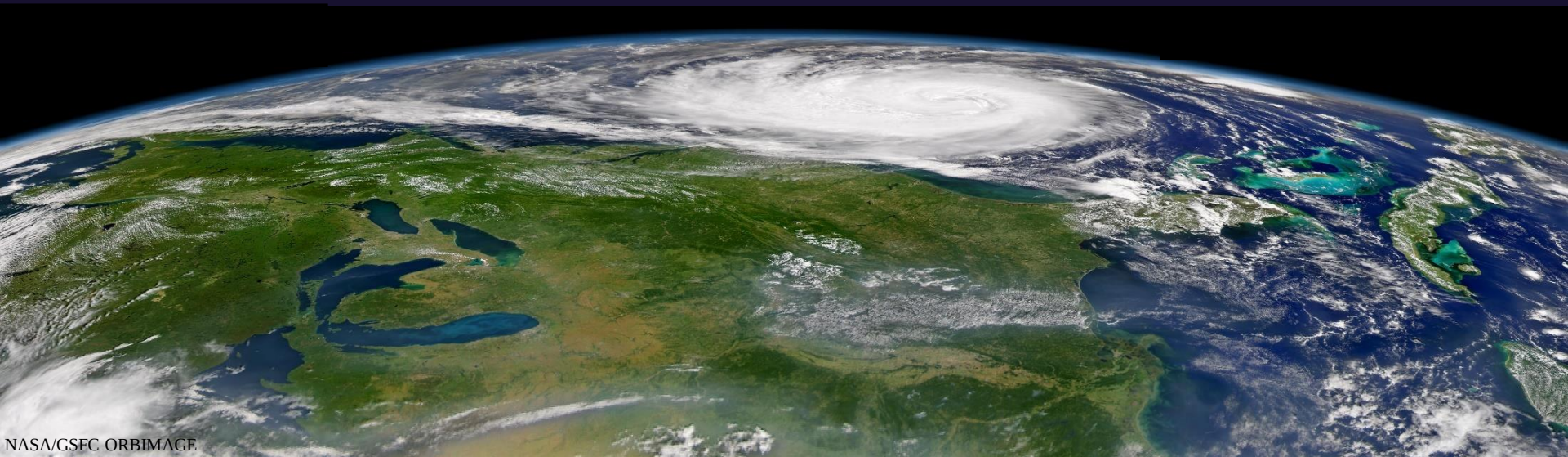
Globális klímaváltozás: mit tanultunk az elmúlt 14 évben?

Jánosi Imre

ELTE TTK, Komplex Rendszerek Fizikája Tanszék

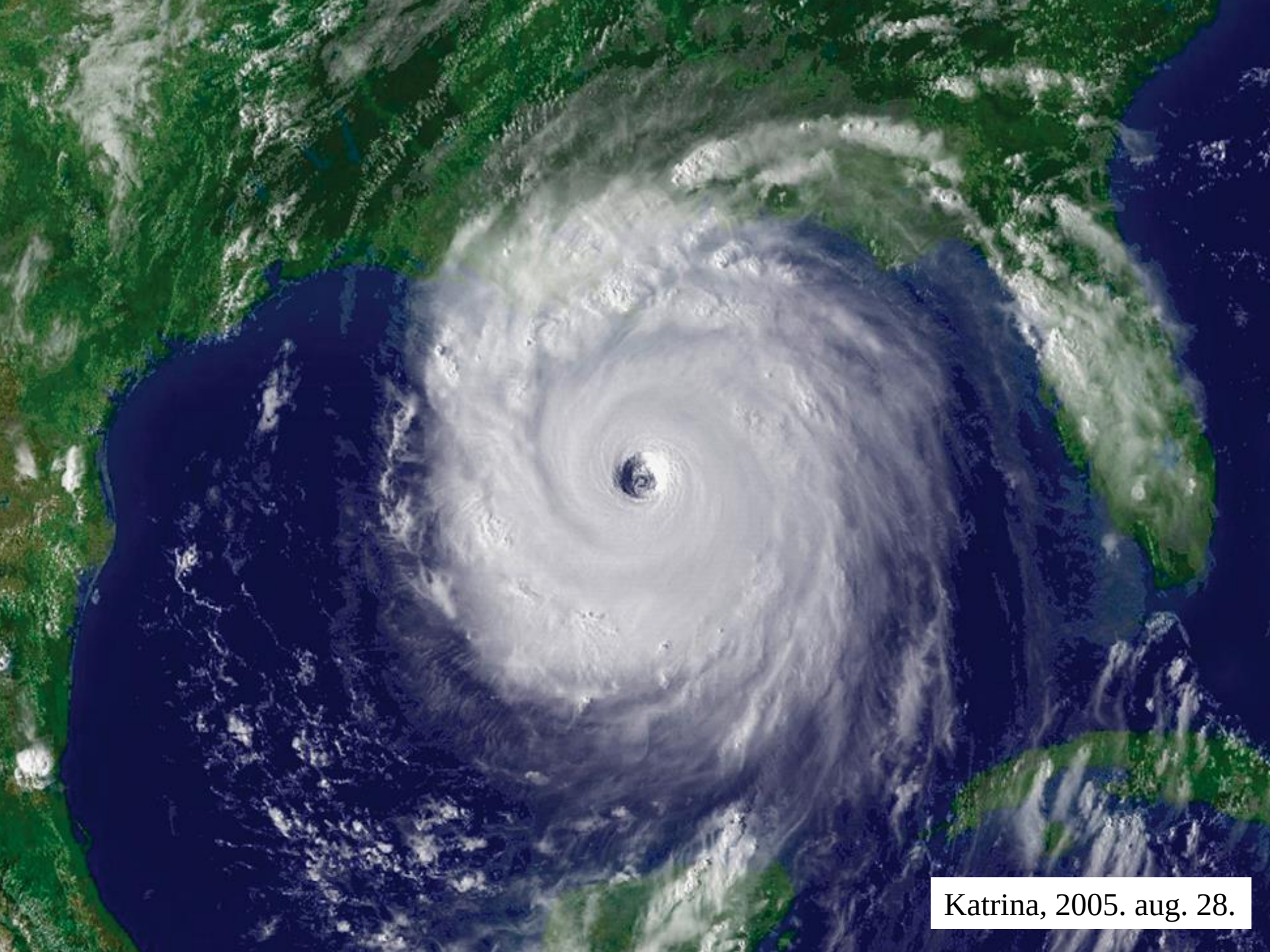
Kármán Környezeti Áramlások Laboratórium

http://www.atomcsill.elte.hu



NASA/GSFC ORBIMAGE


New Orleans, 2005. aug. 31.

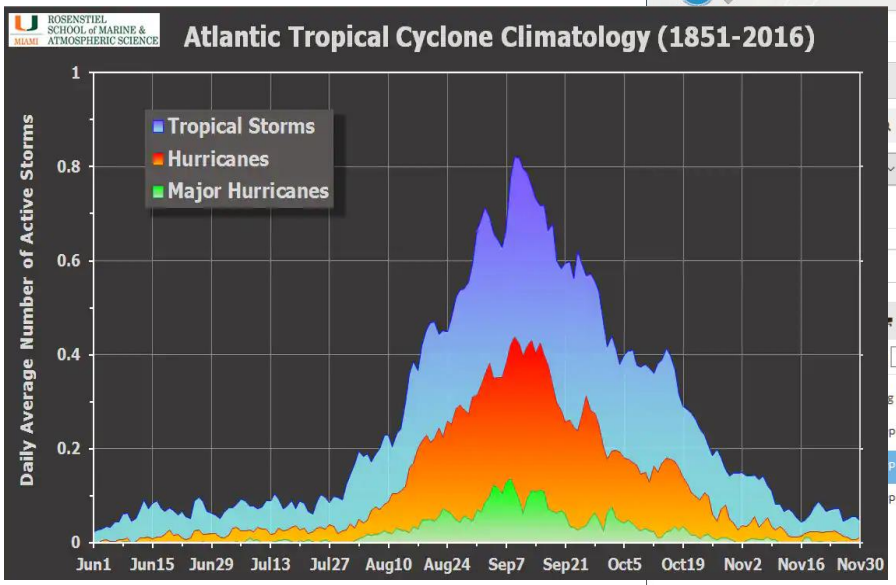


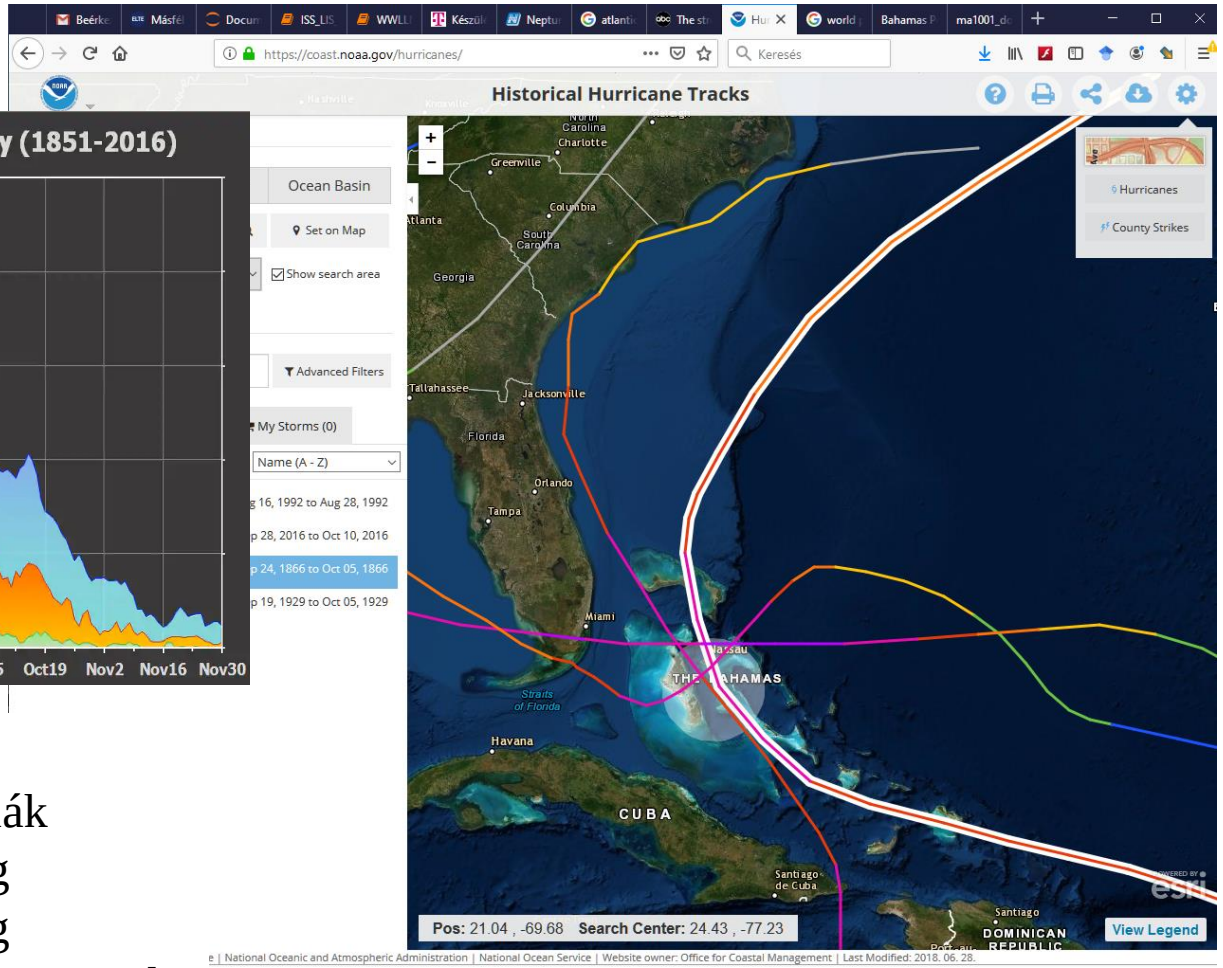
Katrina, 2005. aug. 28.


Bahama-szigetek, 2019. szept. 4.

Dorian, 2019. szept. 2.

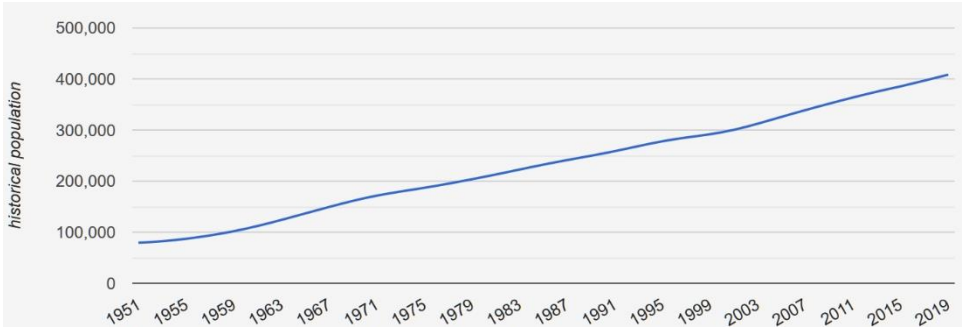
Micsoda egybeesés!?
(Nem.)



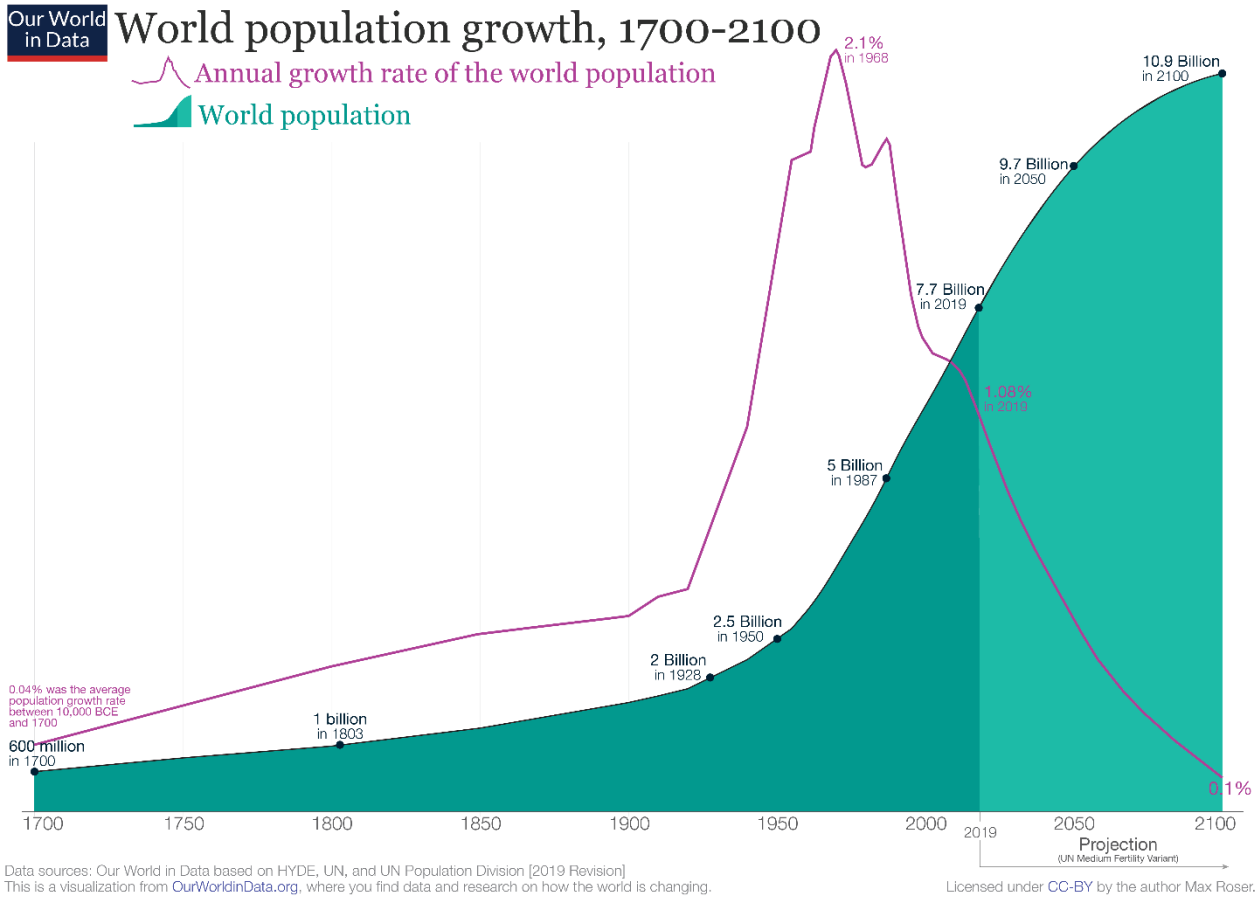


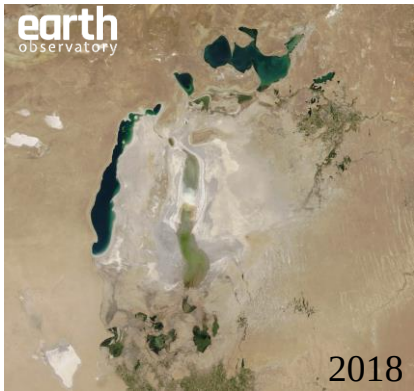
2005	Katrina(5)	Louisiana
2008	Ike(4)	Nagy-Antillák
2011	Irene(3)	Karib-térség
2012	Sandy(3)	Karib-térség
2016	Matthew(5)	Kolumbia, Venezuela
2017	Harvey(4)	Texas
2017	Maria(5)	Puerto Rico
2018	Michael(5)	Közép-Amerika
2019	Dorian(5)	Bahama-szigetek

…….

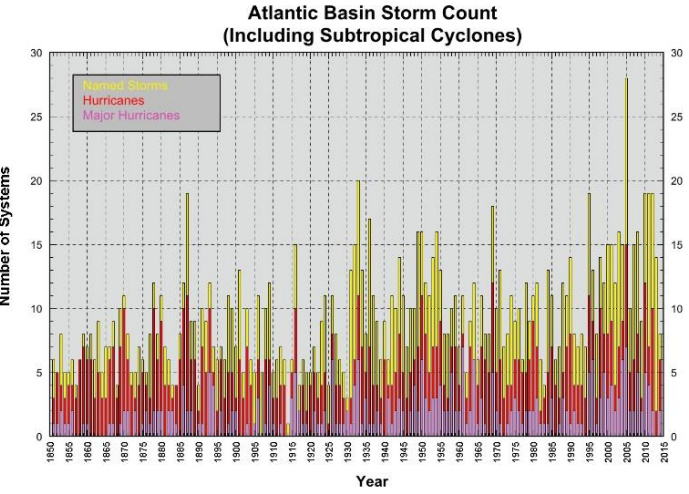


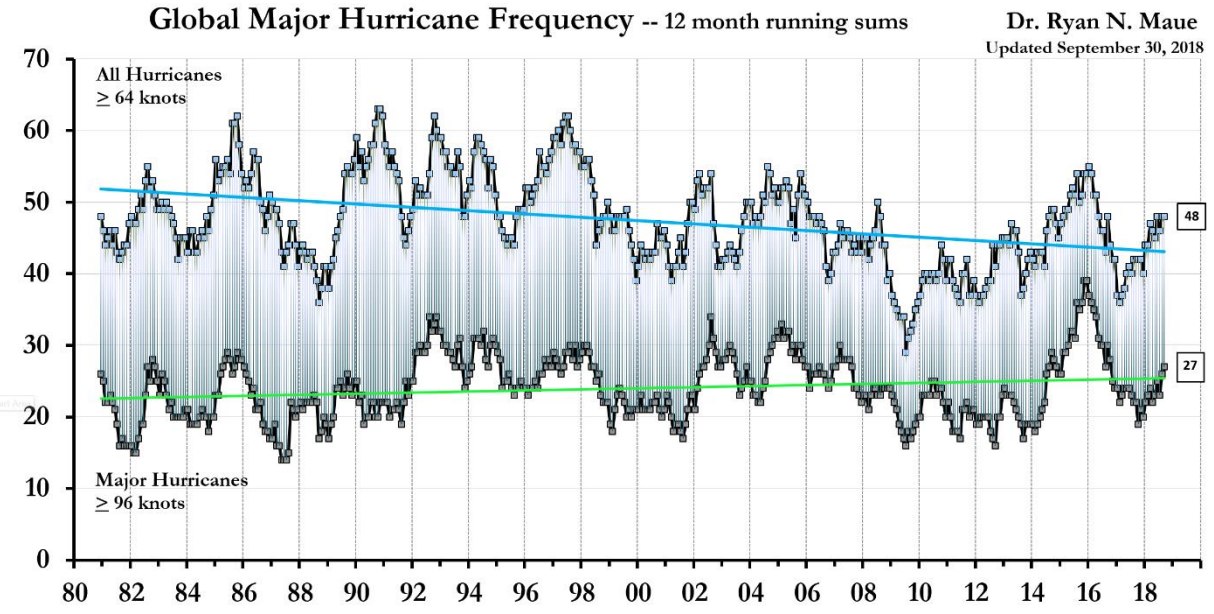
A leggyakoribb félreértés…..

