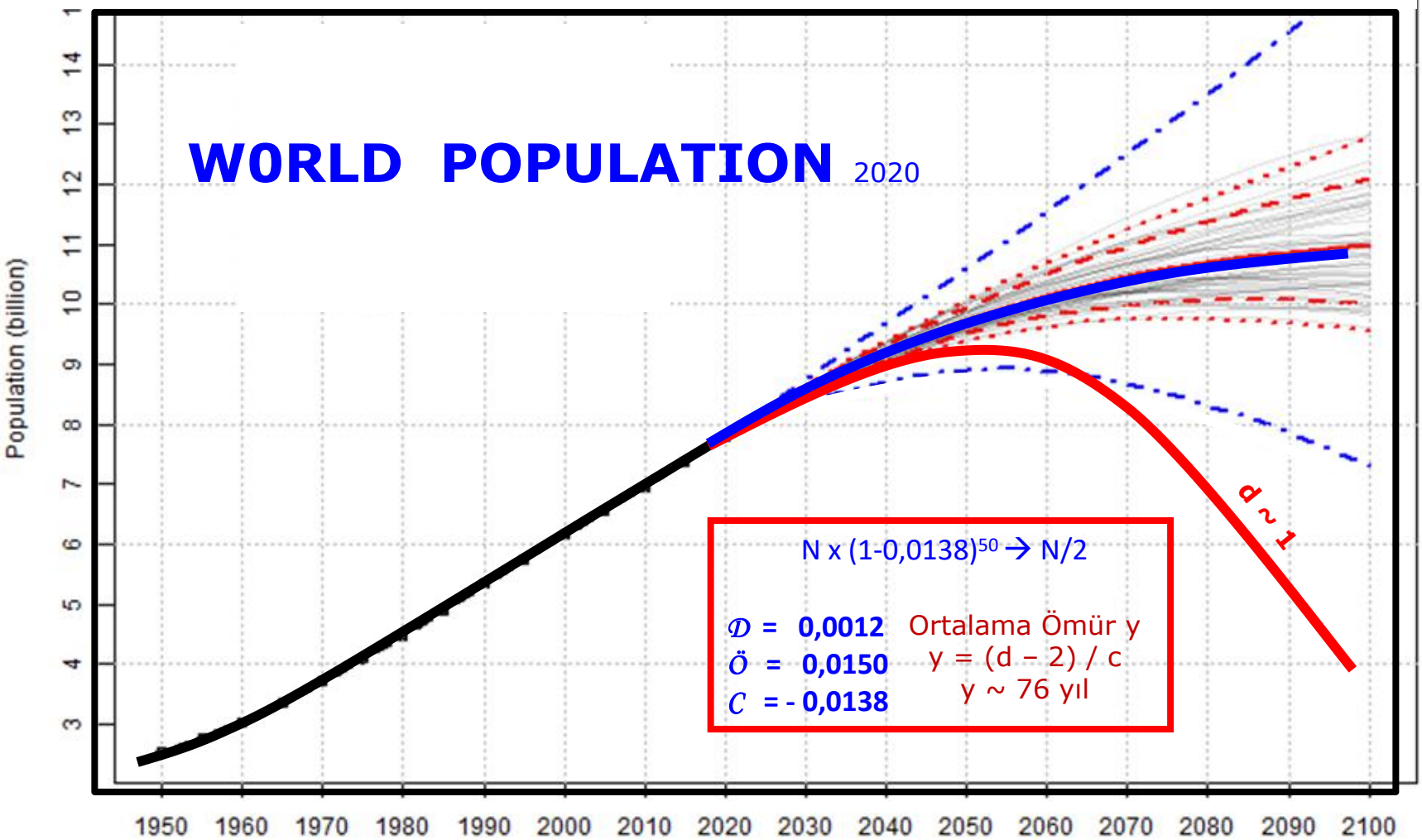
Başka Dünya yok ! æ

daliercan@gmail.com

Ekler


GO BACK.
WE FUCKED UP
EVERYTHING.


10000M
1000M
100M
10M
-10000
4M
-8000
5M
-6000
5M
-4000
7M
-2000
27M
0
170M
2000
6070M



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United Nations, DESA, Population Division. *World Population Prospects 2019*. http://population.un.org/wpp/