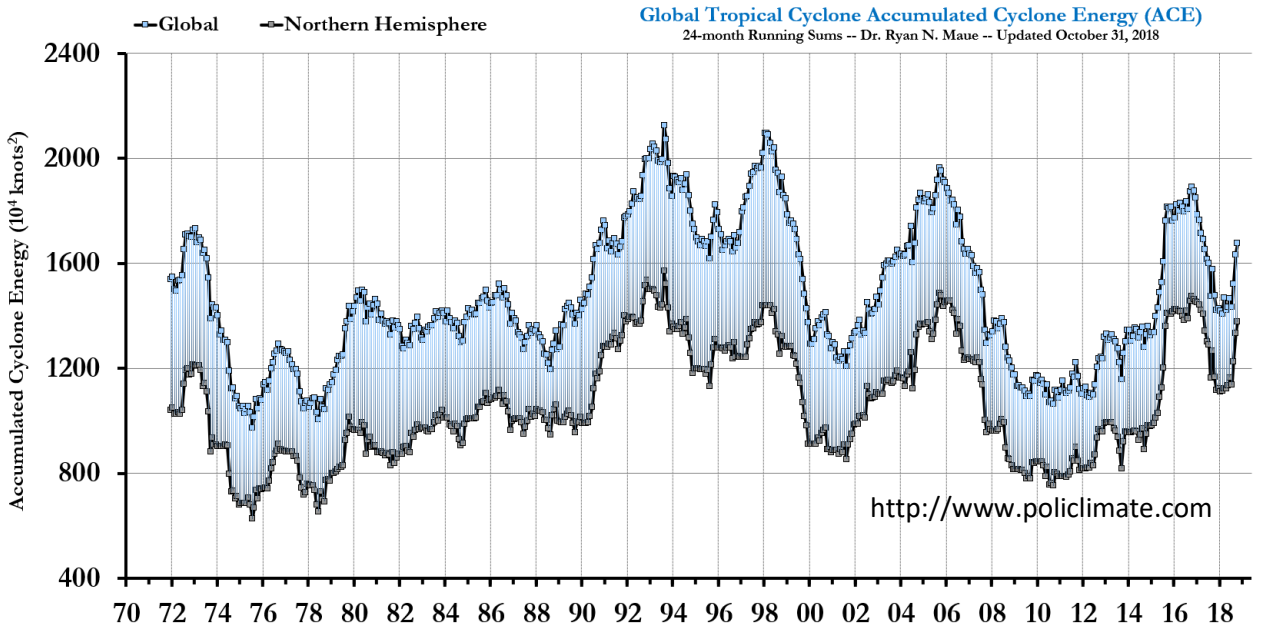




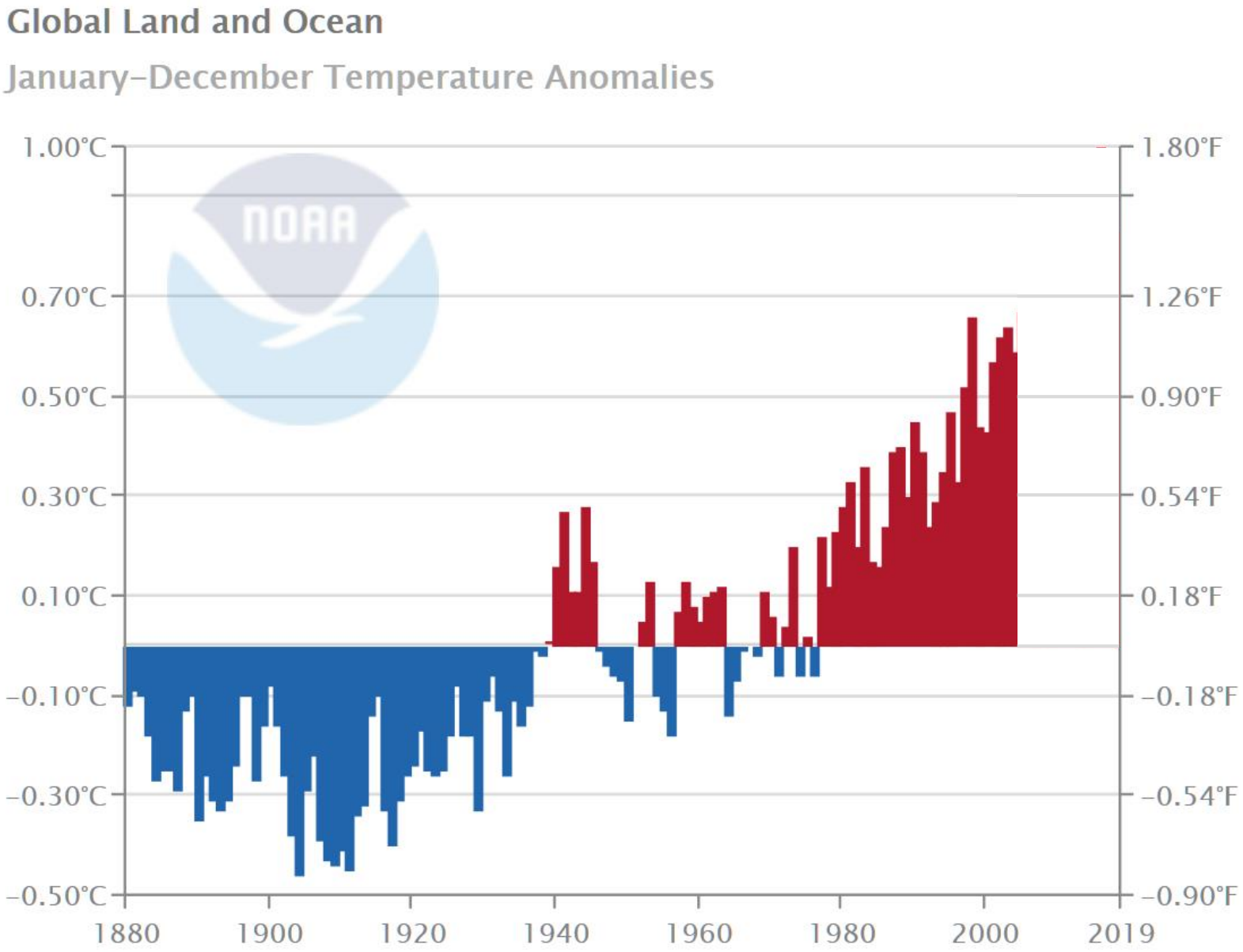
"The environment for all such storms has changed because of climate change."
(Kevin Trenberth, NCAR – *Sci. Am.* 3 Sept. 2019)







1. Globális felmelegedés



https://www.ncdc.noaa.gov/cag/

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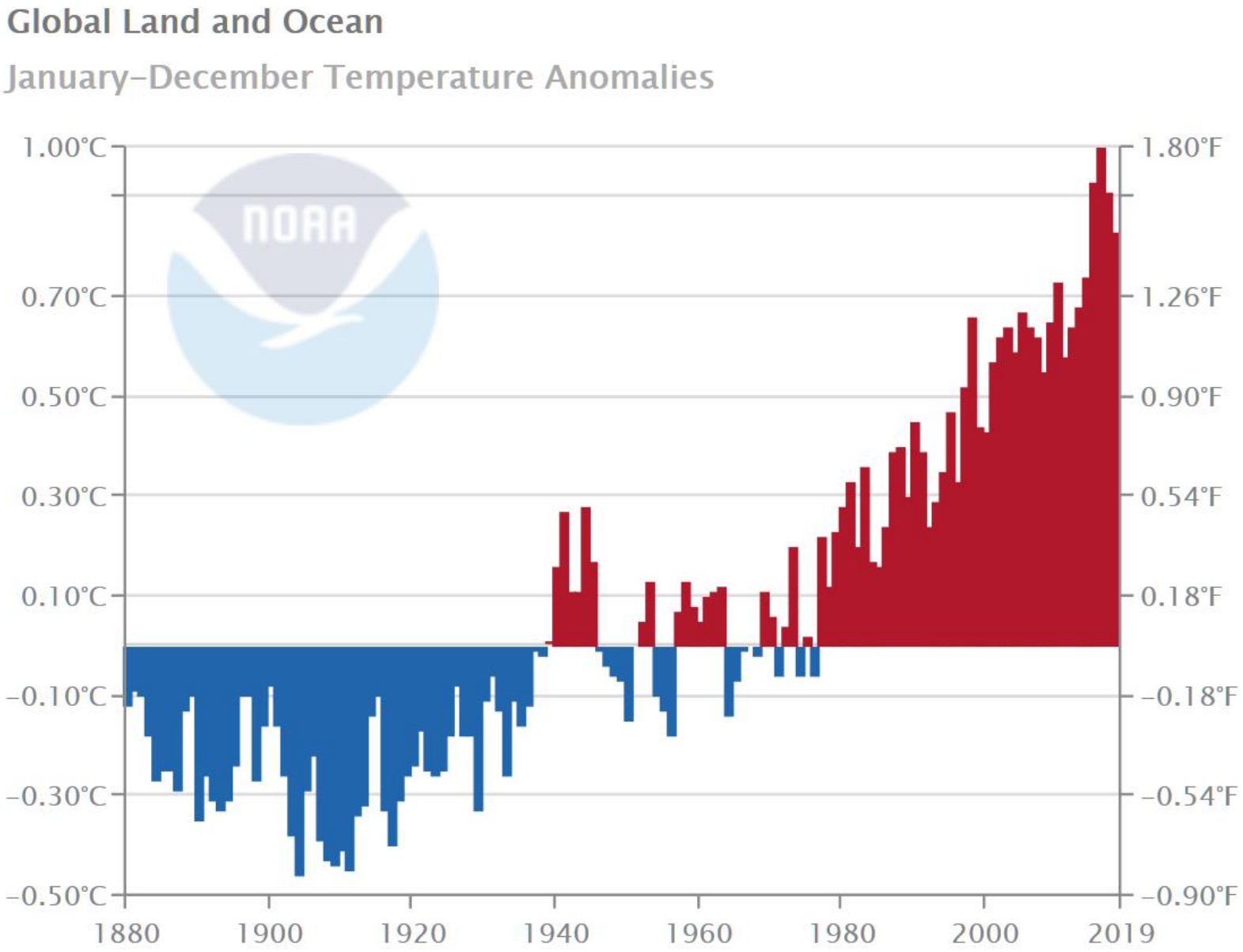

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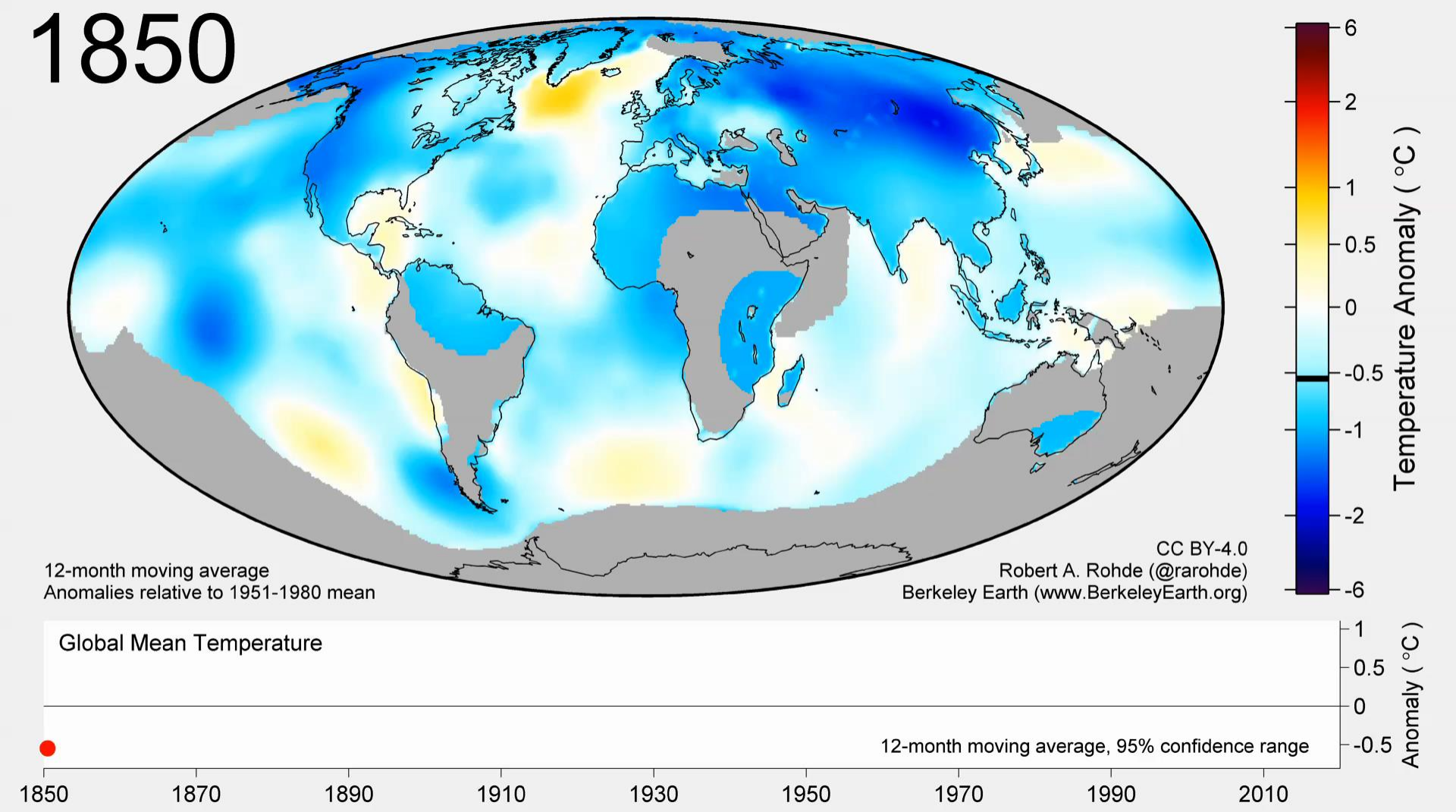
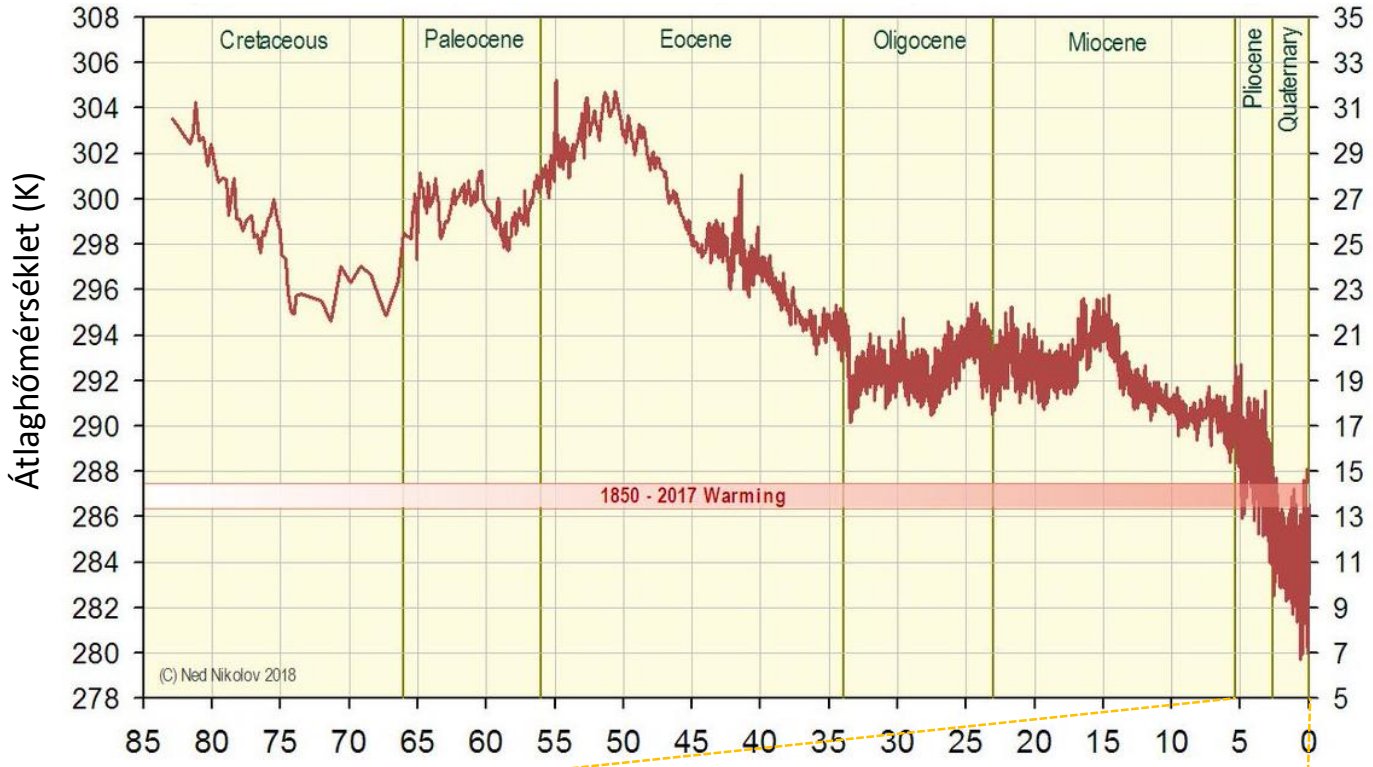
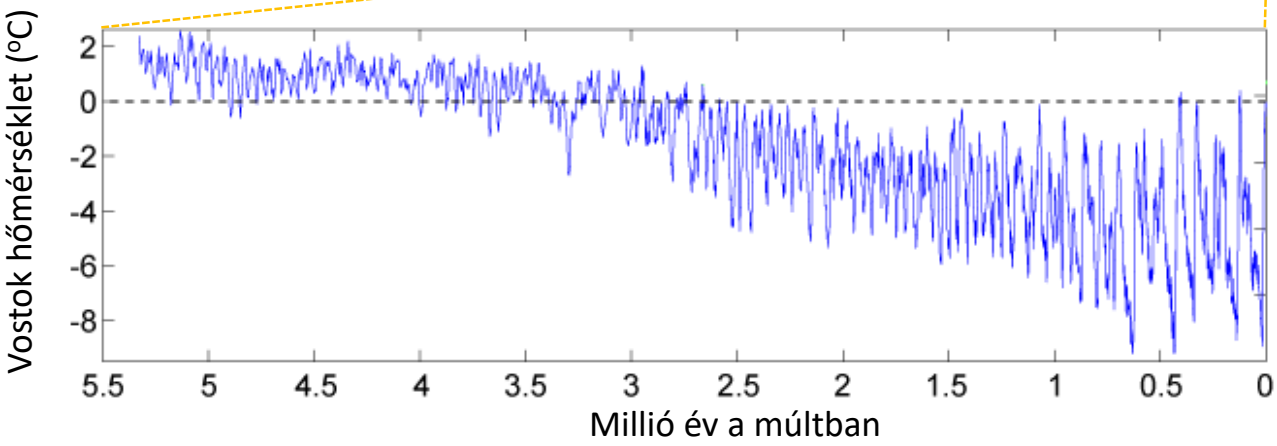
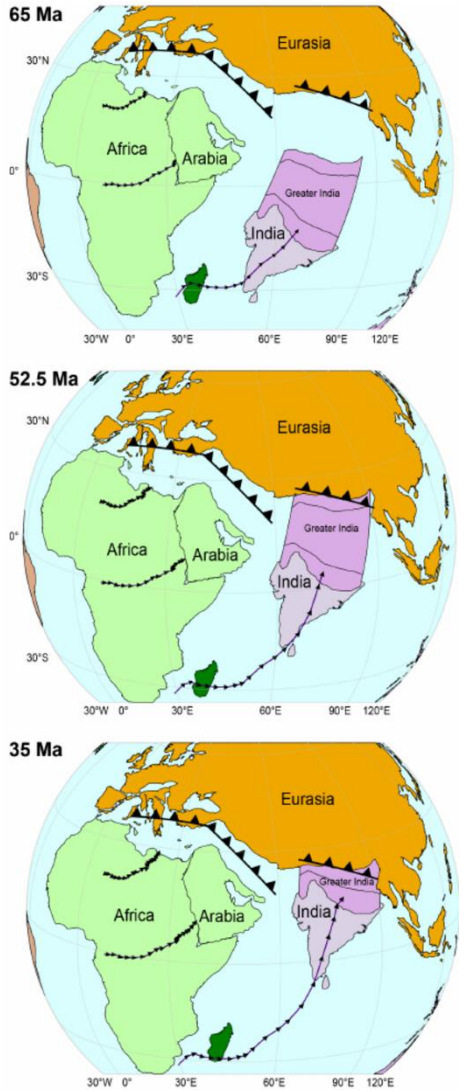


1. Globális felmelegedés a paleoklimatológia tükrében







Hoareau et al., *Climate of the Past*, **11**, 1751-1767, 2015

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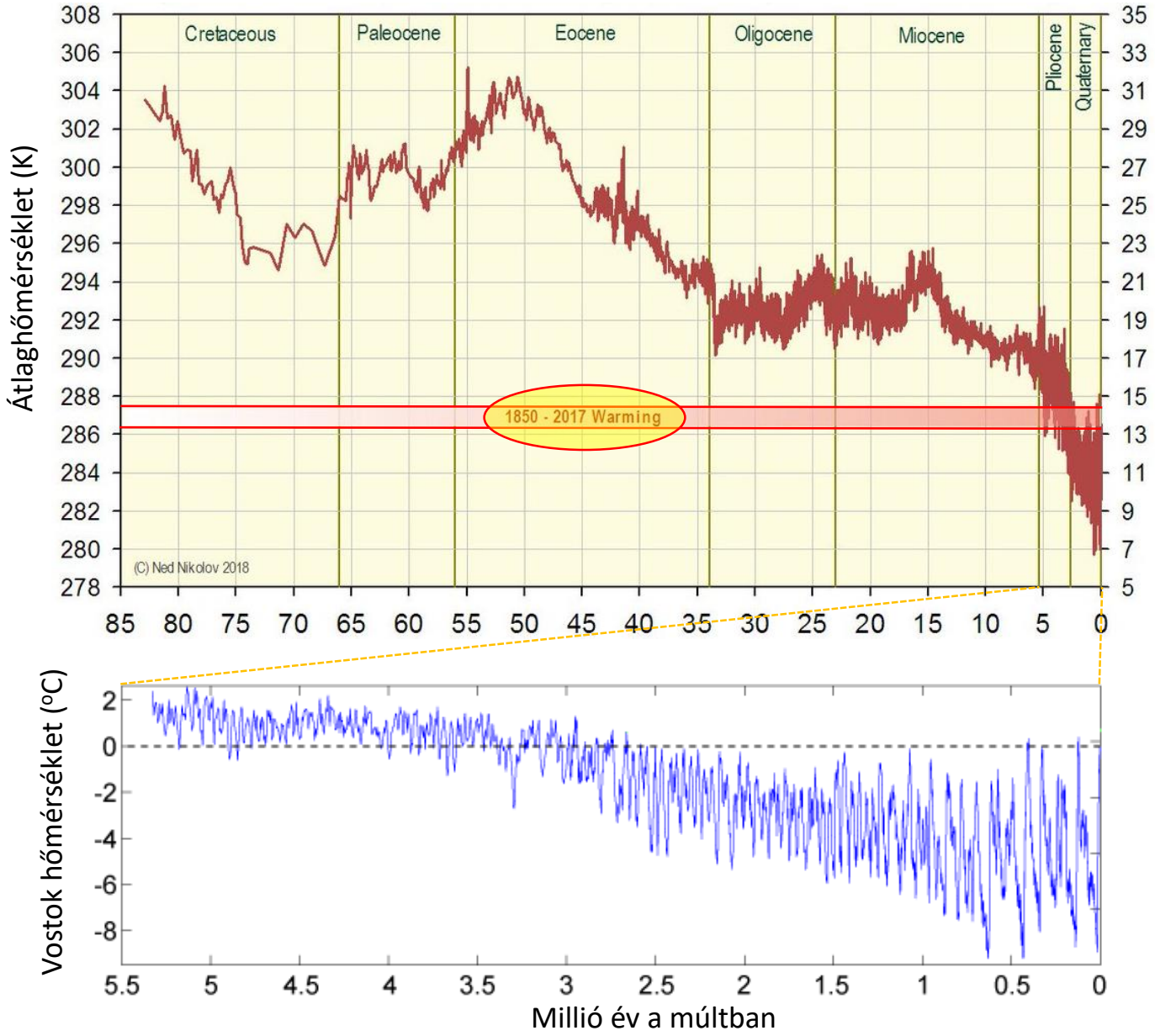

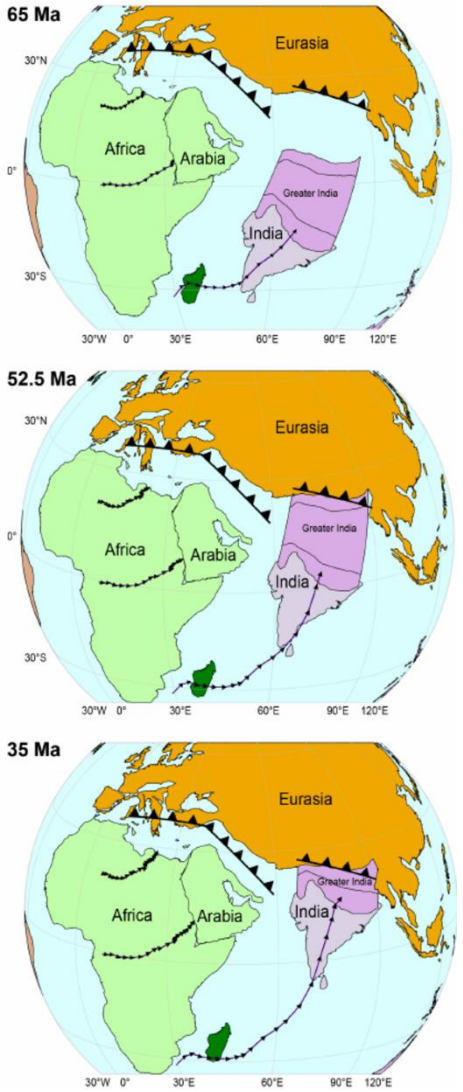

Hoareau et al., *Climate of the Past*, **11**, 1751-1767, 2015

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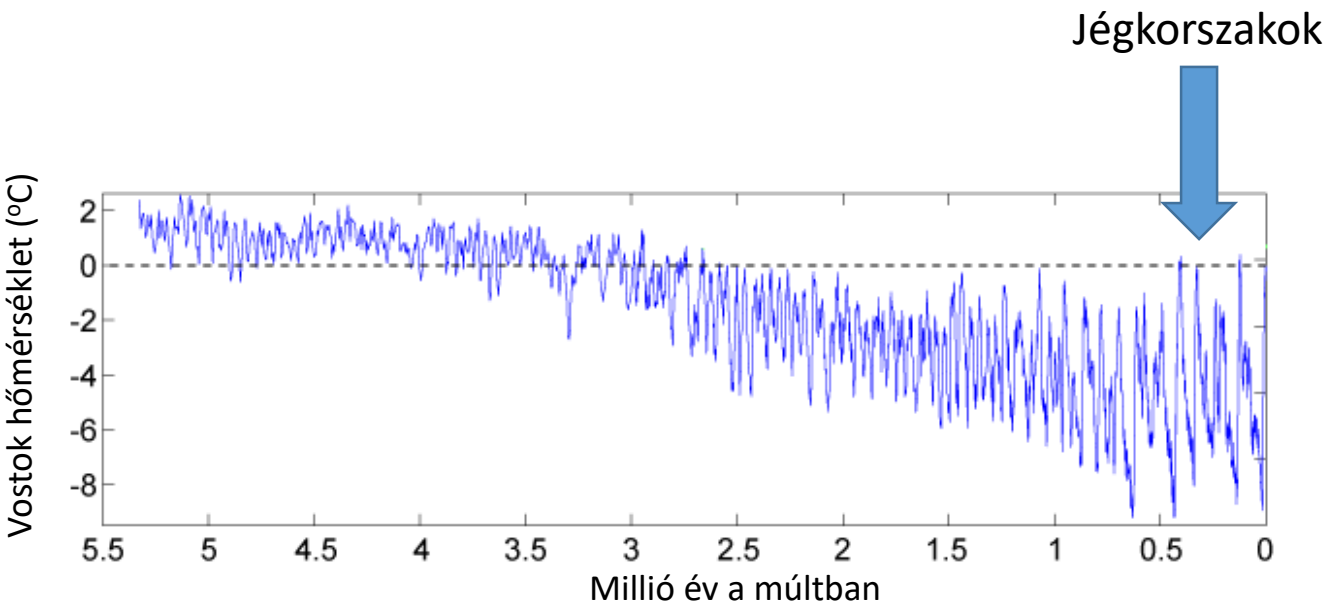

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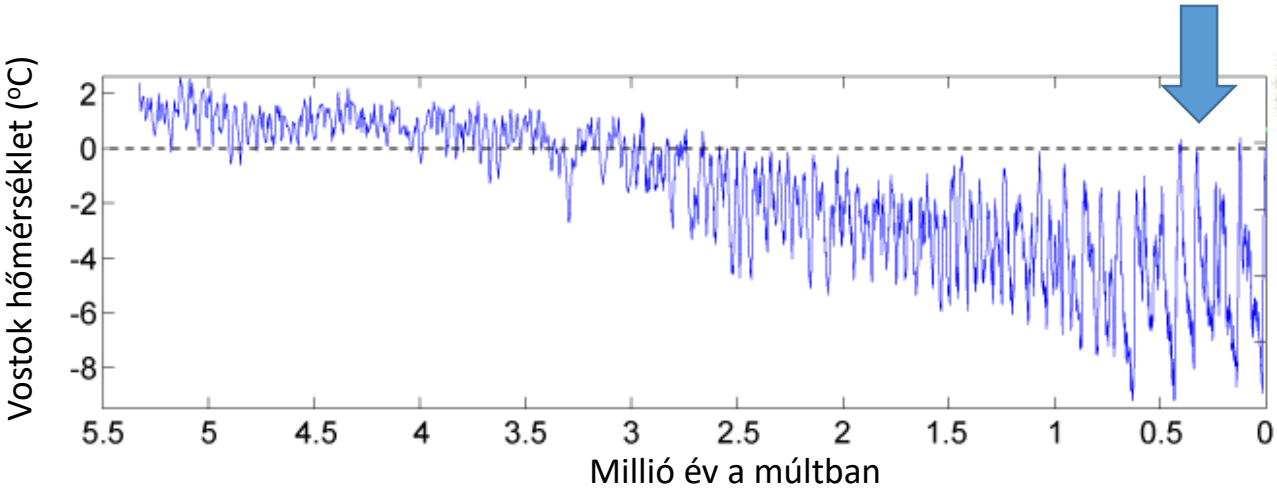
Jégkorszakok



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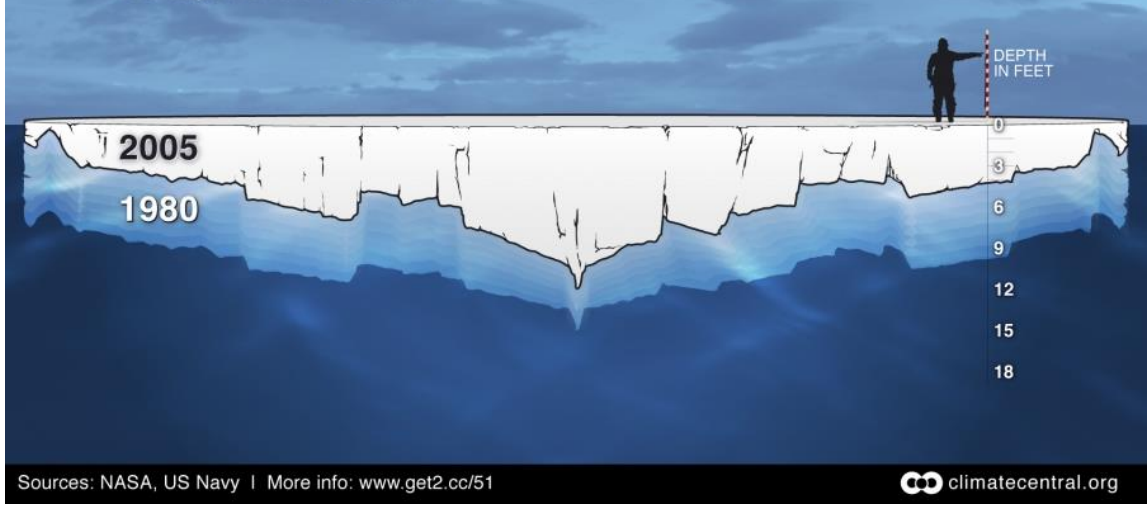

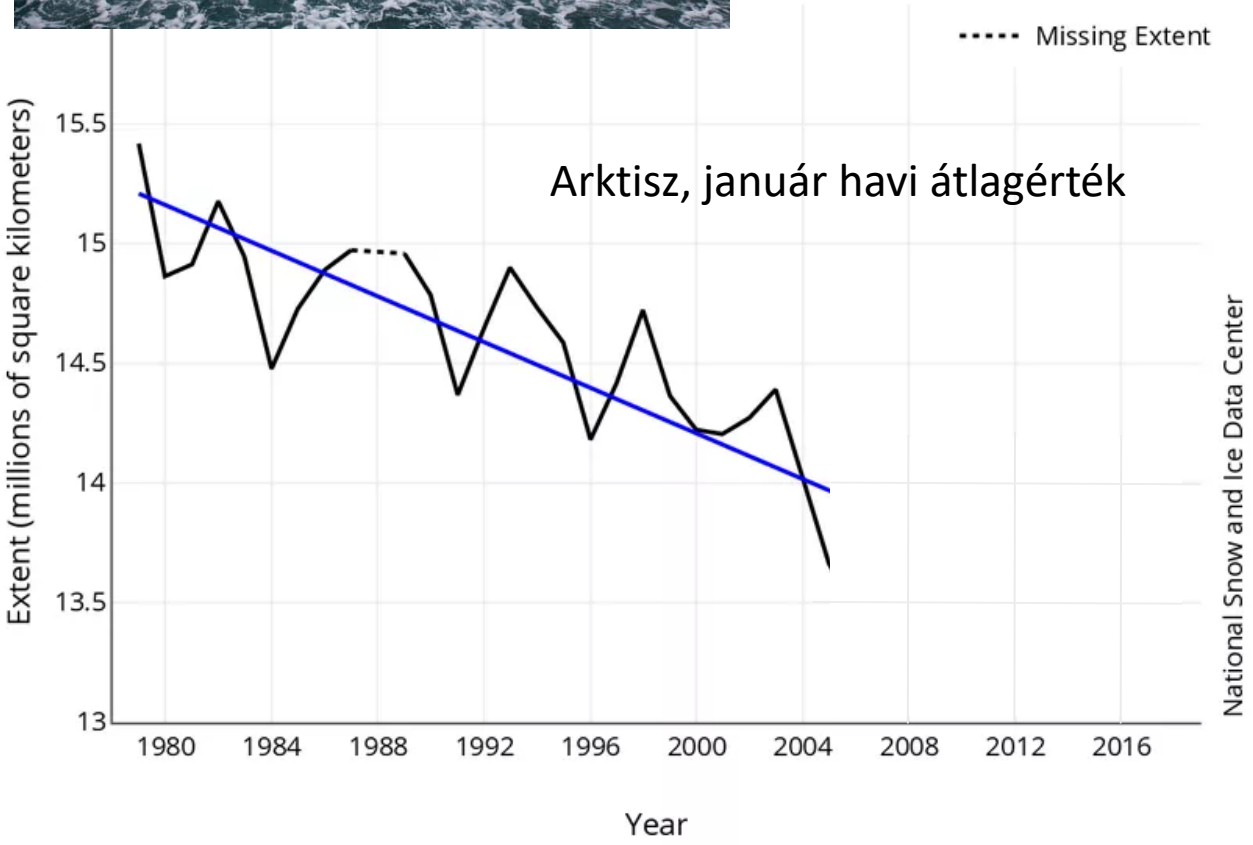

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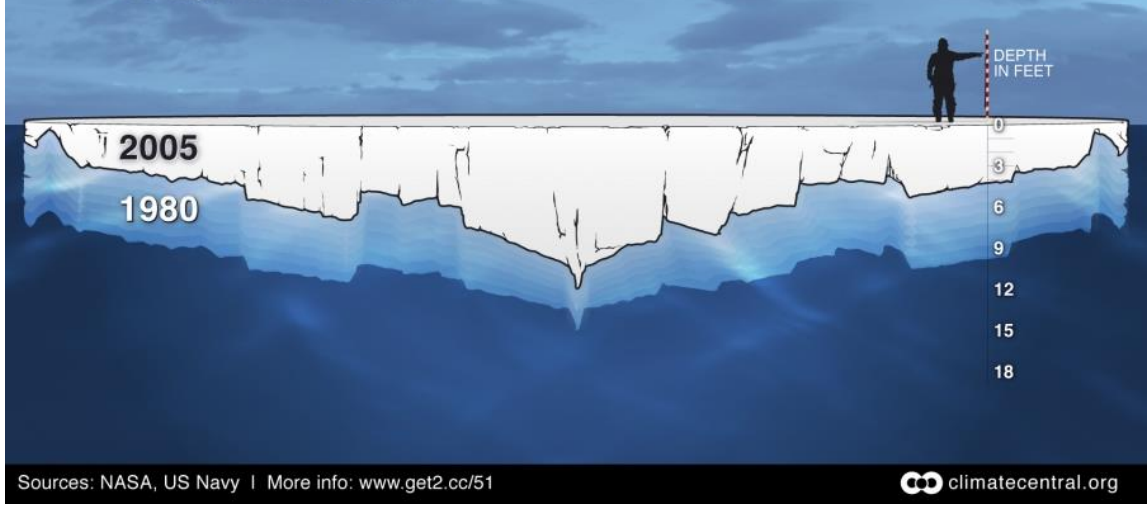