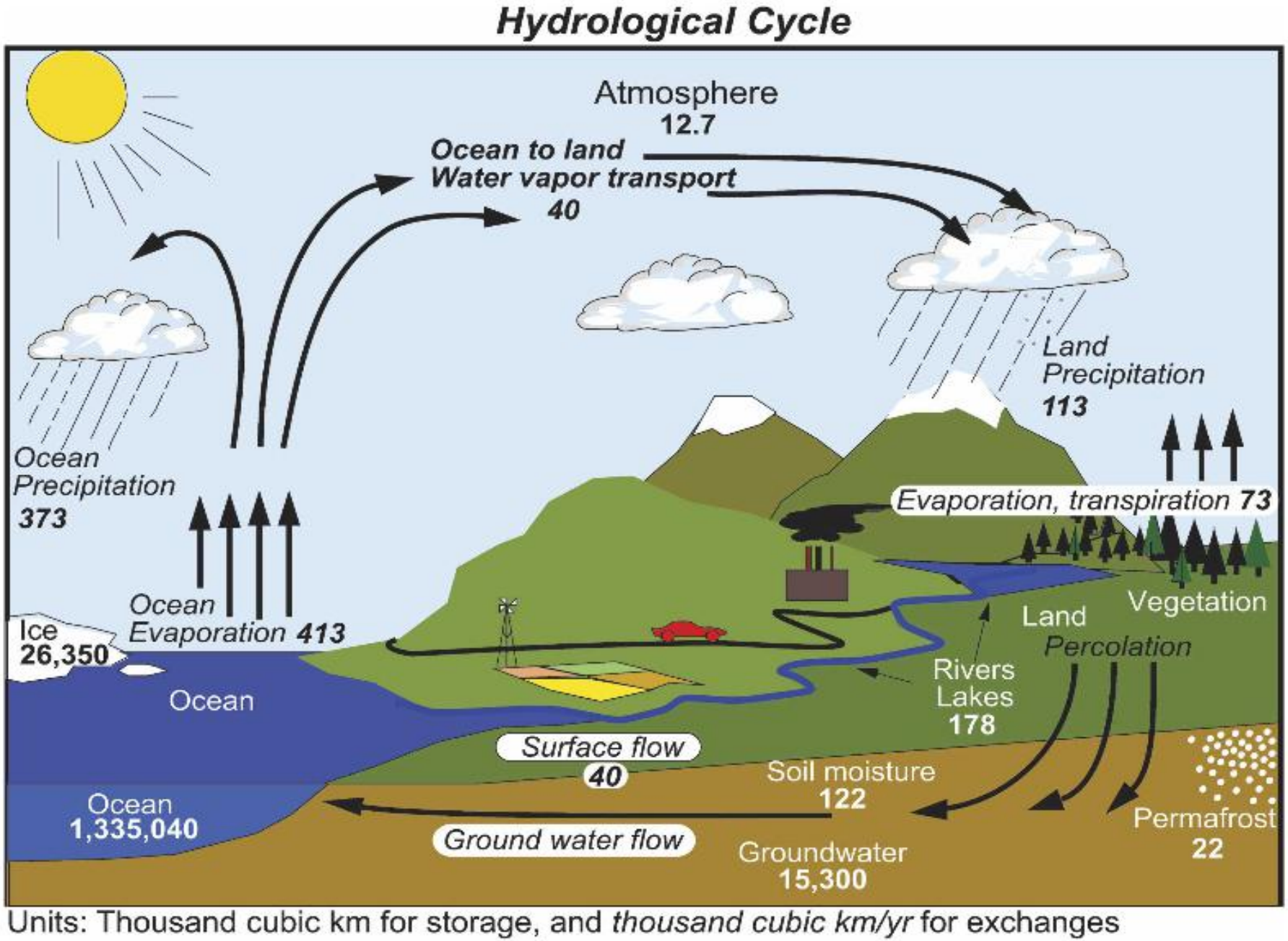
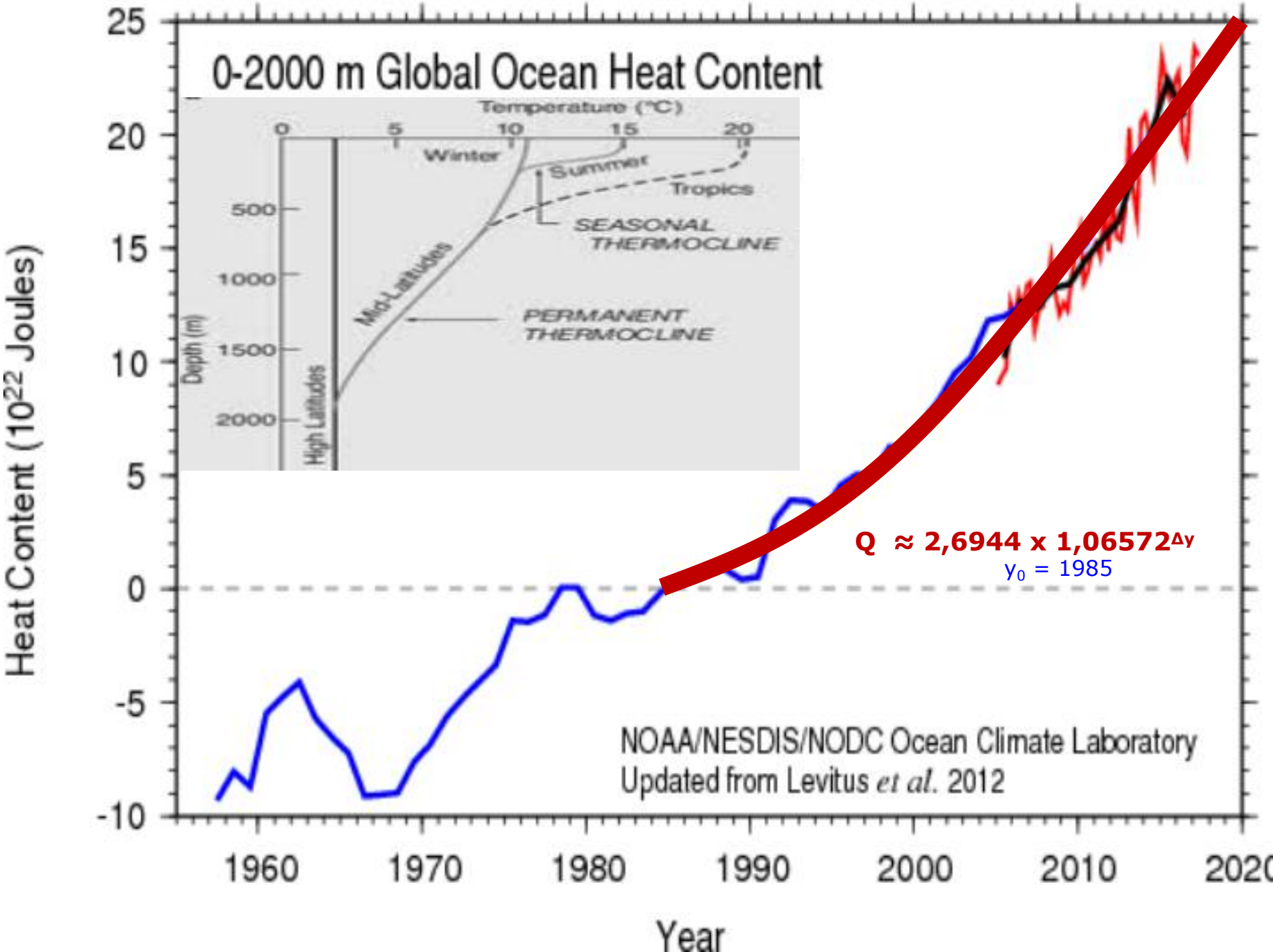