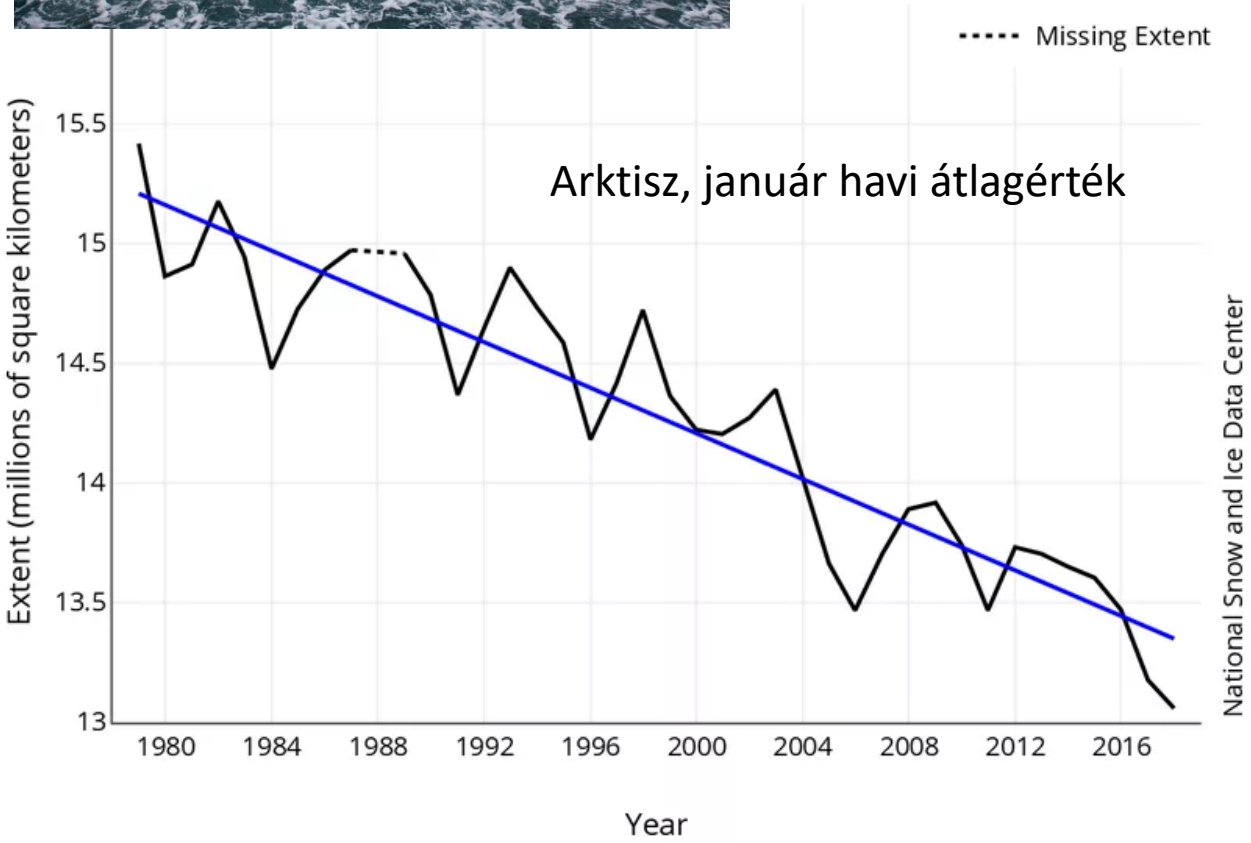

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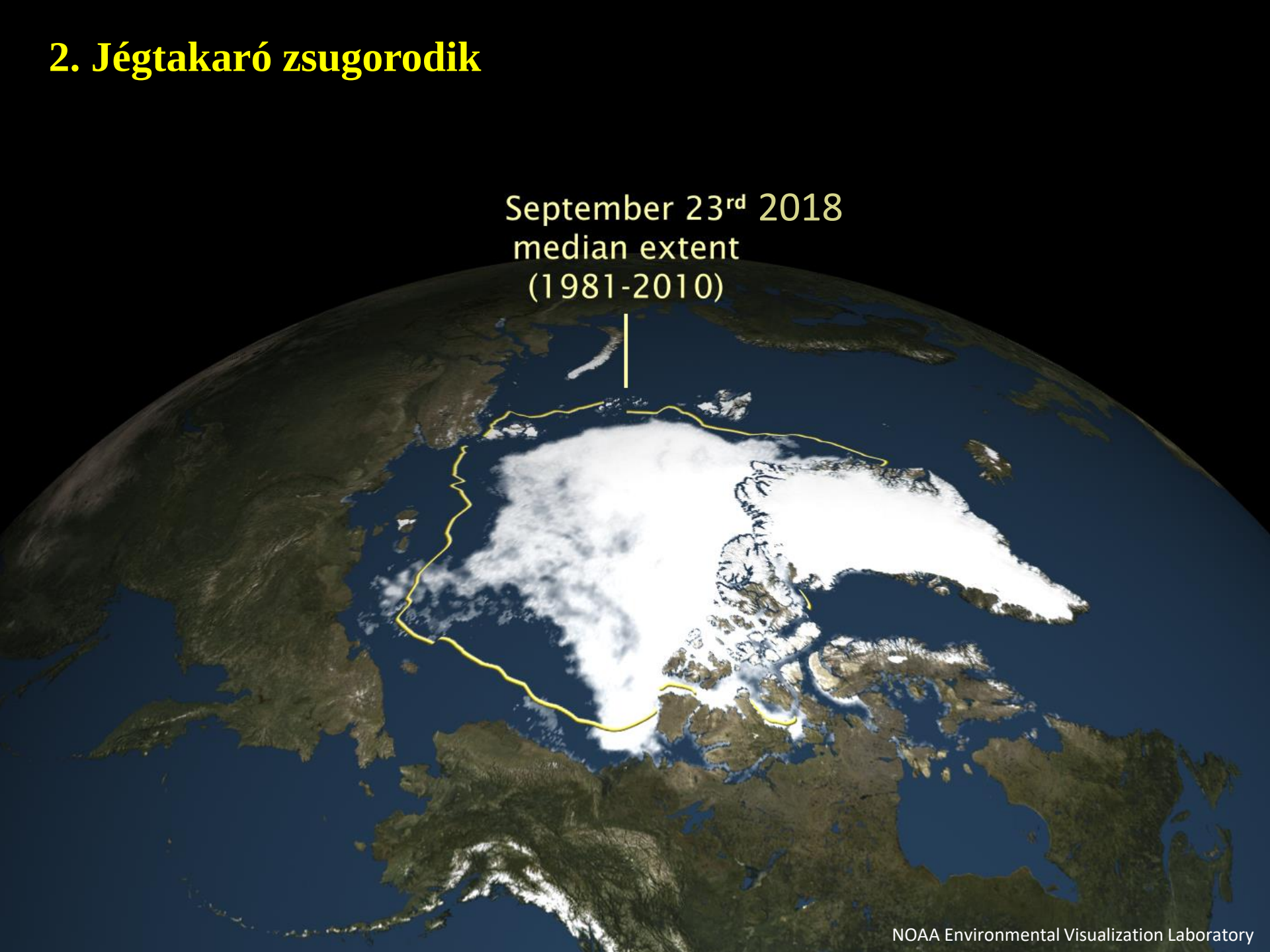

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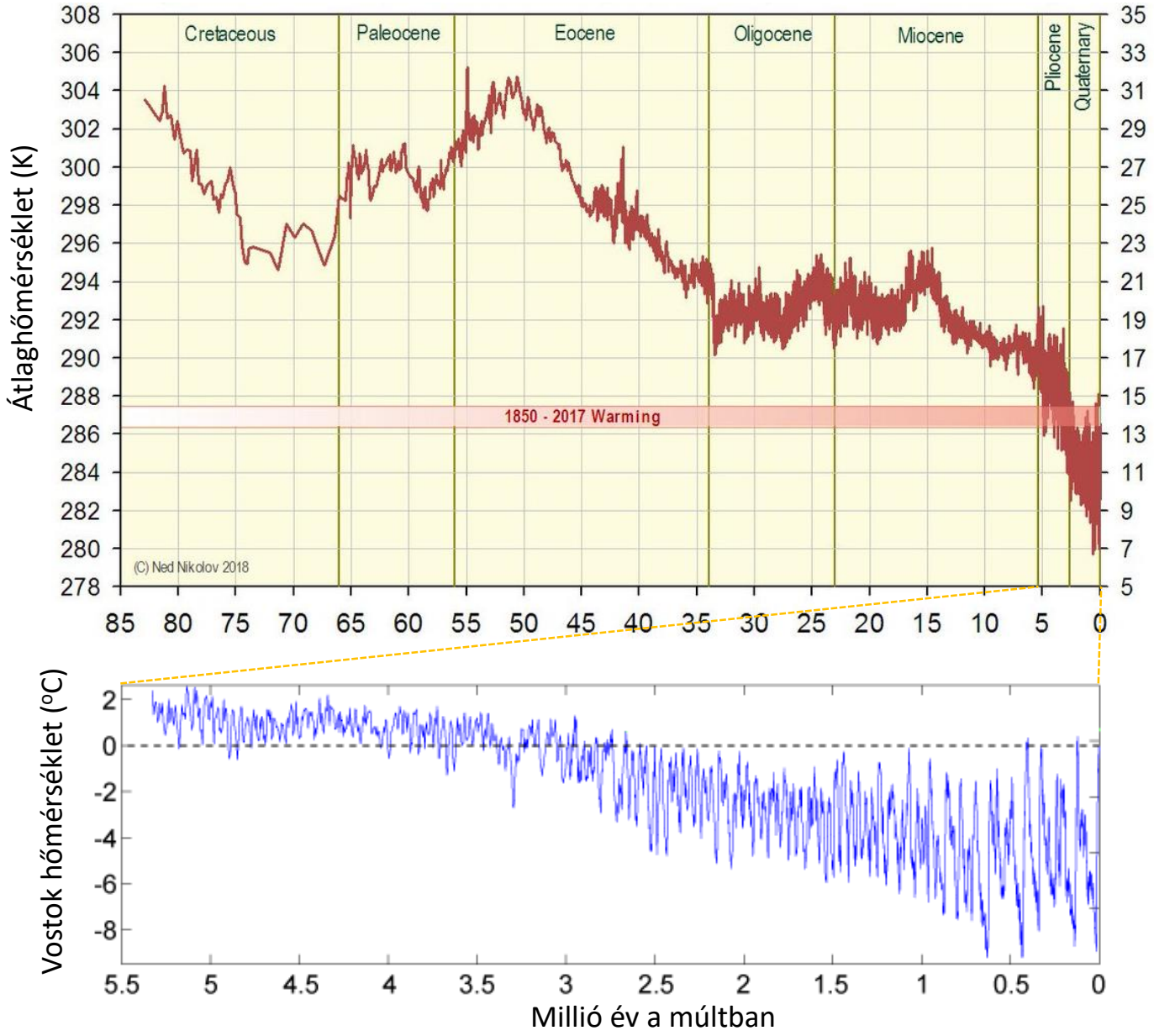

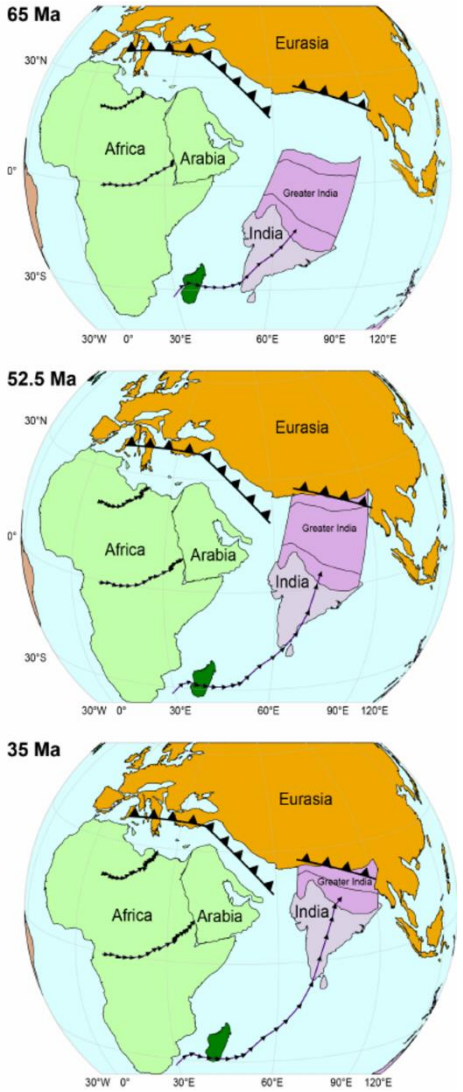

Hoareau et al., *Climate of the Past*, **11**, 1751-1767, 2015

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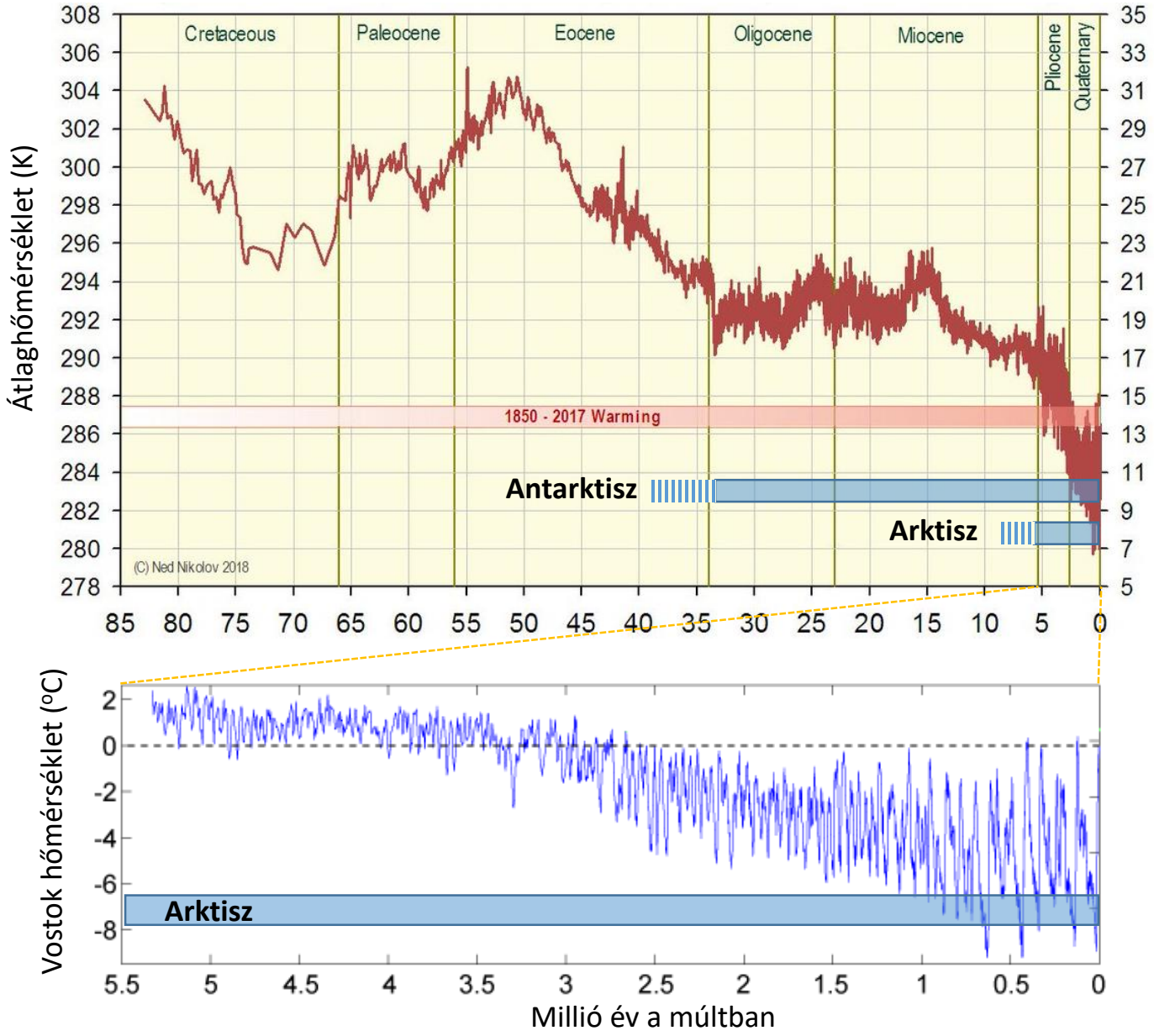

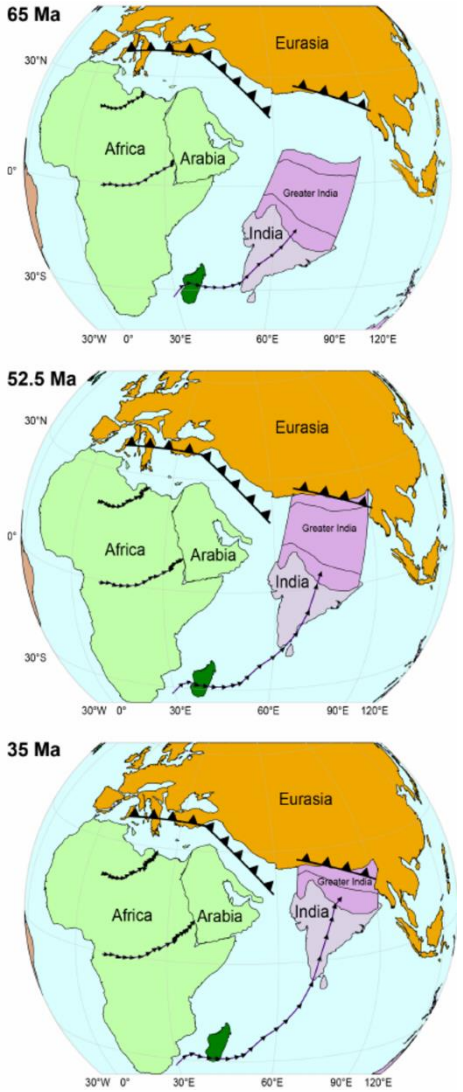

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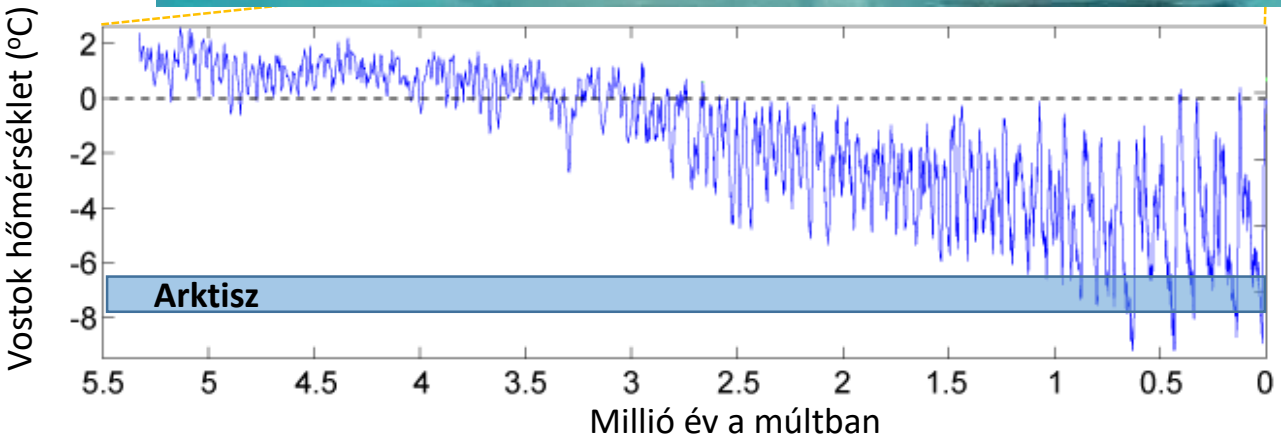

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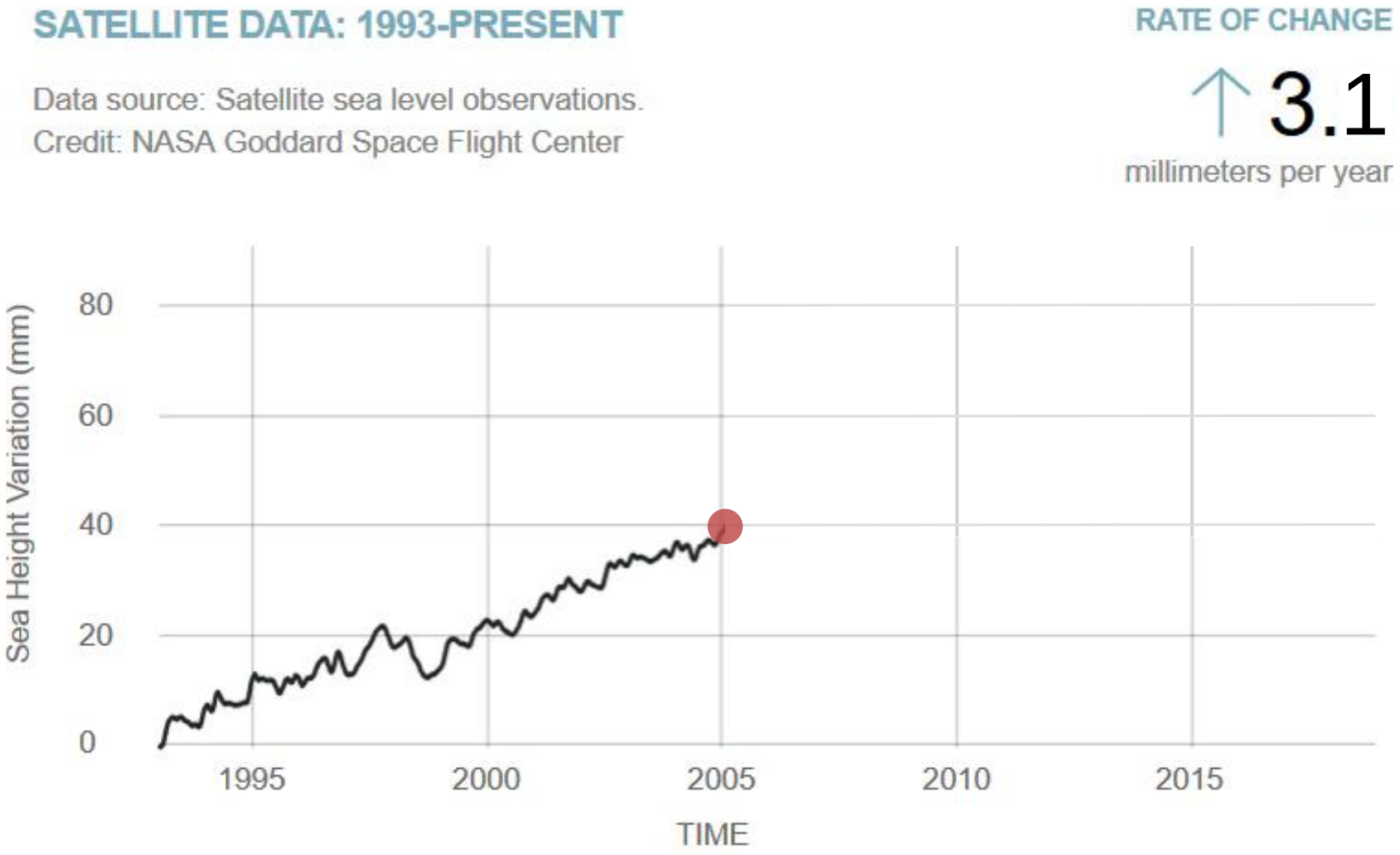

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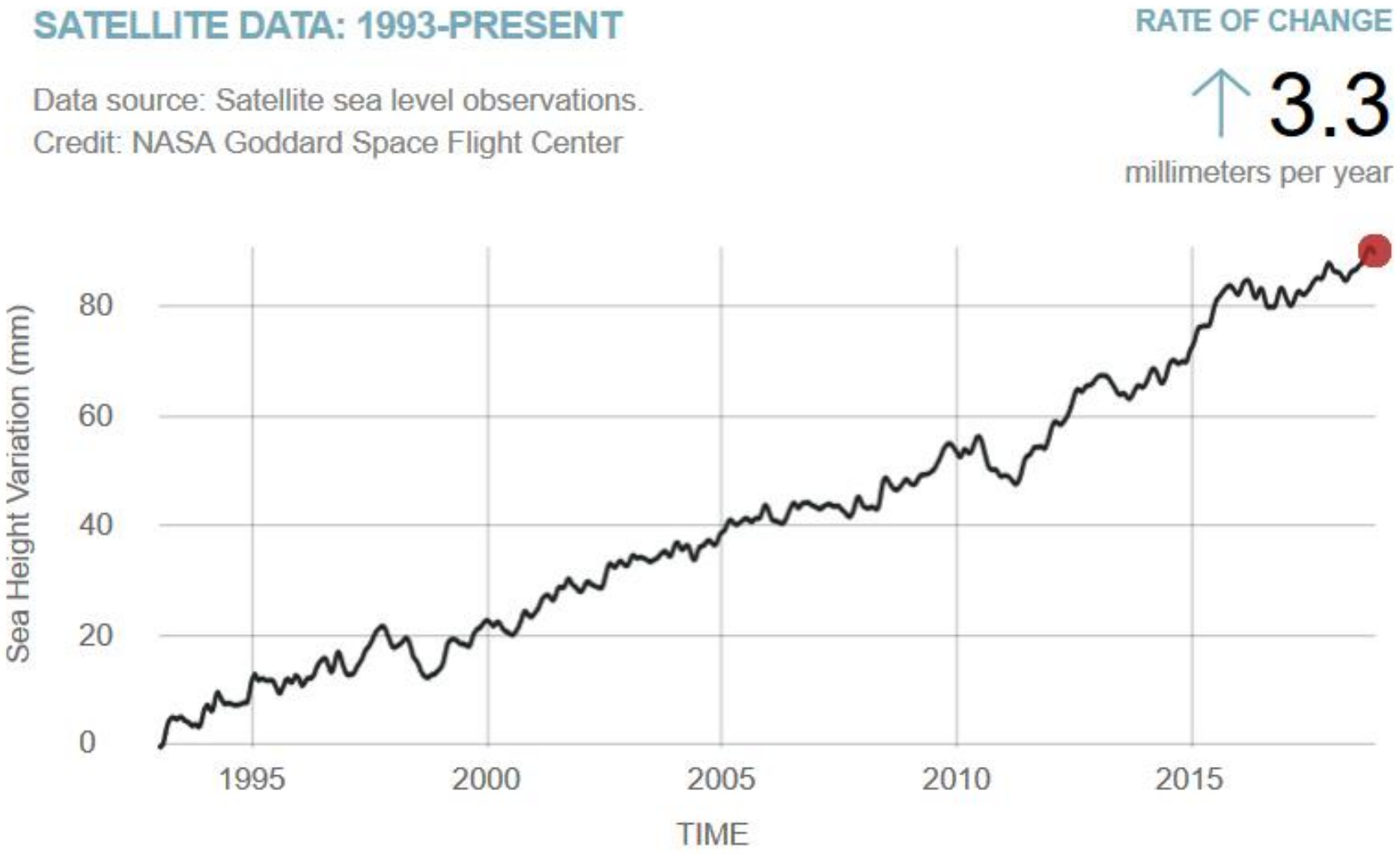

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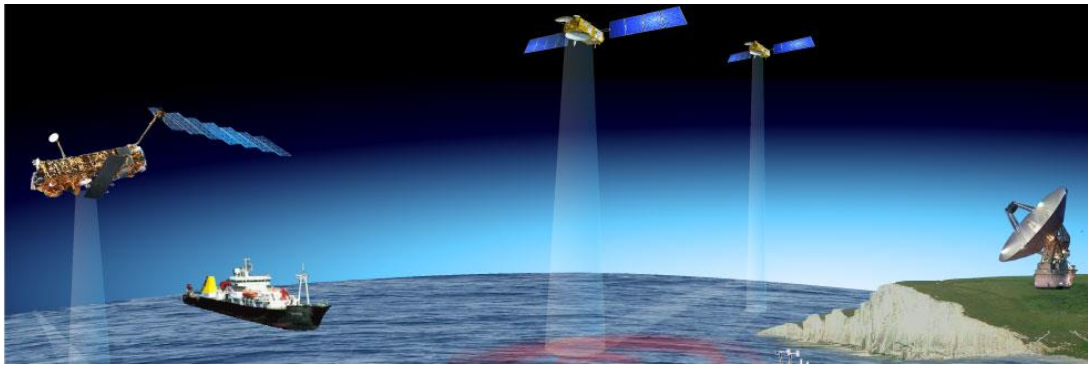

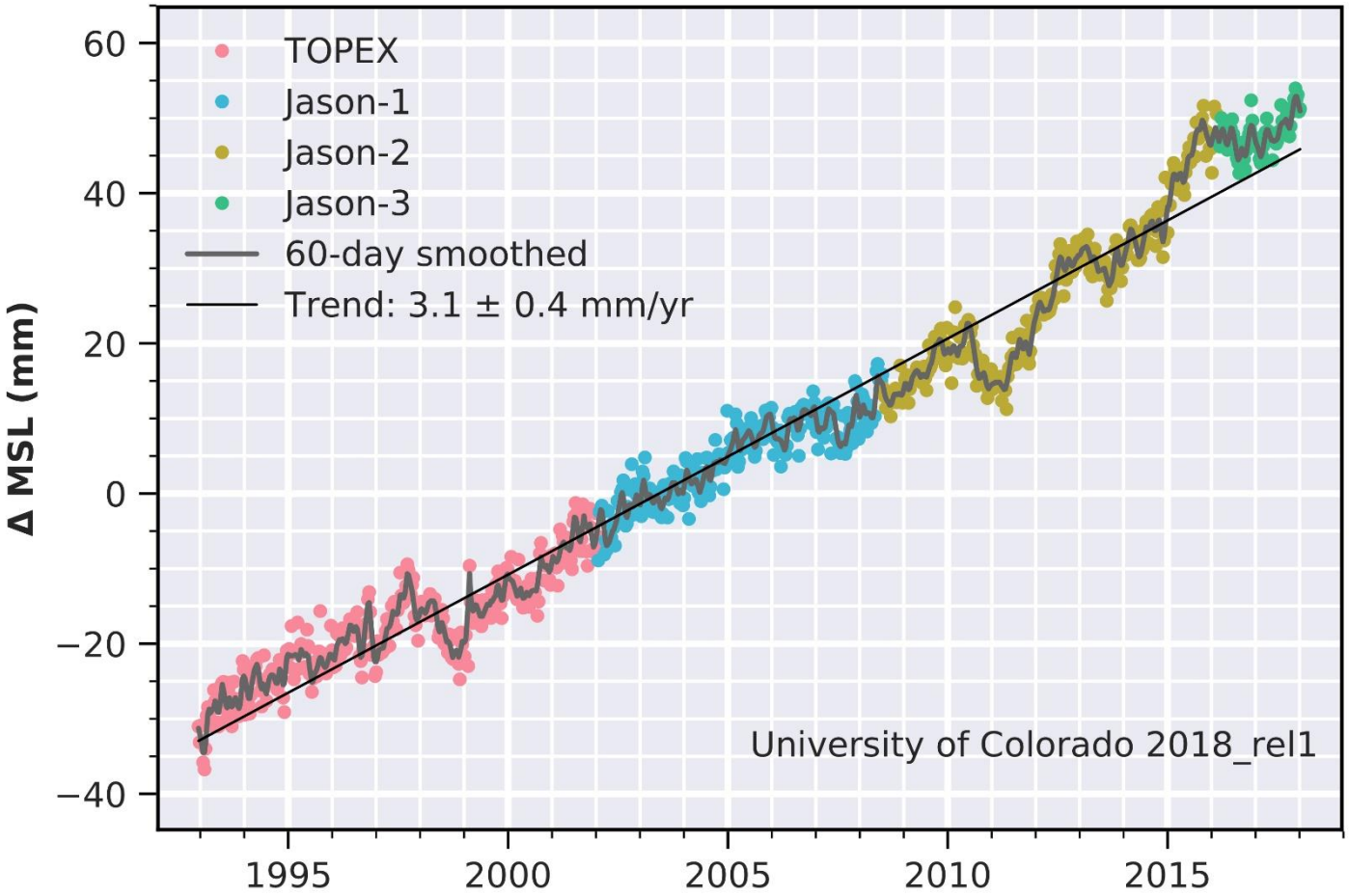

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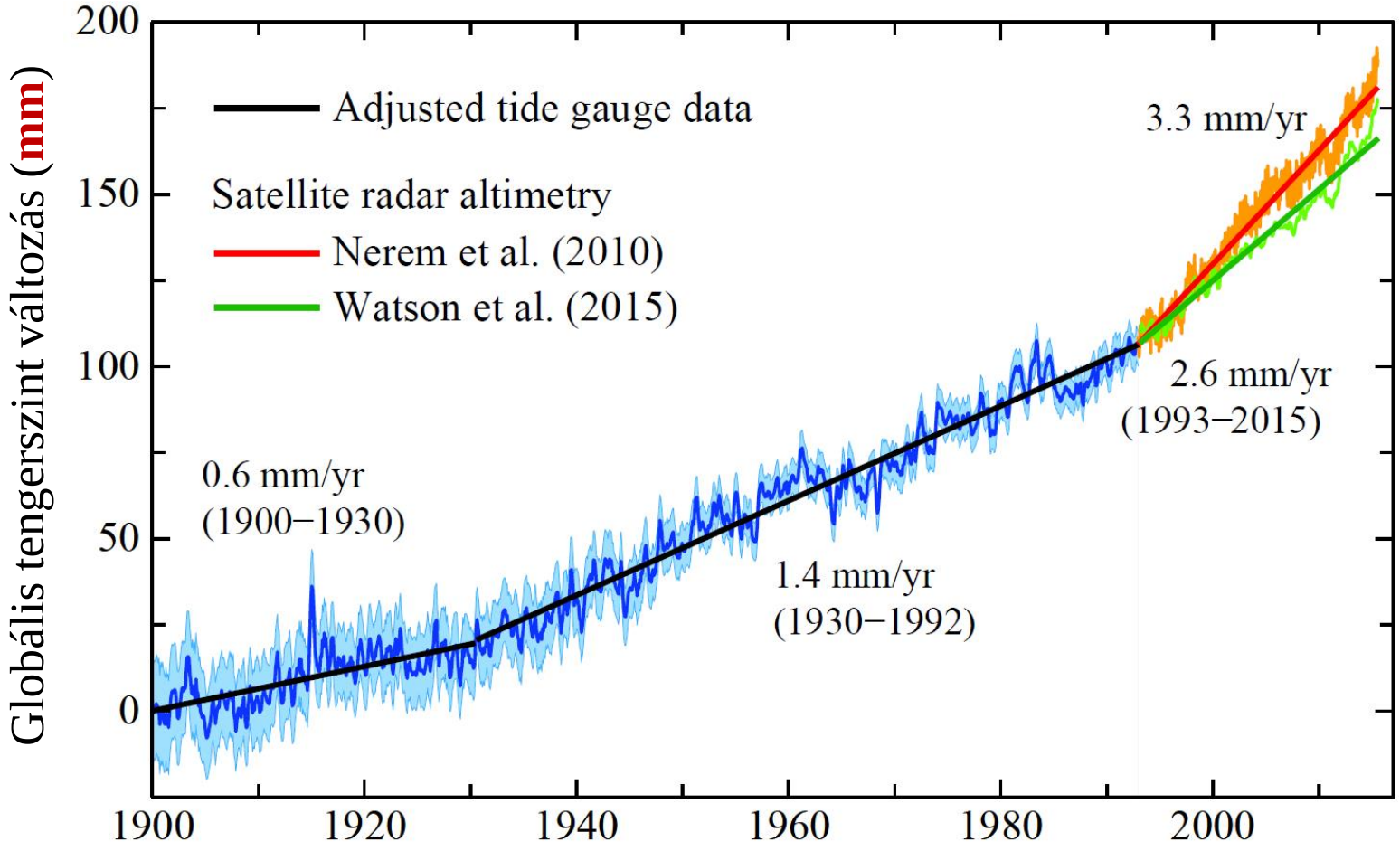

Hansen, J. et al., *Atmos. Chem. Phys.*, **16**, 3761–3812, 2016

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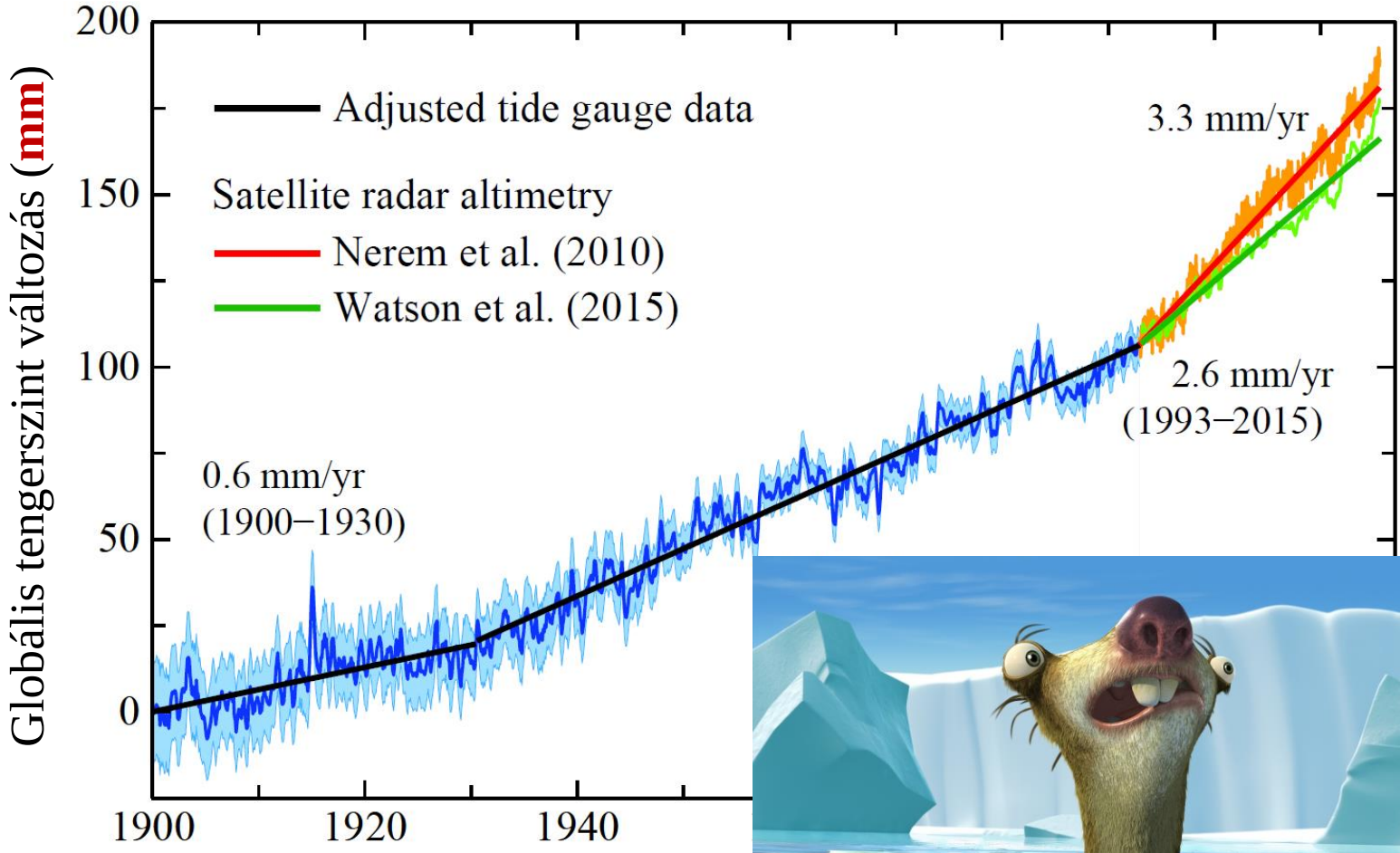
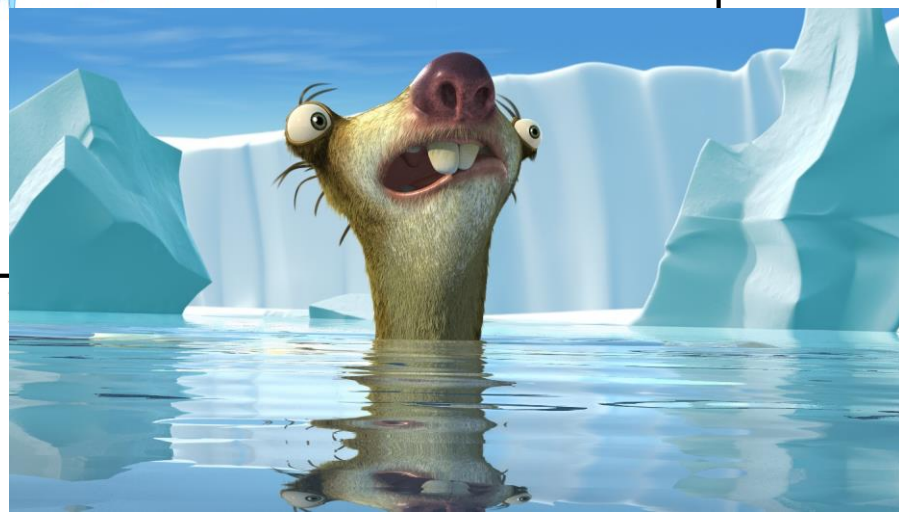
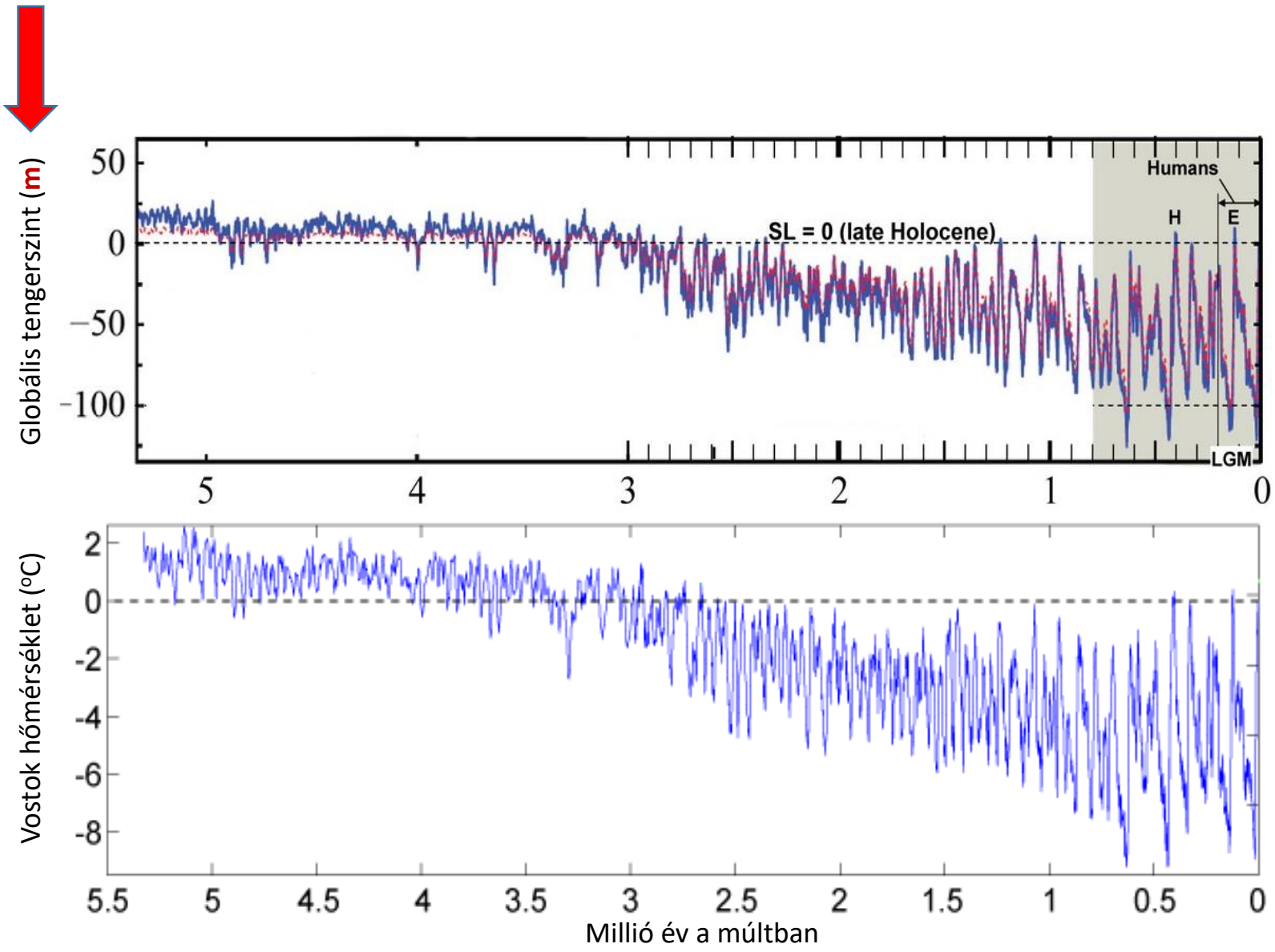