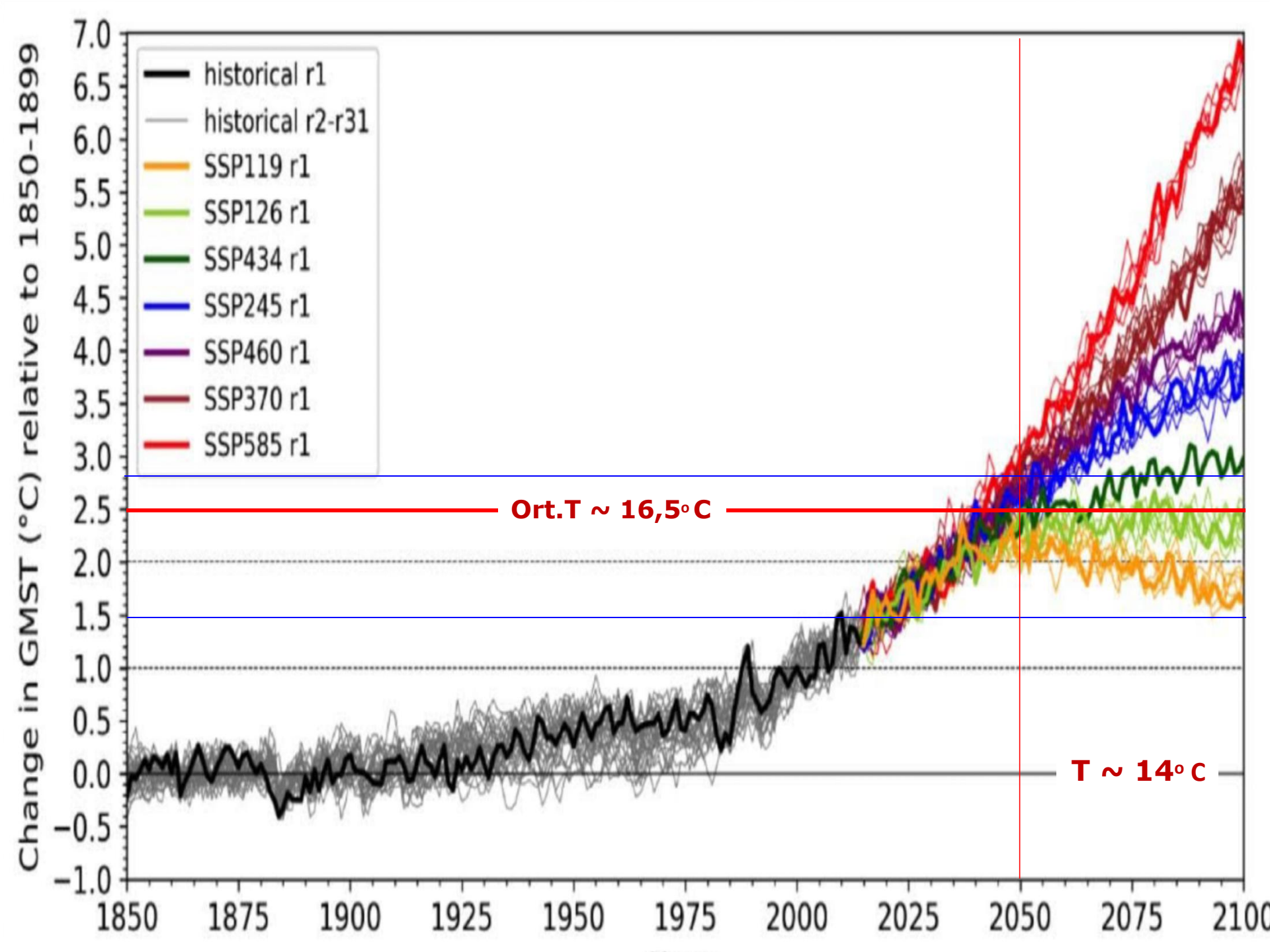