3. Óceánok vízszintje: paleoklimatológia



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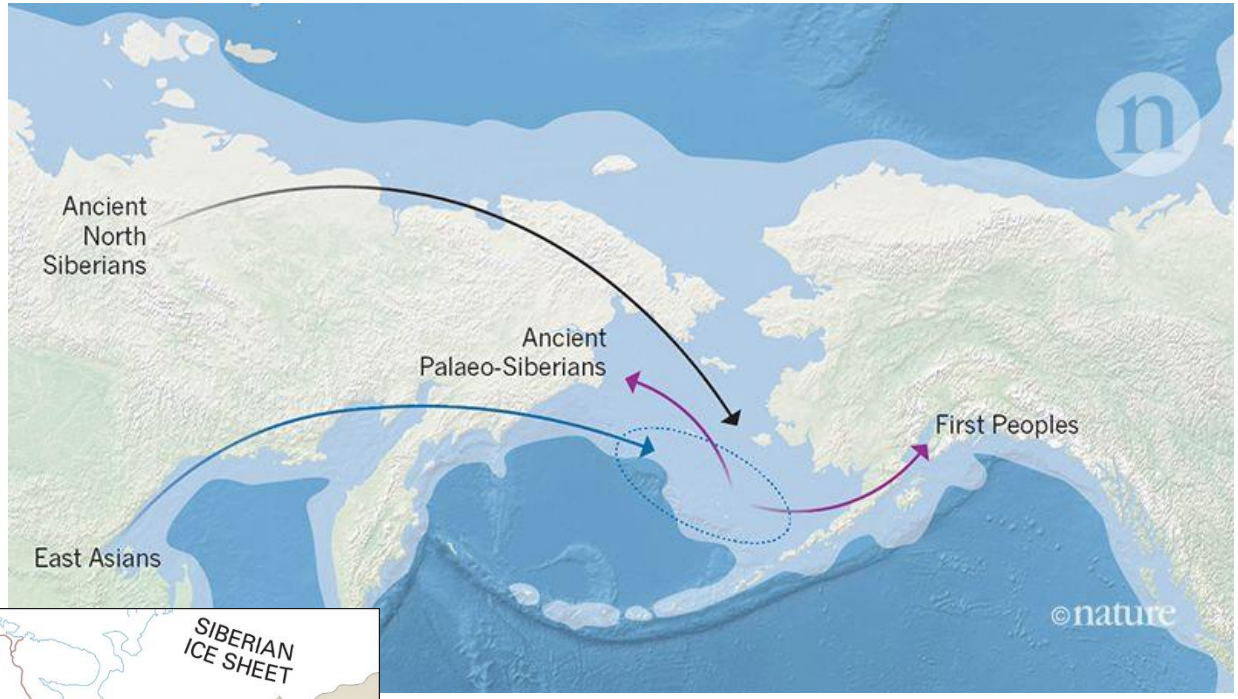

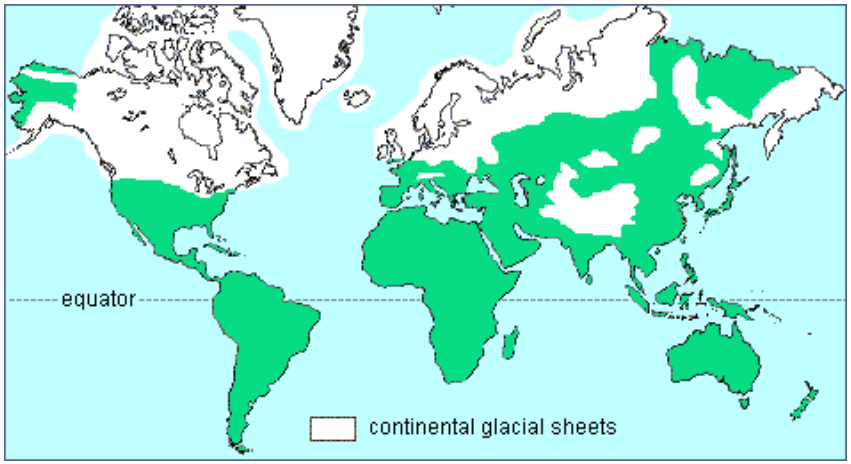

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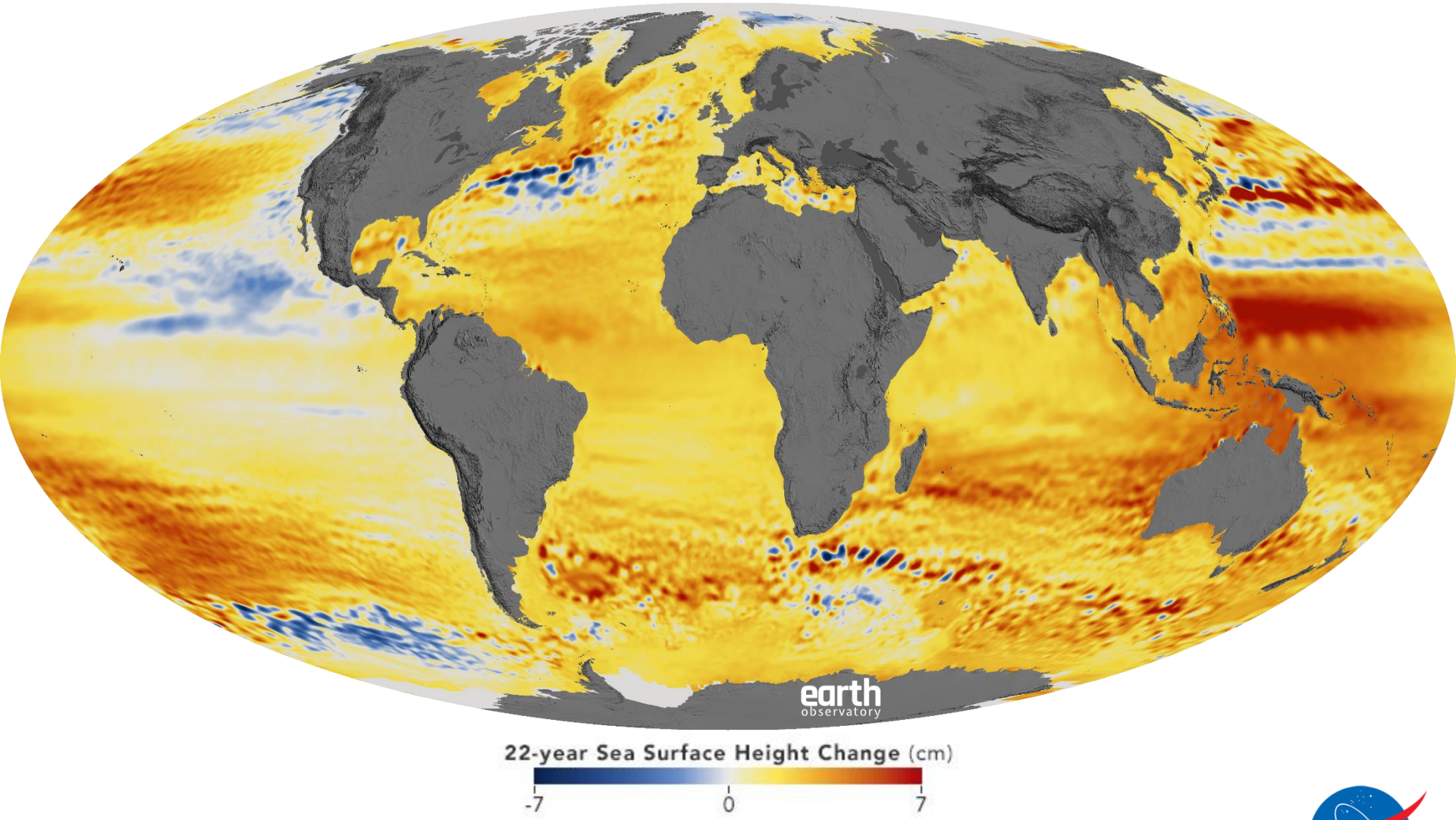
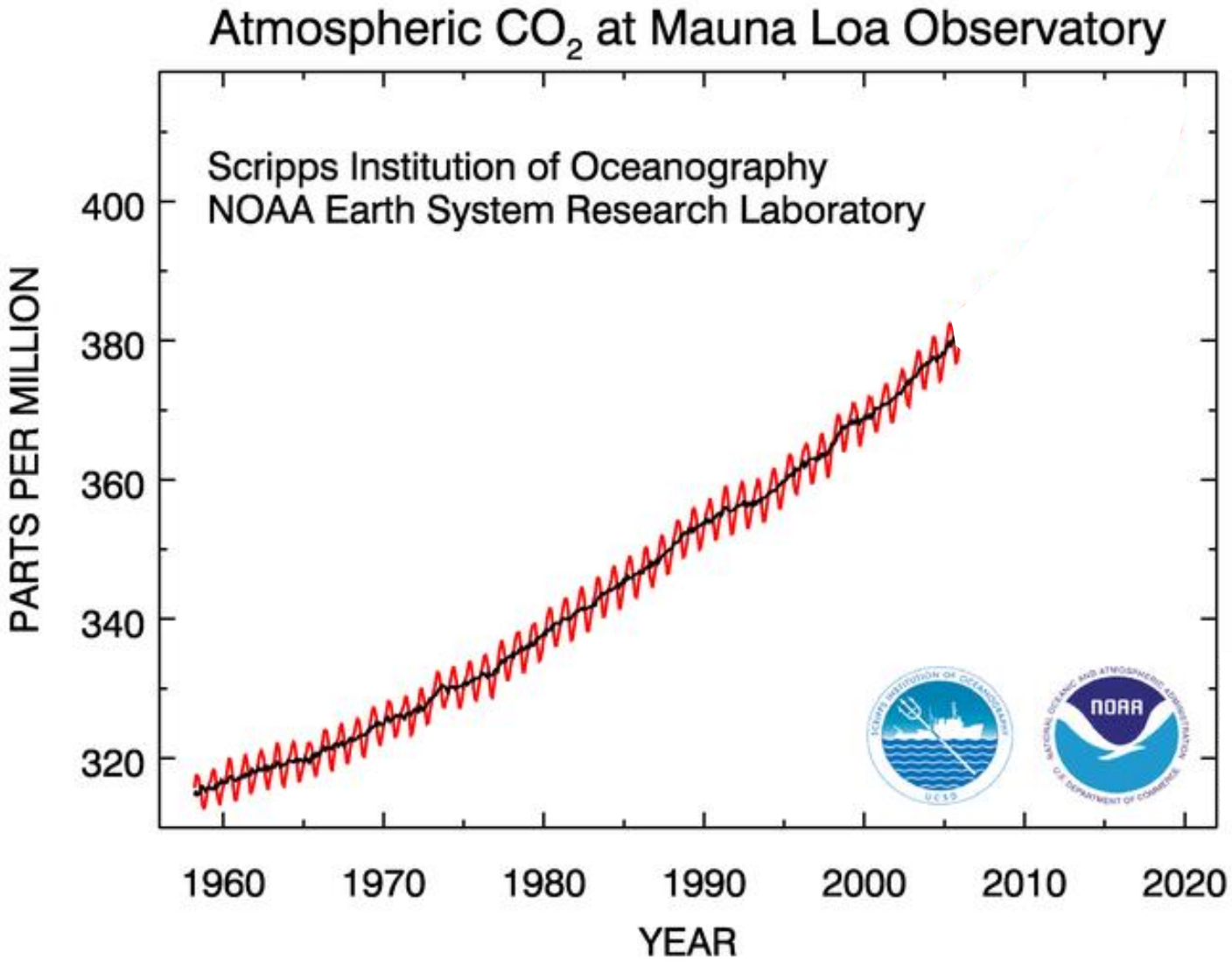


4. Emberi tevékenység



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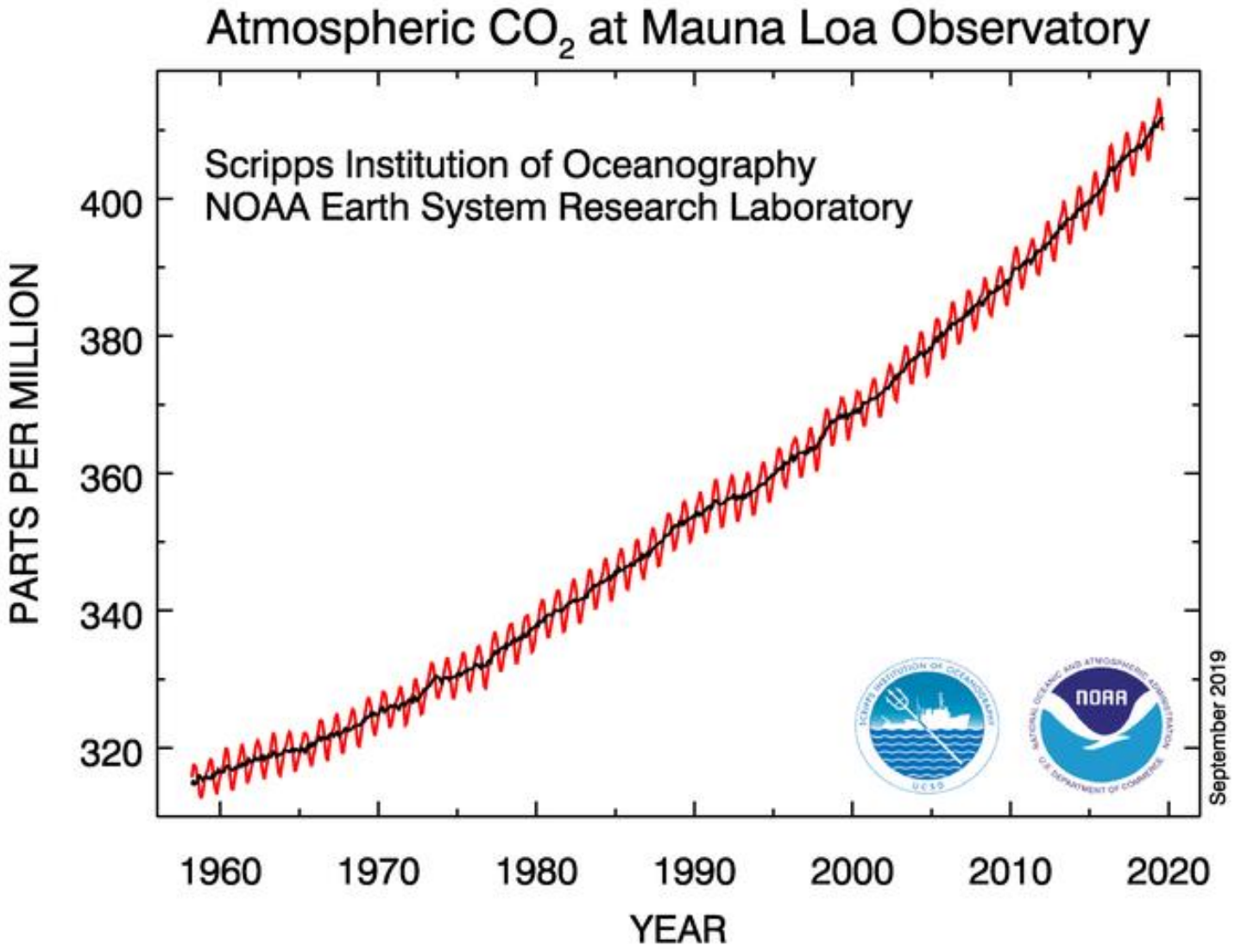

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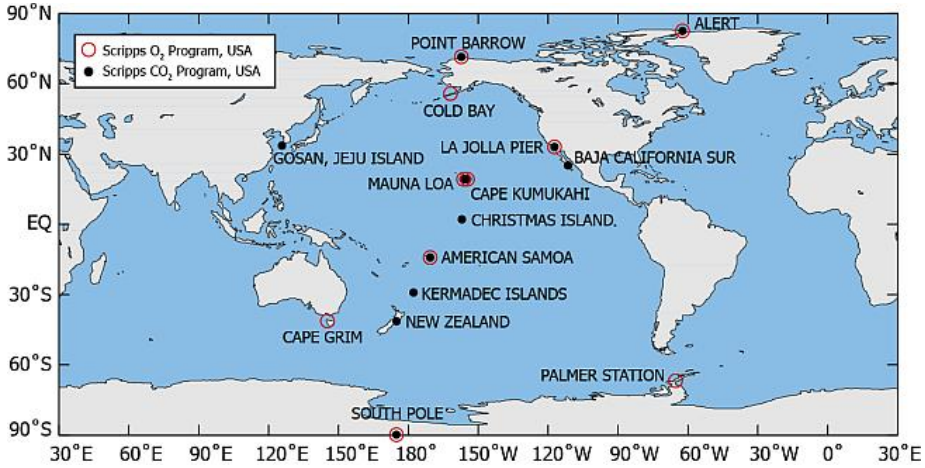

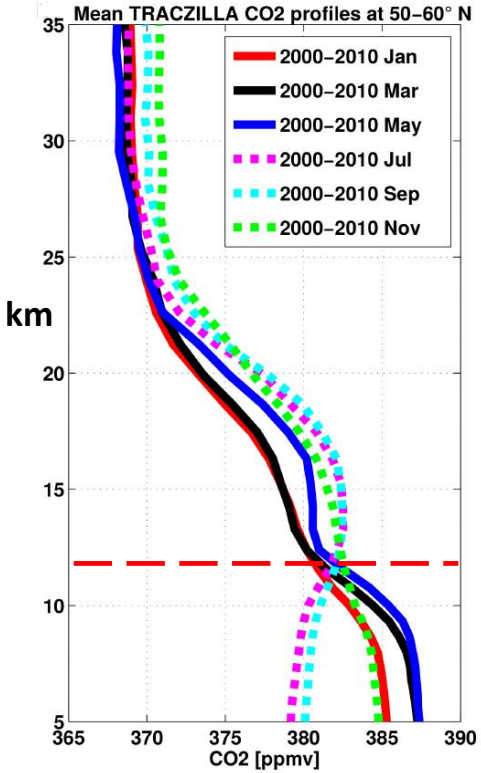

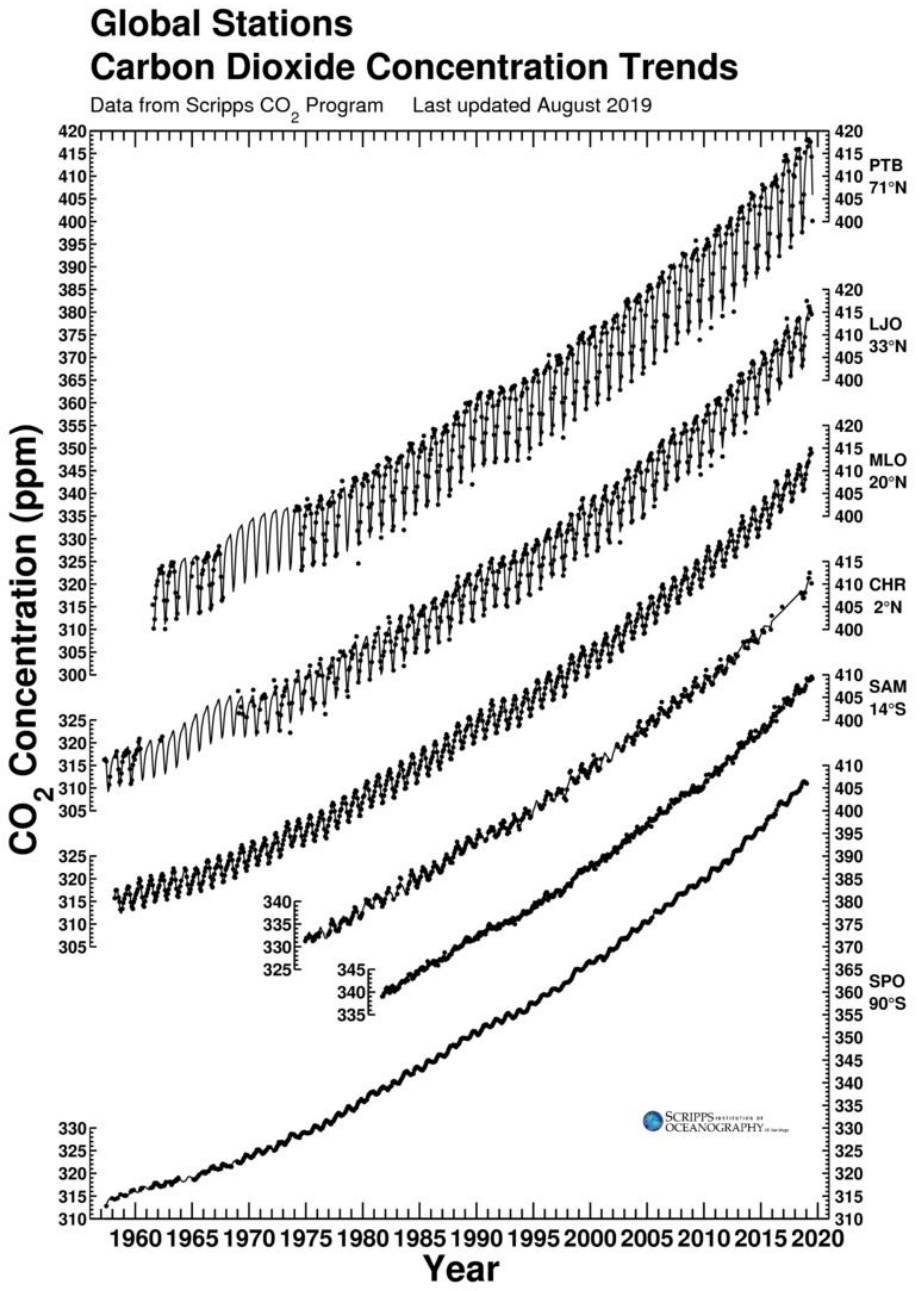

Diallo, M. et al., *Atmos. Chem. Phys.*, **17**, 3861–3878, 2017

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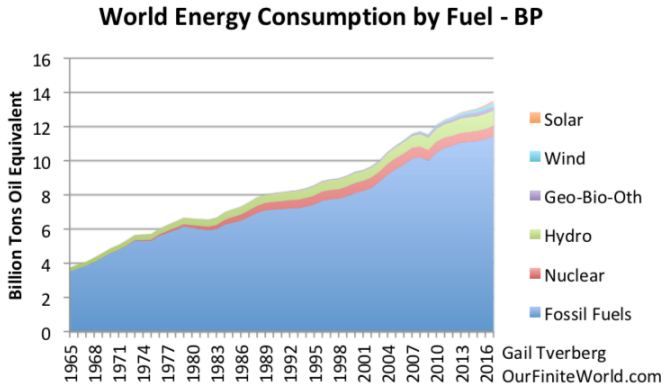

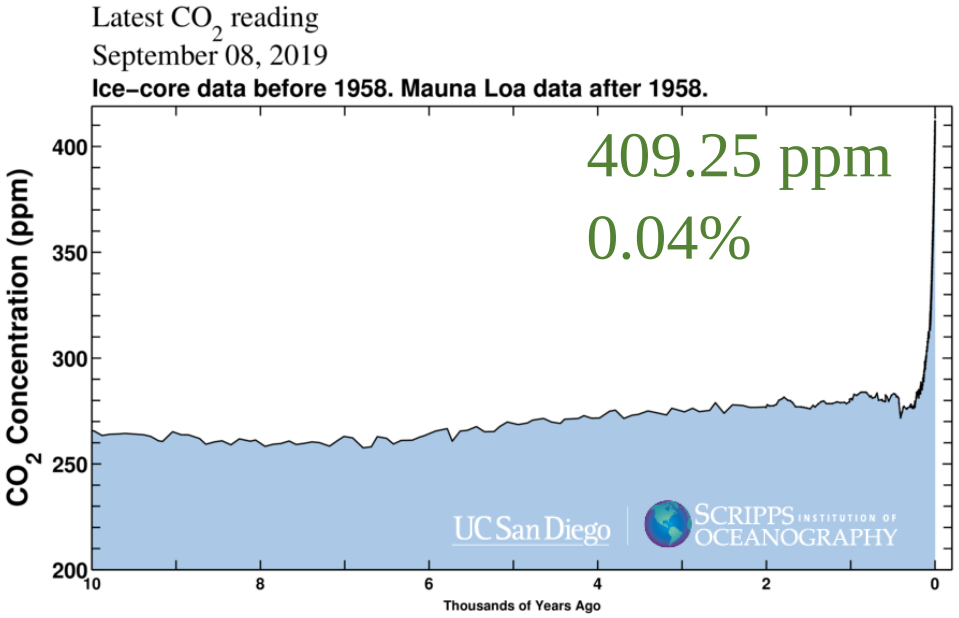

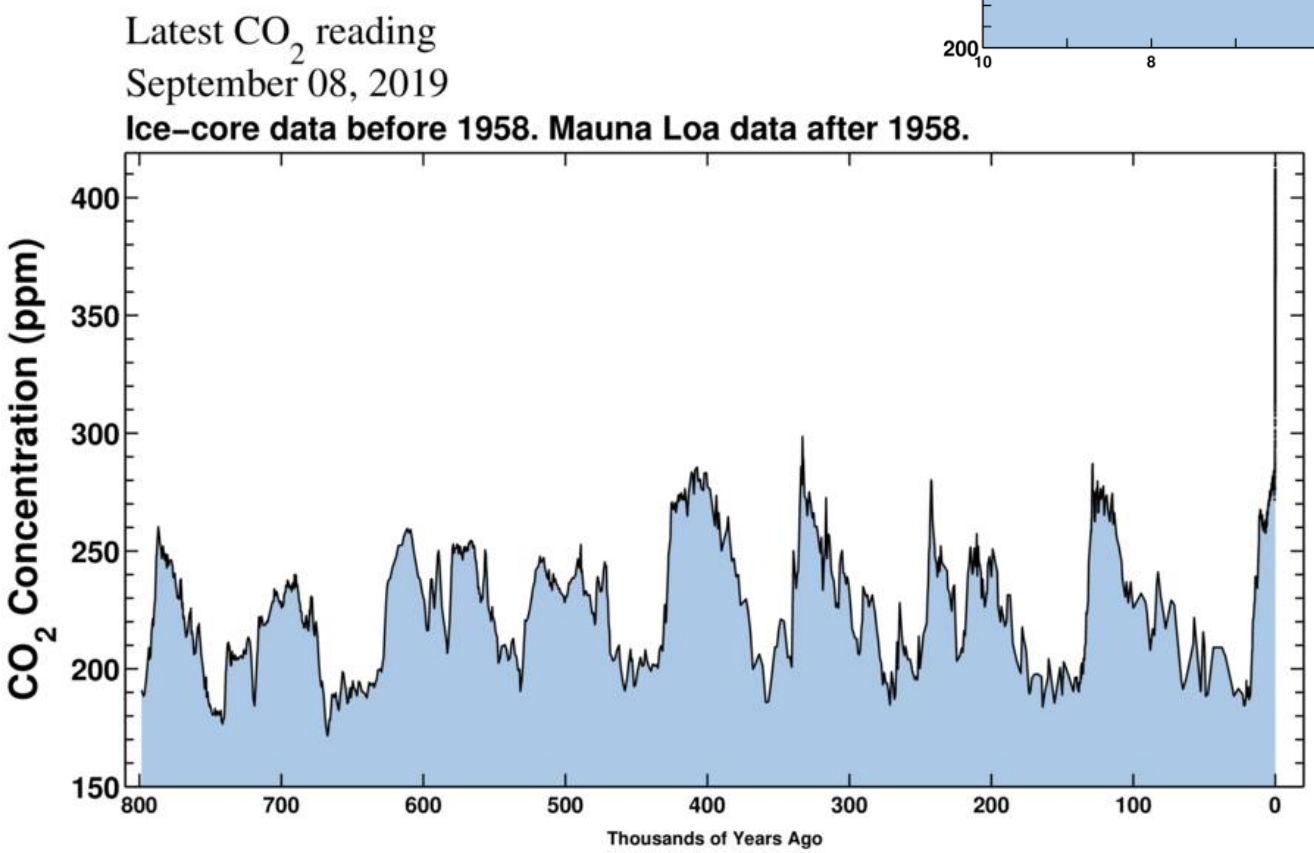

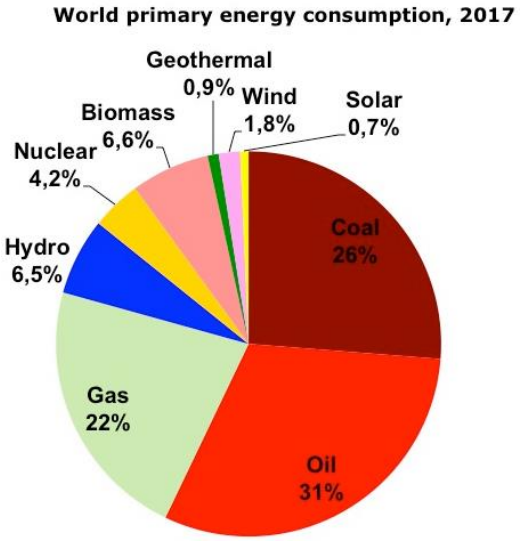

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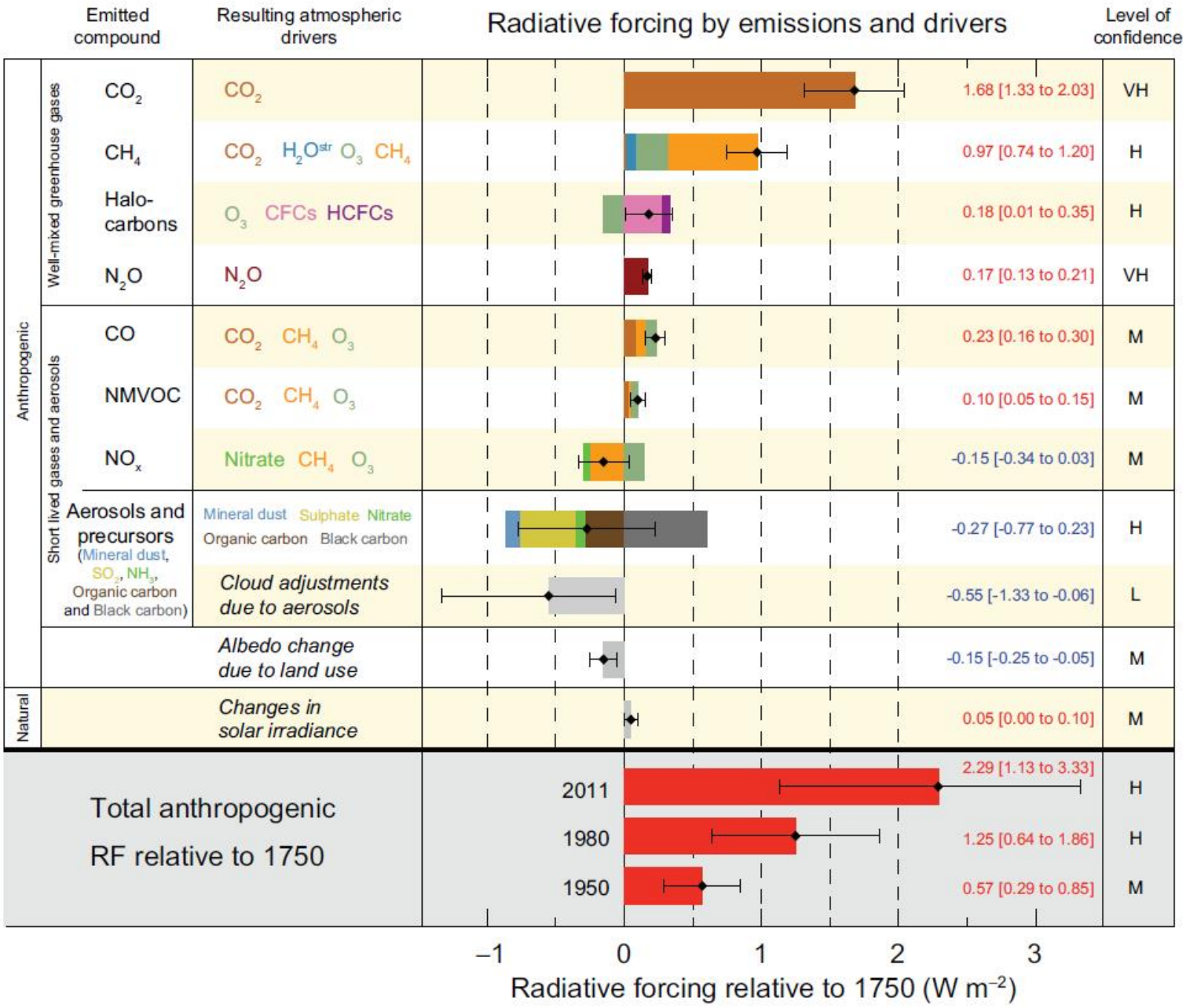

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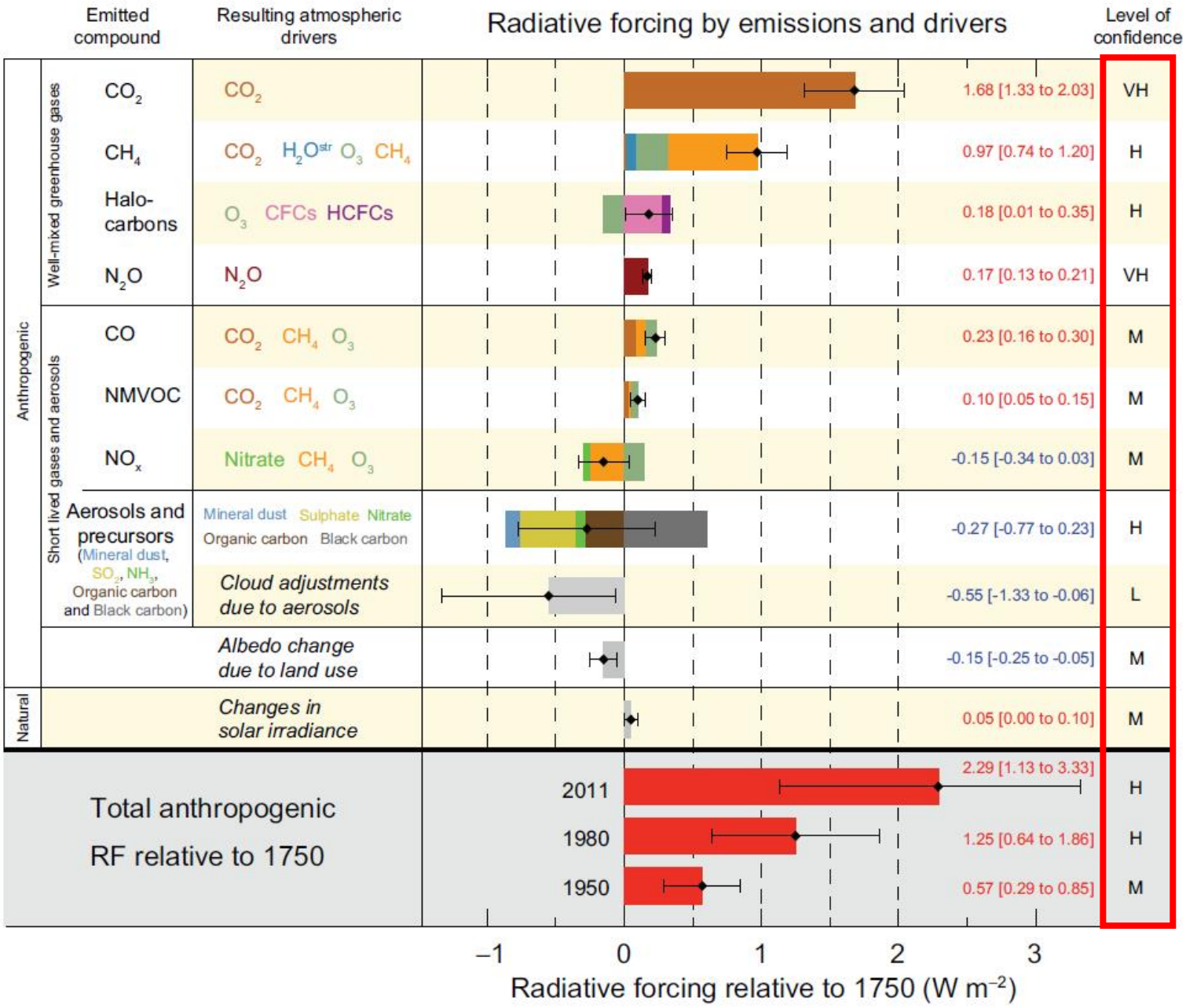
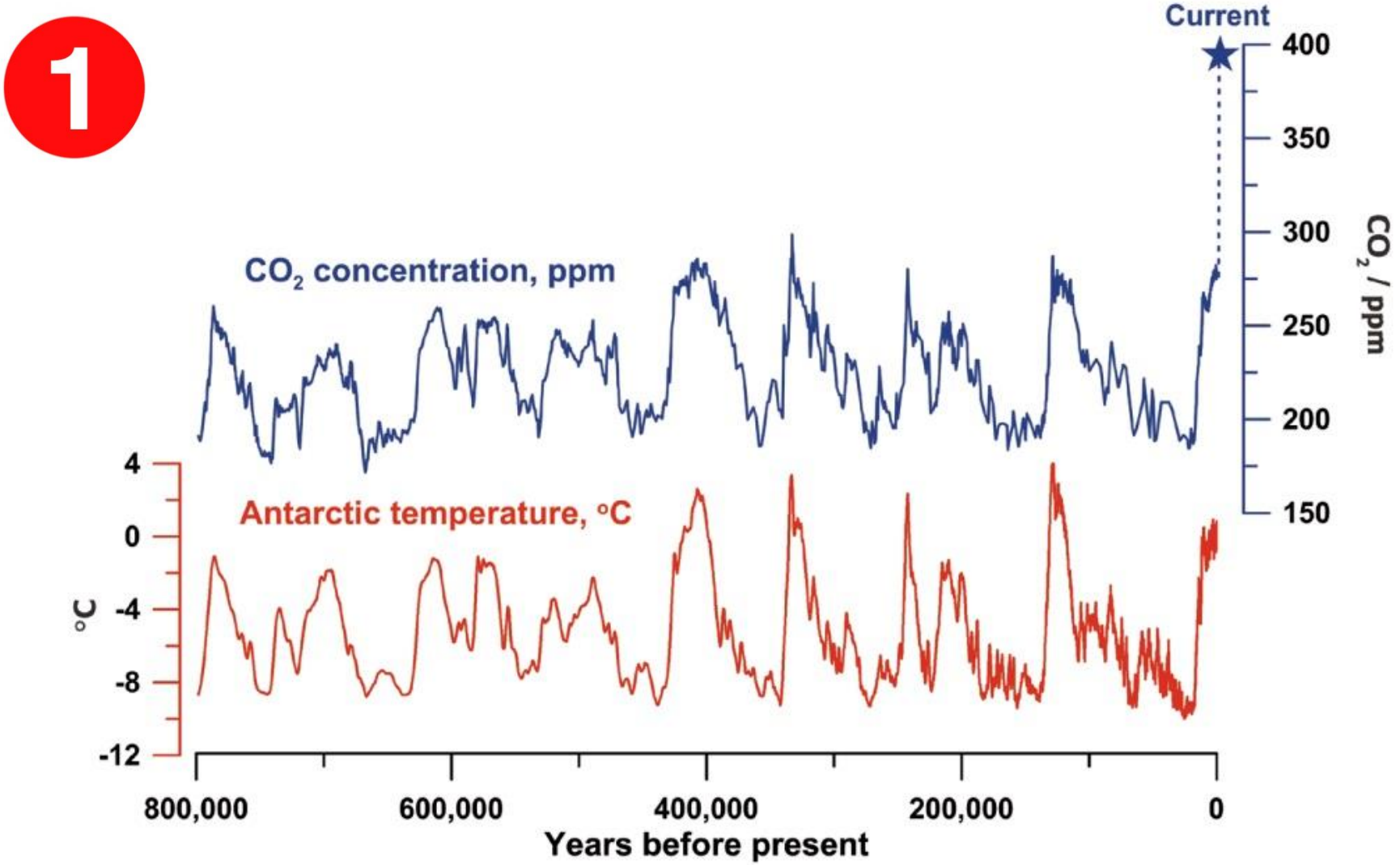