FIG. 1. The hydrological cycle. Estimates of the main water reservoirs, given in plain font in 10^3 km^3, and the flow of moisture through the system, given in slant font (10^3 km^3 yr^{-1}), equivalent to Eg (10^{18} g) yr^{-1}.

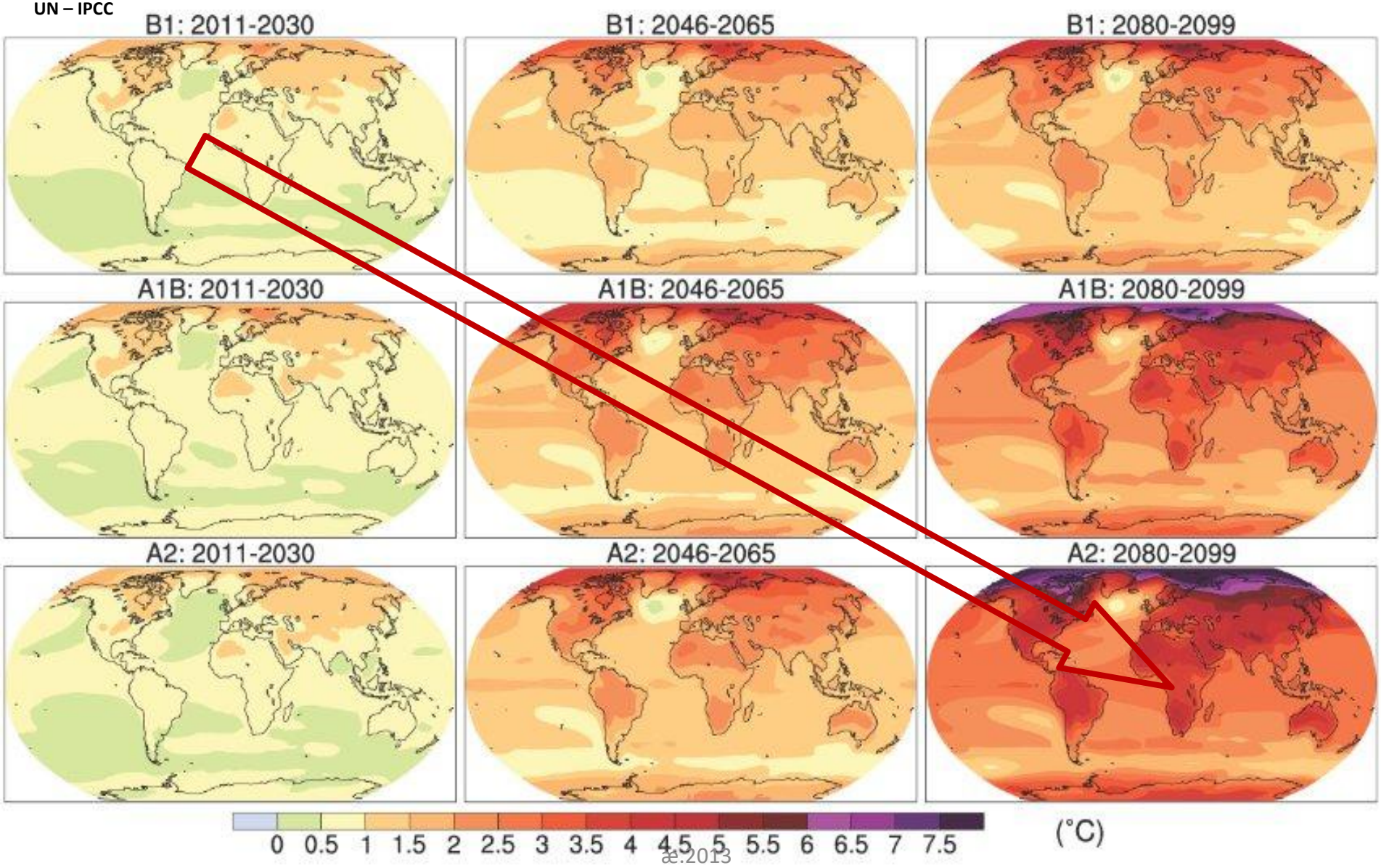

0-2000 m Global Ocean Heat Content
Temperature (°C)
0
5
10
15
20
Winter
Summer
Tropics
SEASONAL THERMOCLINE
PERMANENT THERMOCLINE
Mid-Latitudes
High Latitudes
Depth (m)
500
1000
1500
2000
Q ≈ 2,6944 x 1,06572^Δy
y0 = 1985
NOAA/NESDIS/NODC Ocean Climate Laboratory
Updated from Levitus et al. 2012
Heat Content (10^22 Joules)
25
20
15
10
5
0
-5
-10
1960
1970
1980
1990
2000
2010
2020
Year


historical r1
historical r2-r31
SSP119 r1
SSP126 r1
SSP434 r1
SSP245 r1
SSP460 r1
SSP370 r1
SSP585 r1
Ort.T ~ 16,5° C
T ~ 14° C
Change in GMST (°C) relative to 1850-1899
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
1850
1875
1900
1925
1950
1975
2000
2025
2050
2075
2100

BM KÜRESEL ISINIM SENARYOLARI

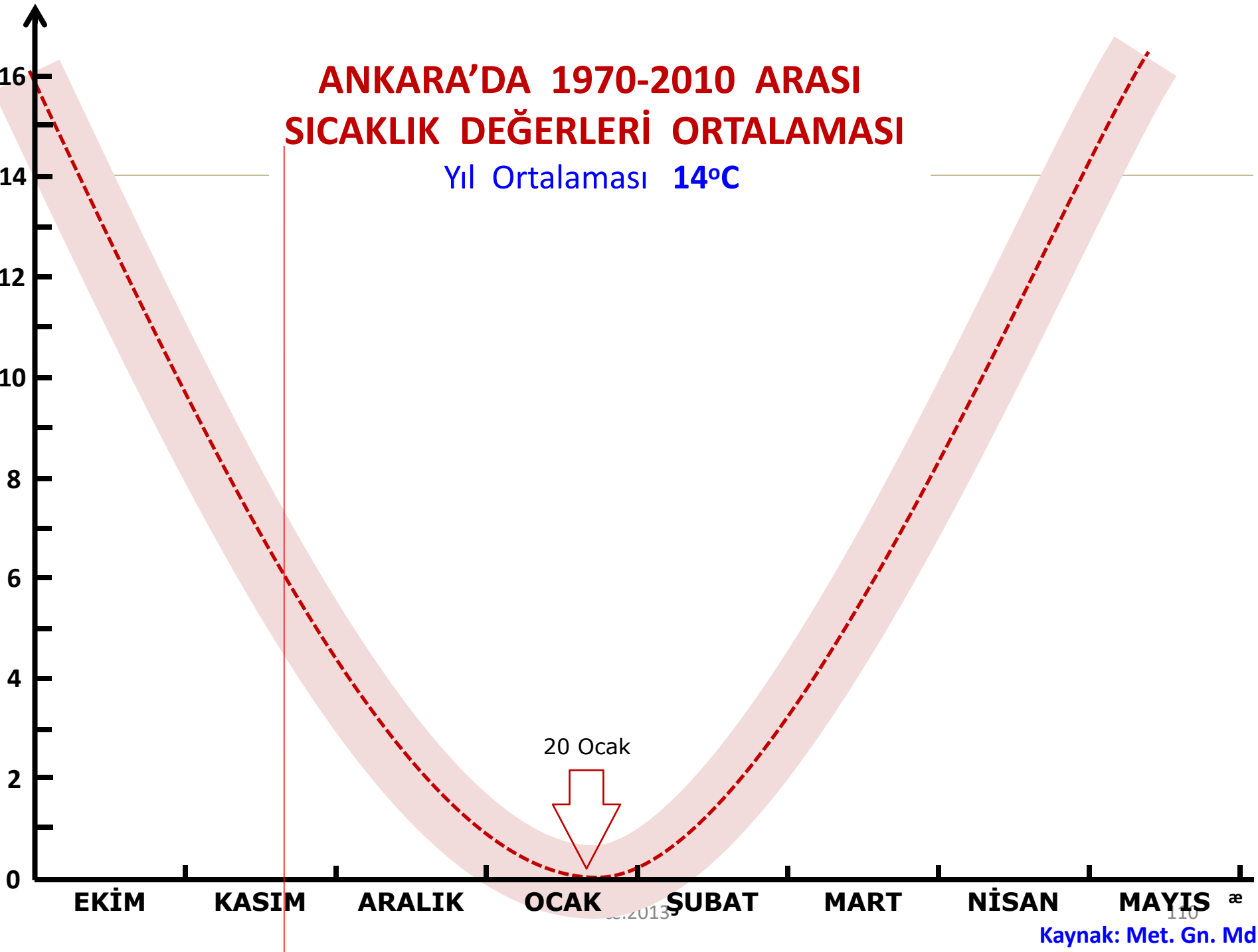
TR + 2 … + 10 derece

UN – IPCC

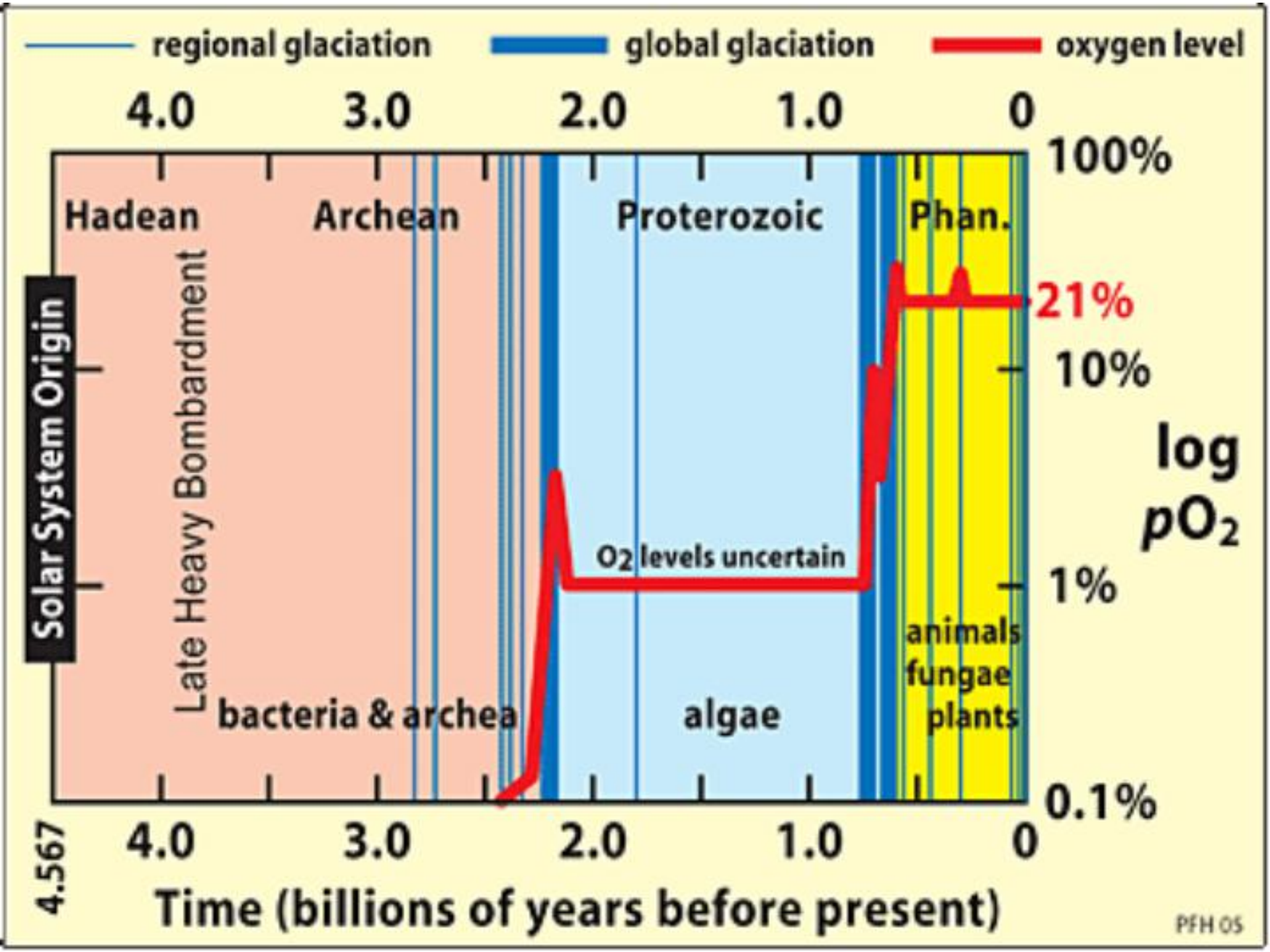


ANKARA'DA 1970-2010 ARASI SICAKLIK DEĞERLERİ ORTALAMASI

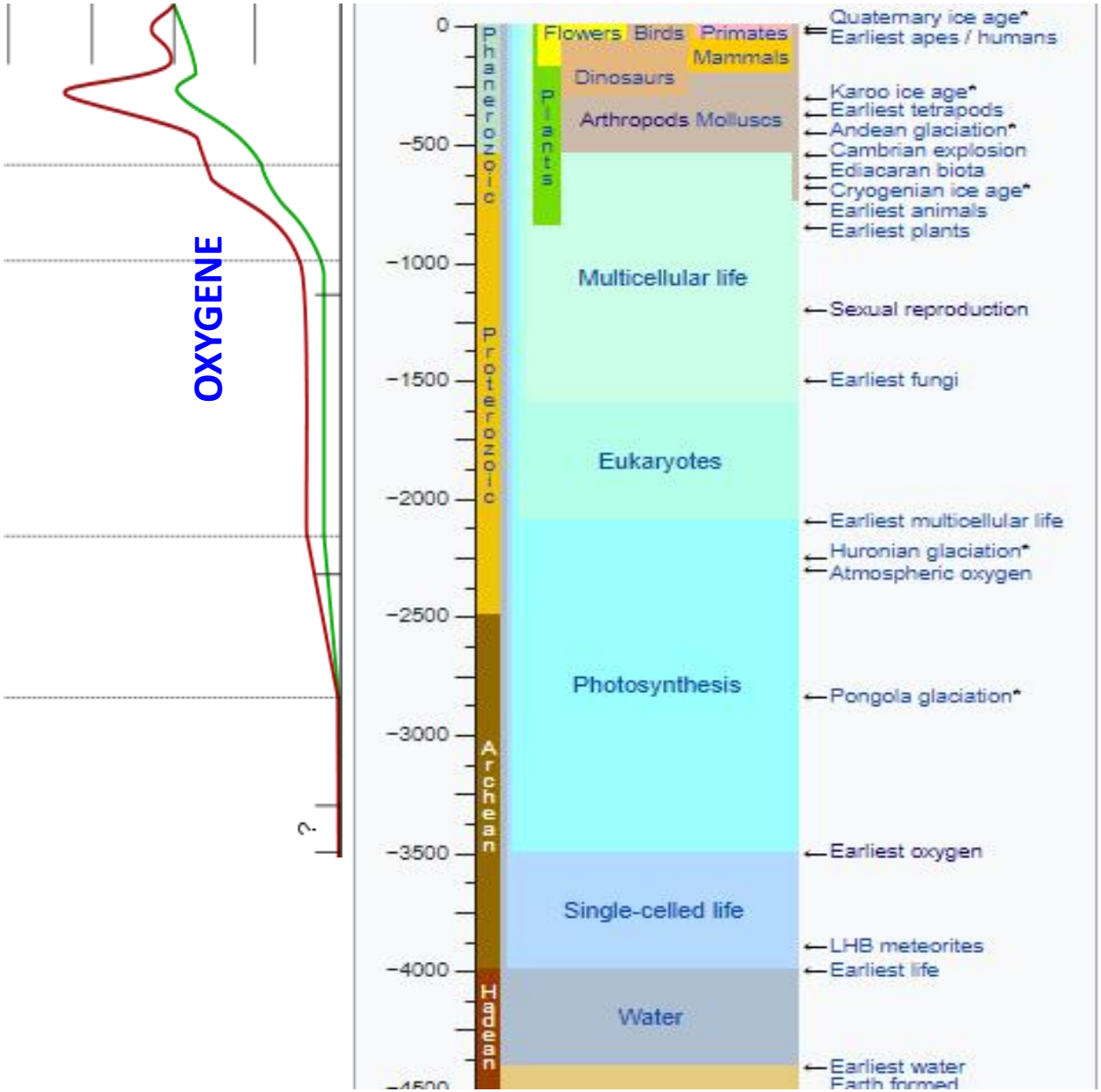