4. Emberi tevékenység – klímamódosítás – mi a bizonyíték?



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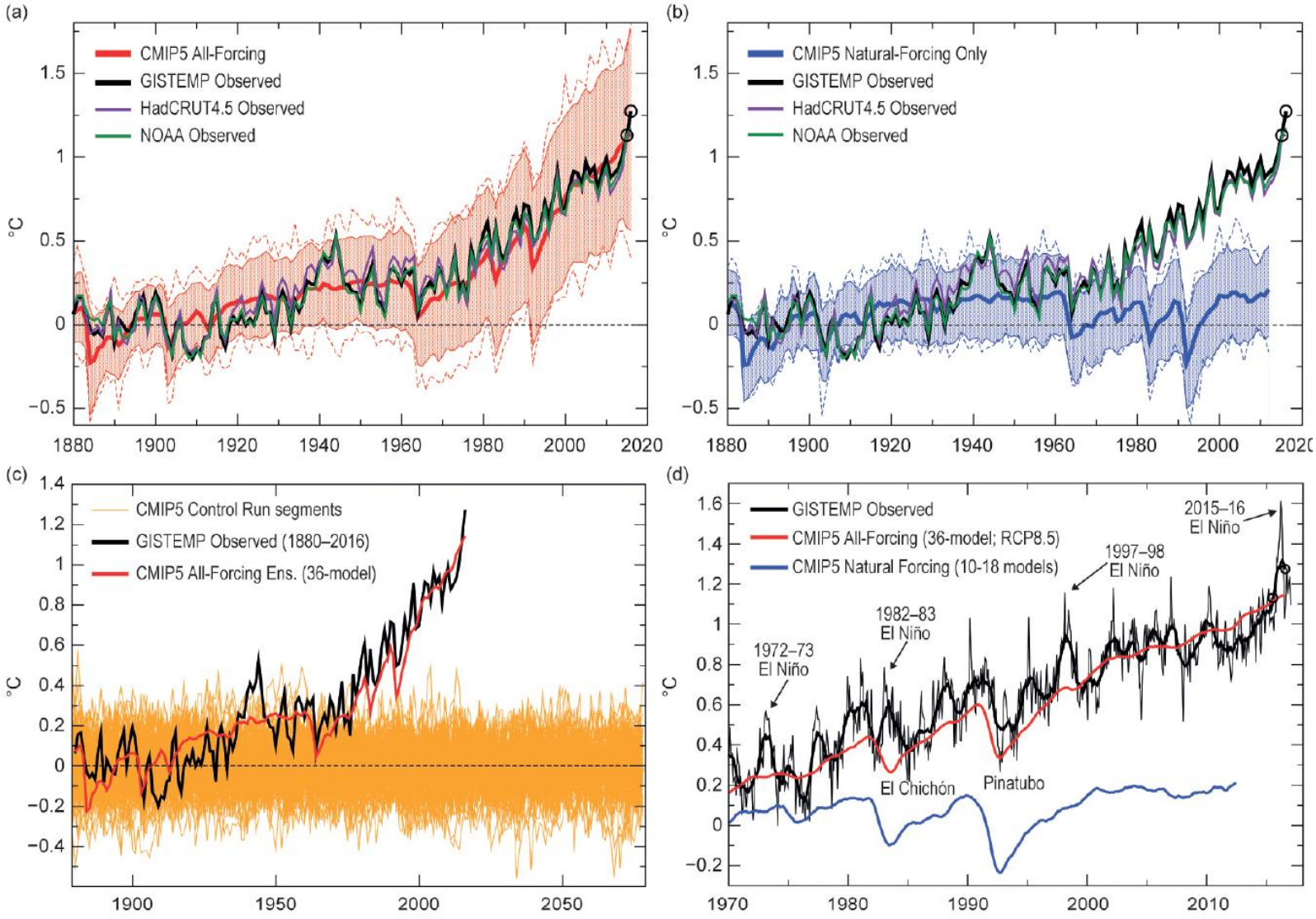
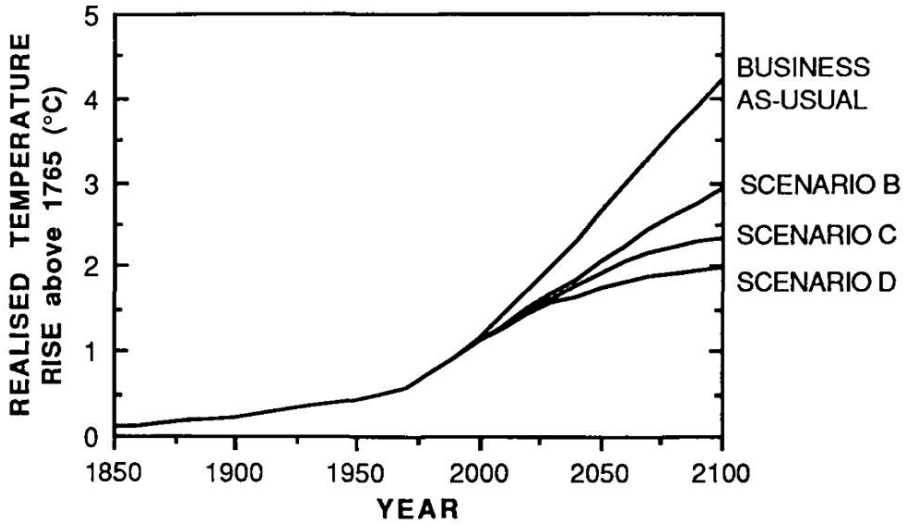
CMIP5: 36 globális csatolt atmoszféra-óceán modell

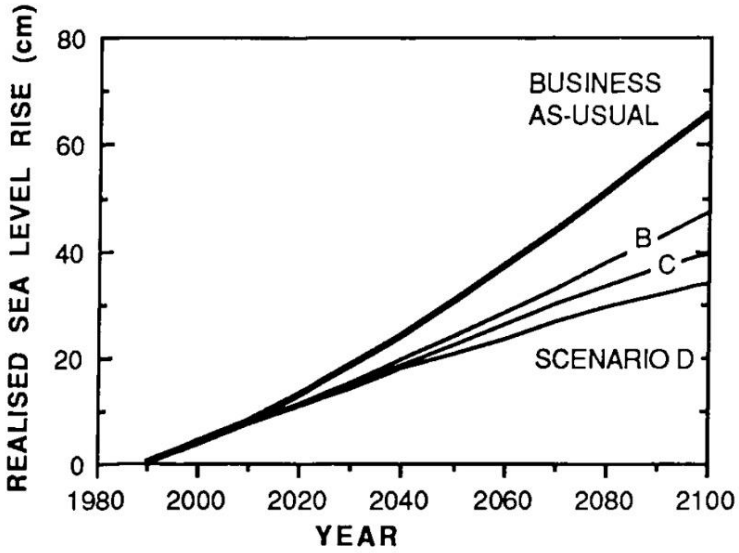


Knutson, T.R., J. Kam, F. Zeng, and A.T. Wittenberg, *Bull. Amer. Meteor. Soc.*, **99**, S11–S15, 2018

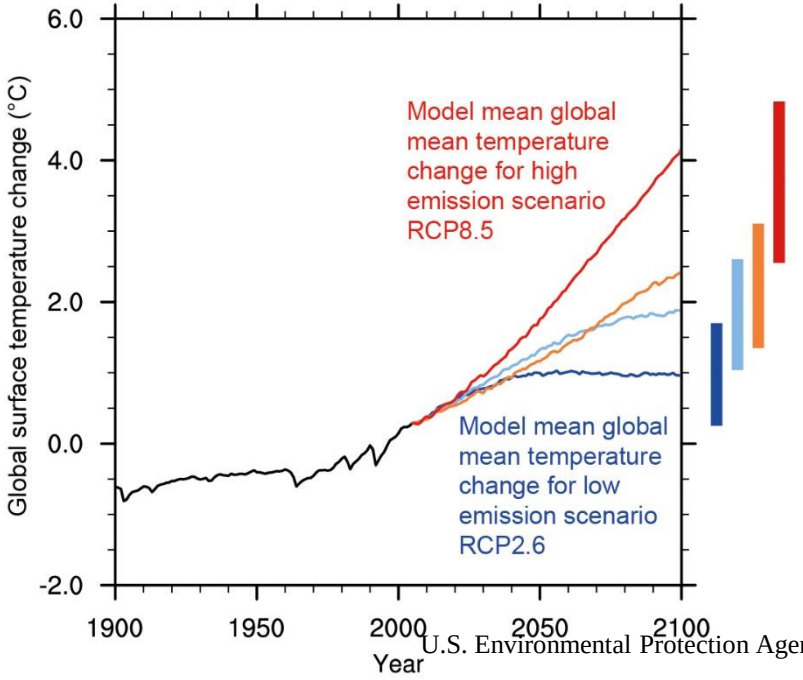
5. Klíma projekciók

IPCC, 1990: AR1, Scientific Assessment of Climate Change

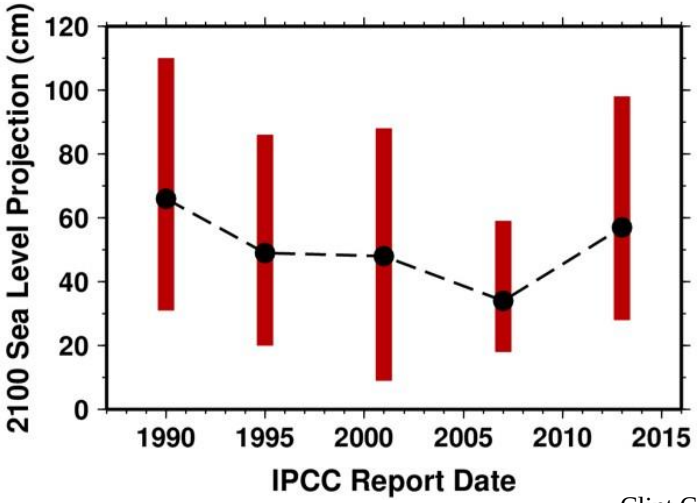




IPCC, 2013: AR5,: The Physical Science Basis.



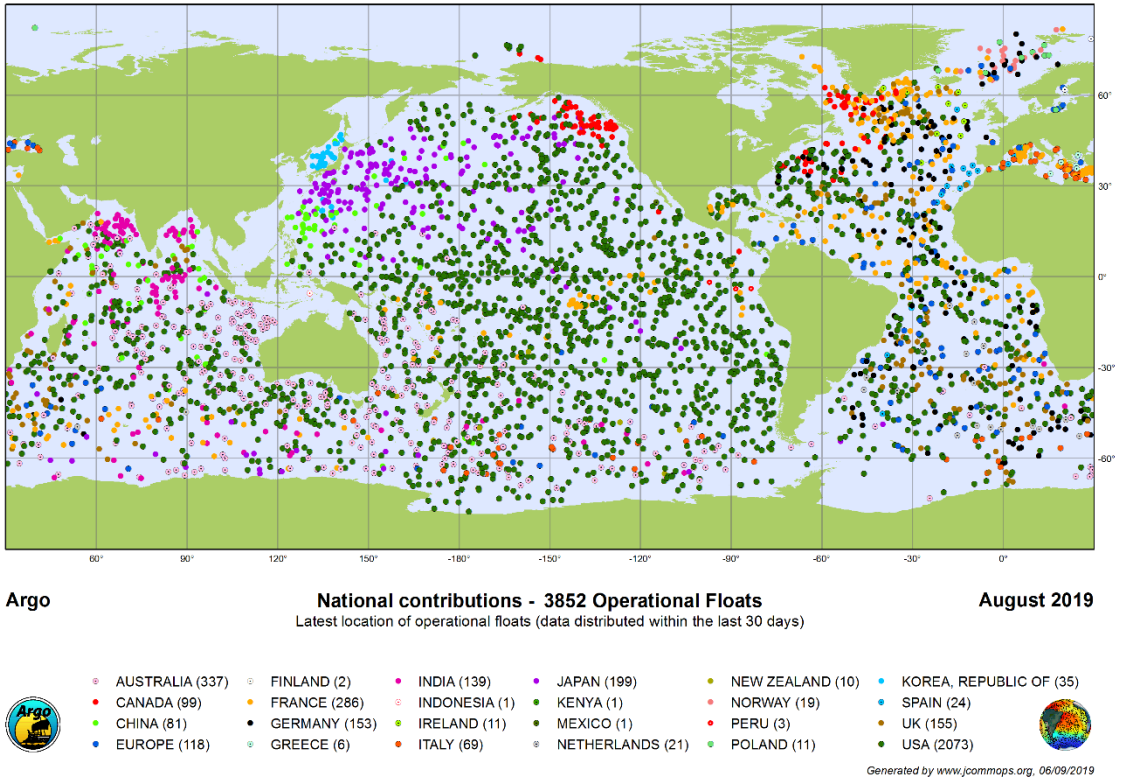
U.S. Environmental Protection Agency

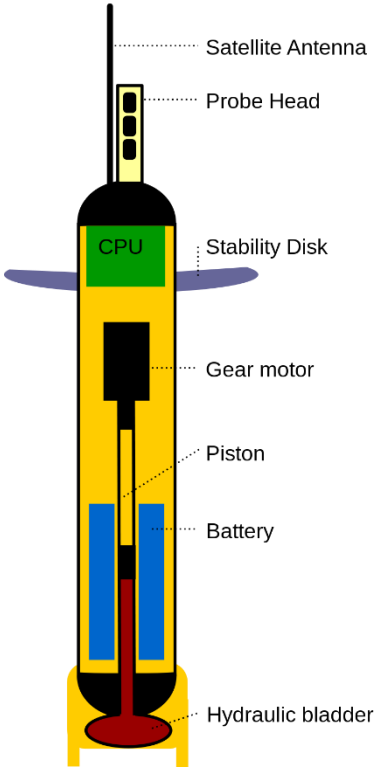


Clint Conrad, EGU

6. Új eredmények

- Meg kell érteni, mi folyik az óceánokban

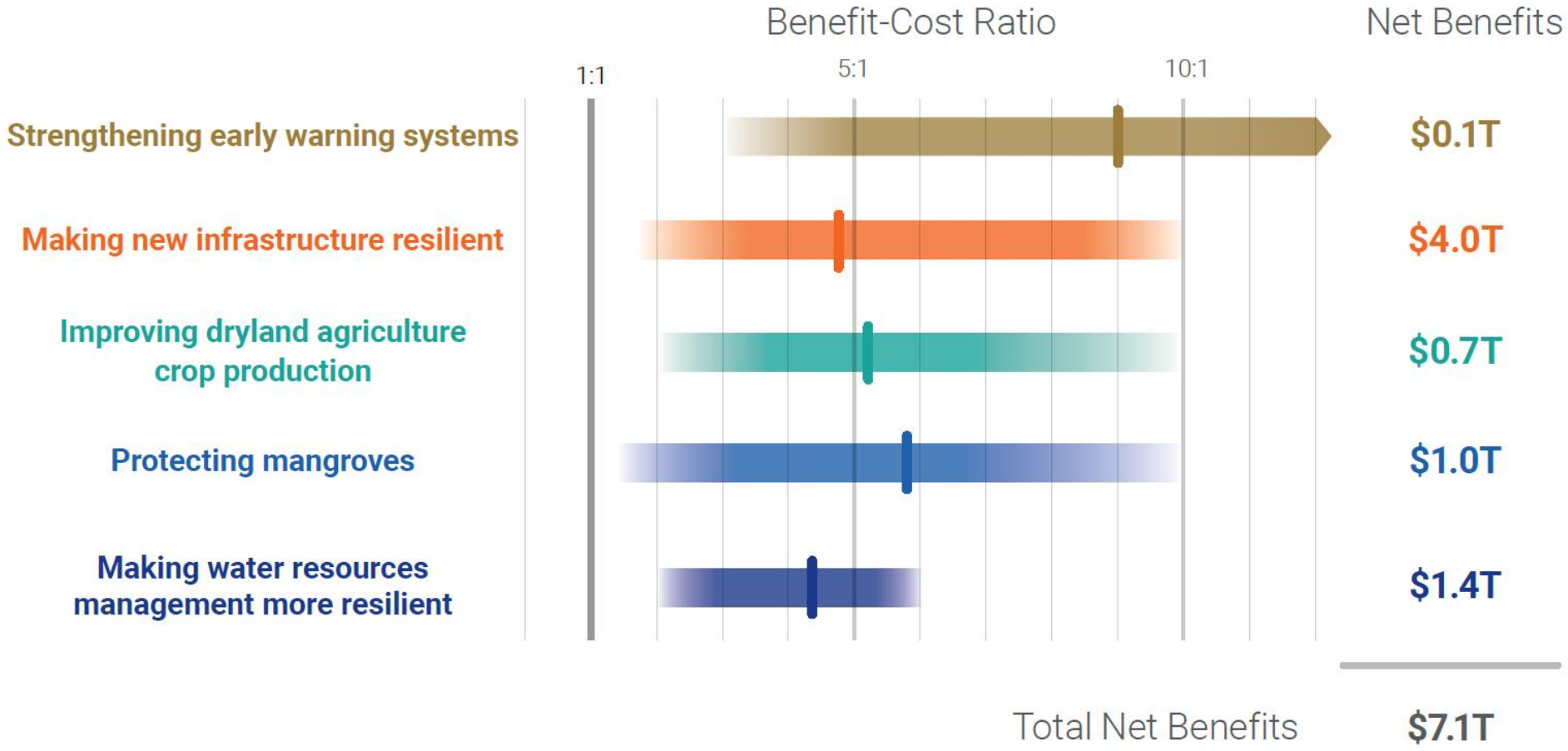




- Az erdőtüzek lassítják a felmelegedést (*Science*, 2006)
- Az óceánokban nem érdemes algavirágzást indukálni (*Nature*, *2009*)
- Nem az iparszerű állattenyésztés a légköri CH_4 fő forrása (*Nature Climate Change*, *2015)*
- Az Amazonas vidéke nem a „Föld tüdeje” (*Science*, 2017)
- A (hagyományos) bio-üzemanyag előállítás zsákutca (EU, *2017*)
- Az Antarktisz olvadó jege hűti a légkört (*Nature*,*2018*)
- ….

6. Ajánlások

Economics of Adaptation: Benefits and Costs of Selected Investments in Adaptation



#AdaptOurWorld

GLOBAL COMMISSION ON ADAPTATION

Teljes befektetés 2020-2030: $1.8T

2019. szept. 10.

Összegzés

- Globális klímaváltozás: jól mérhető trend
- Példátlan? (nem)
- Környezetszennyezés: tény
- Csatolás a kettő között? (nem tudjuk)
- Mi a teendő? (nem tudjuk)