Yıl Ortalaması **14°C**

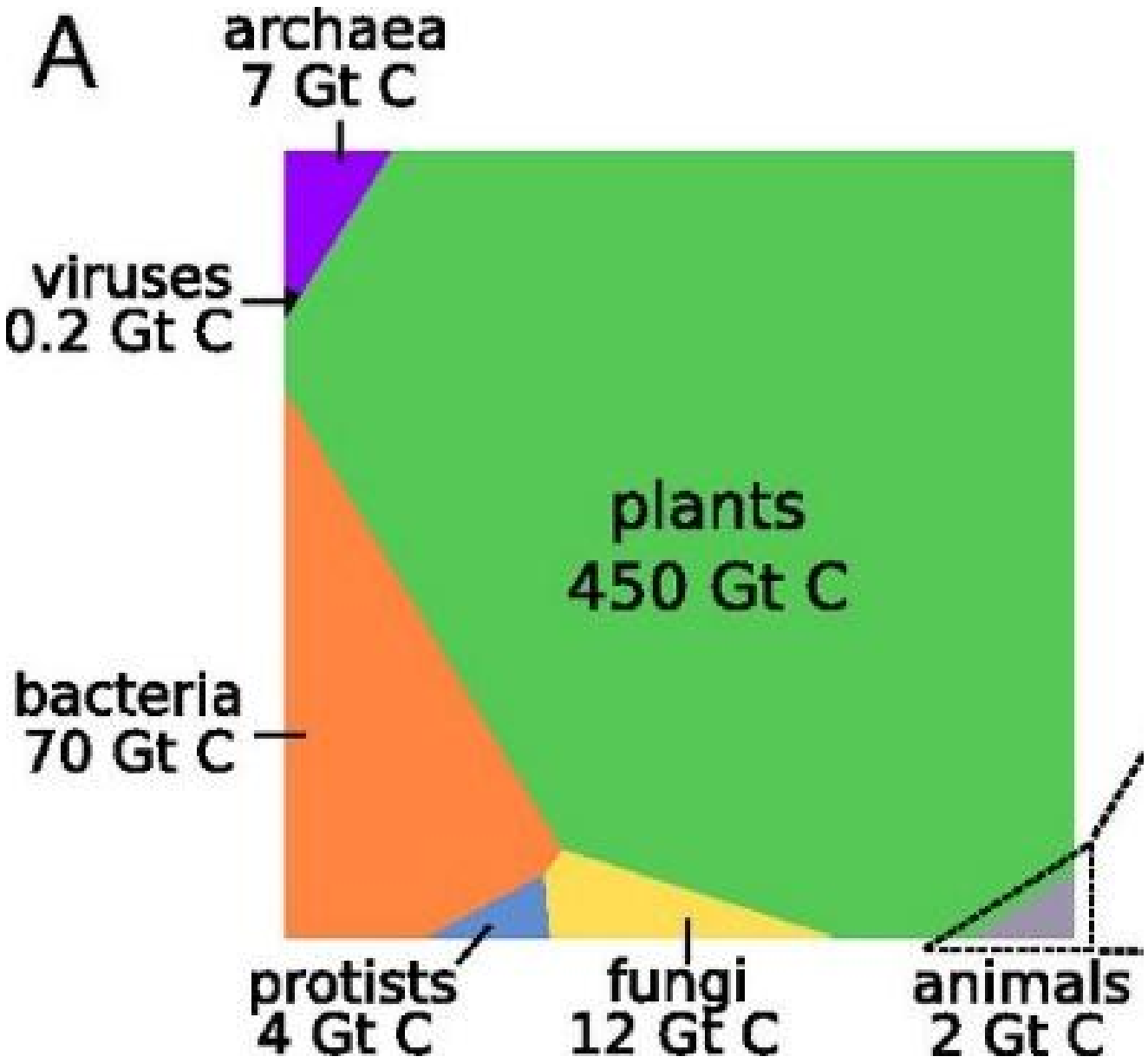


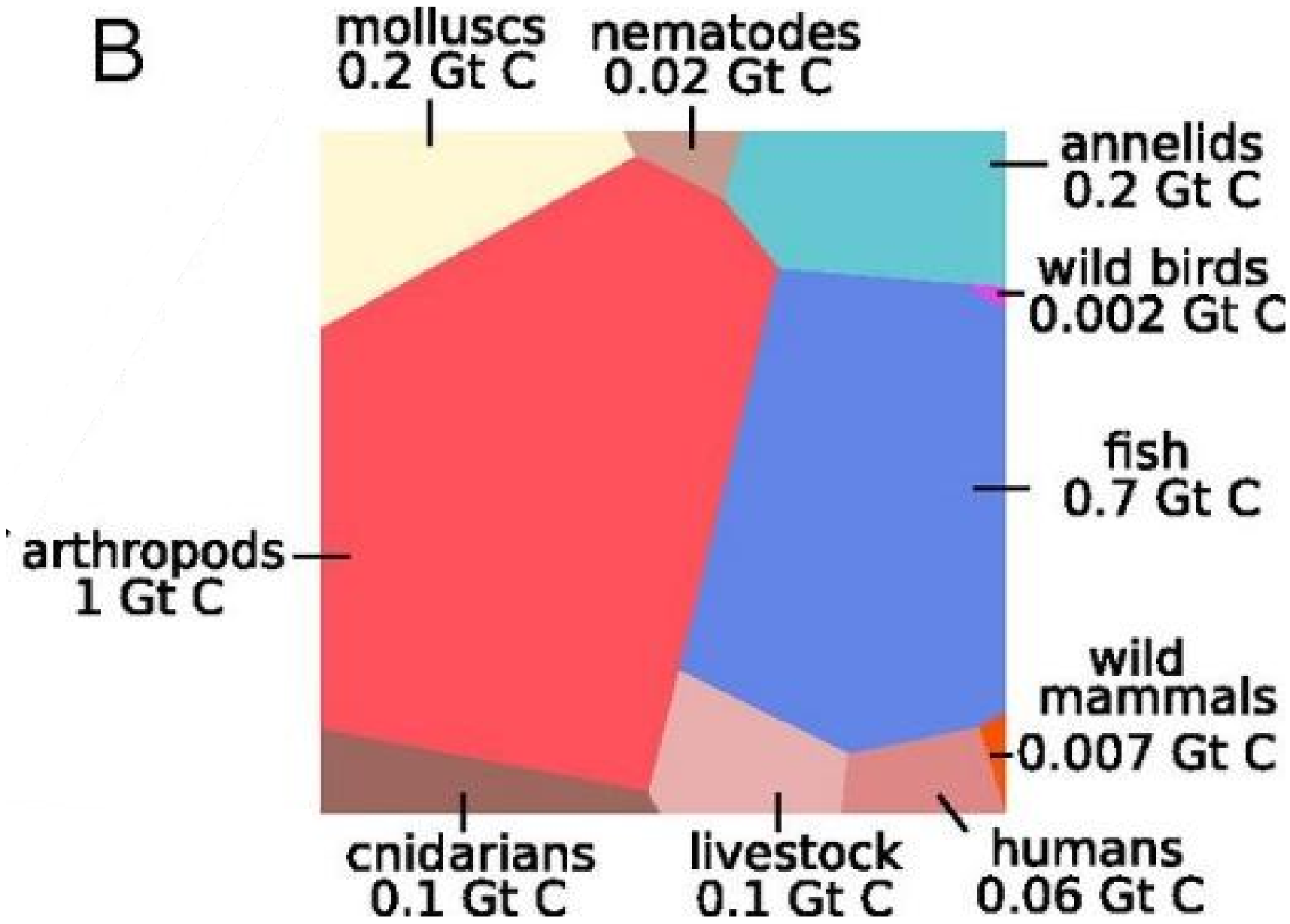
Kaynak: Met. Gn. Md


regional glaciation
global glaciation
oxygen level
4.0
3.0
2.0
1.0
0
100%
Hadean
Archean
Proterozoic
Phan.
21%
10%
Solar System Origin
Late Heavy Bombardment
log
pO_2
O_2 levels uncertain
1%
animals
fungae
plants
bacteria & archea
algae
0.1%
4.567
4.0
3.0
2.0
1.0
0
Time (billions of years before present)
PFH 05

GEZEGENİN EVRİM SÜRECİ



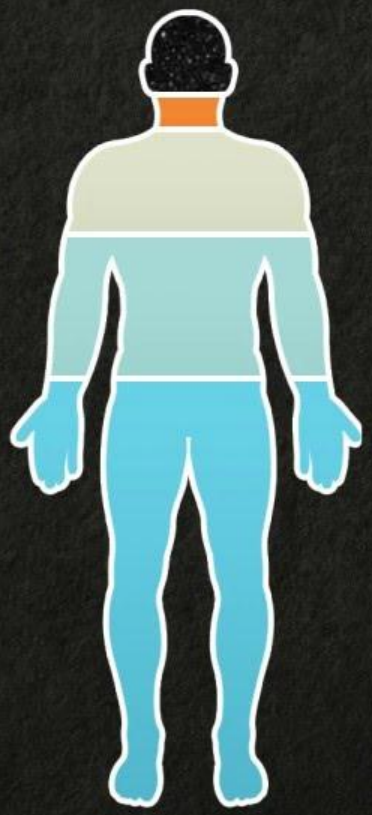

A
archaea
7 Gt C
viruses
0.2 Gt C
plants
450 Gt C
bacteria
70 Gt C
protists
4 Gt C
fungi
12 Gt C
animals
2 Gt C


B
molluscs
0.2 Gt C
nematodes
0.02 Gt C
annelids
0.2 Gt C
wild birds
0.002 Gt C
fish
0.7 Gt C
arthropods
1 Gt C
wild
mammals
0.007 Gt C
cnidarians
0.1 Gt C
livestock
0.1 Gt C
humans
0.06 Gt C

Elements Of The
HUMAN BODY

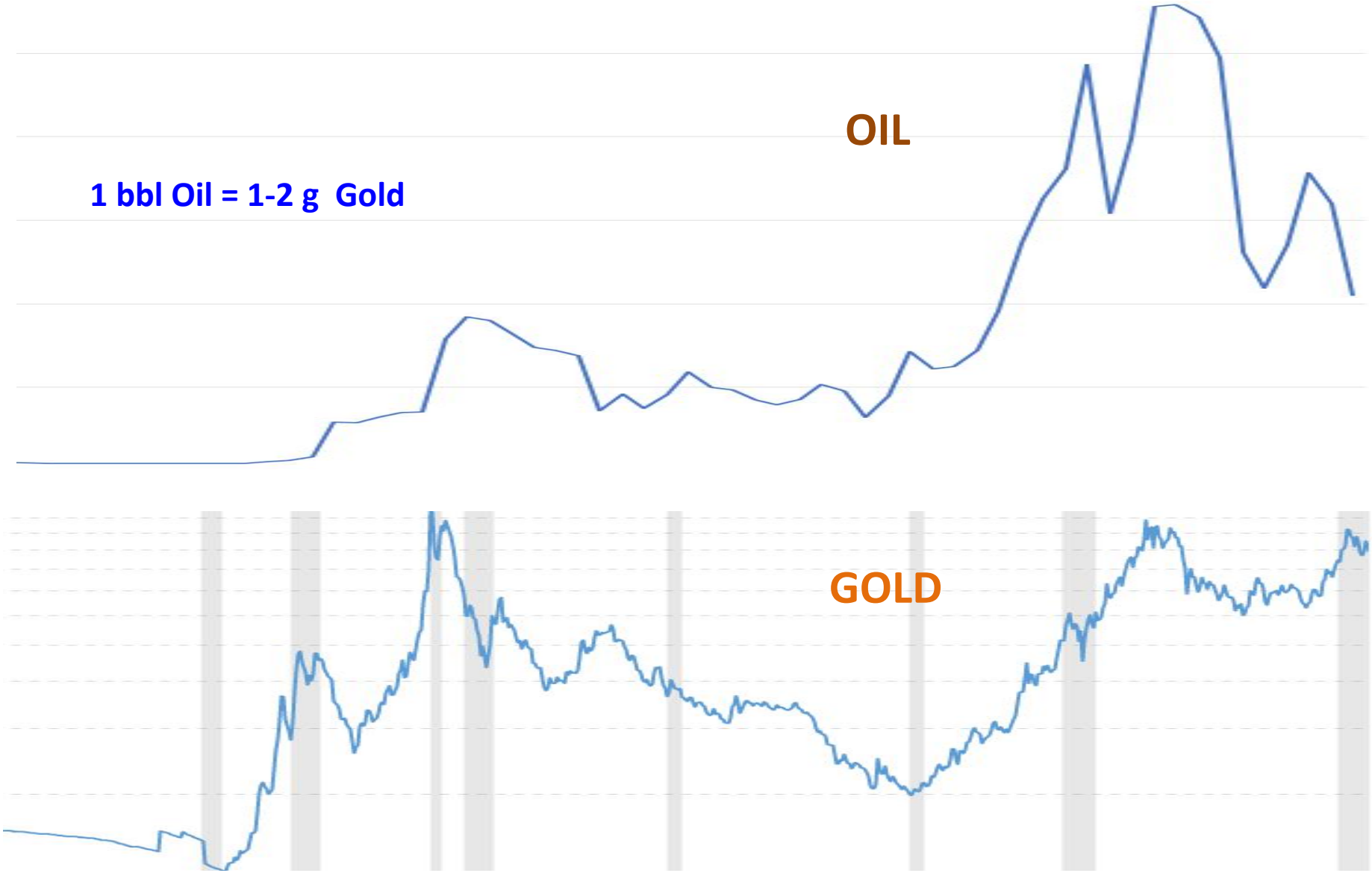
3%
Nitrogen

Carbon
18%



Hydrogen
10%

Oxygen
65%


OIL
1 bbl Oil = 1-2 g Gold
GOLD

DÜNYANIN GÜÇLÜ ORDULARI

1.ABD **
2.Rusya **
3.Çin **
4.Hindistan *
5.Fransa **
6.Japonya
7.Kore *
8.B.Krallık **
9.Türkiye
10.Almanya
11.İtalya
12.Mısır
13.Brezilya
14.İran
15.İndonezya

Dünya ordularında toplam **asker sayısı 22 milyon**un üzerinde.. ve Dünya toplam Savunma giderleri **2 trilyon dolar** *(dünya GNP toplamının % 2,5 kadarı)*

SİLAH YARIŞI