El canvi climàtic després de Paris

Ferran Puig Vilar

Aula Magna La Nau

Universitat de València, 26/05/2016

Manila, 2009

India, abril 2016

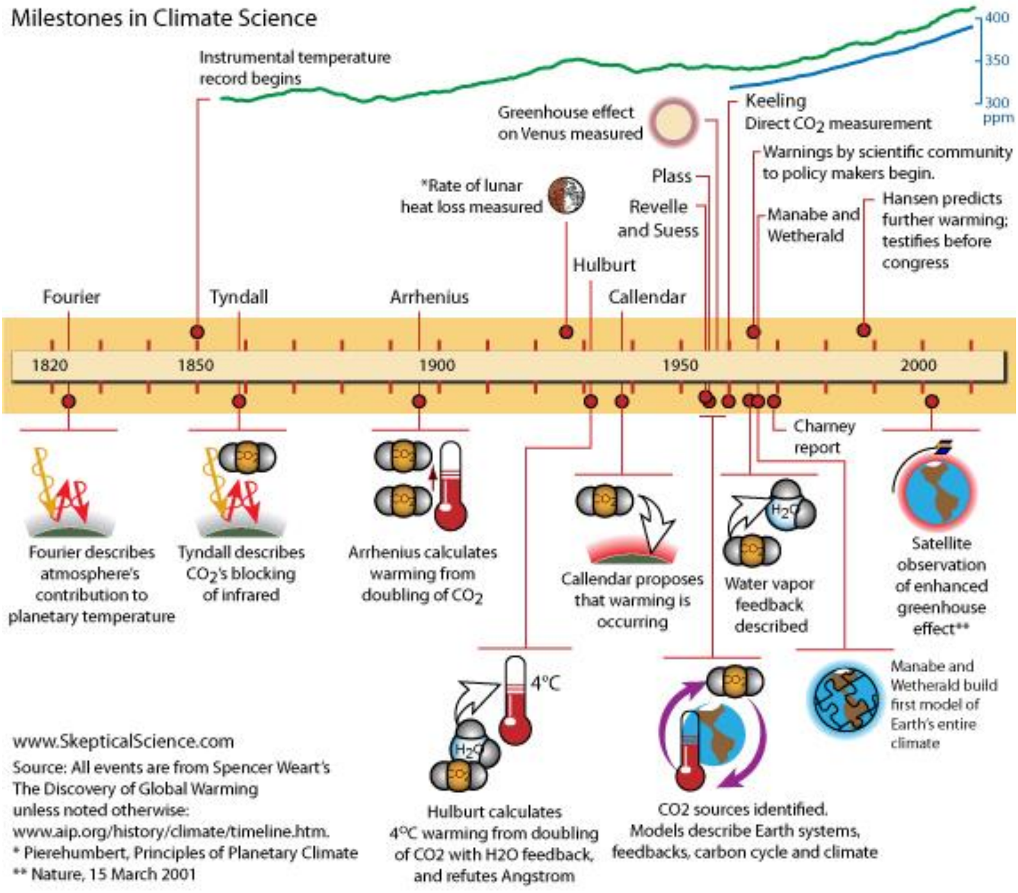
New Jersey, 2012

COP21: Equip intel·lectual

1. Elitista, no popular
2. No *tipping points*
3. No naval, aviació, Pentàgon, només CO_2
4. Economicista, no físic (llarg termini no compta)
5. Datos de partida
6. Símptoma, no malaltia
7. Tractar un símptoma aïlladament
   - Polític-jurídic
   - Tot està interrelacionat
8. Pressió corporativa
   - Costat consum, desviar atenció
   - Curterminisme
9. Actors
   - Països
     - USA + Xina 70% emissions
   - Alternatives
     - Per càpita
     - Per consum individual
10. Reunió prèvia tots els caps
    - Acord com sigui (efecte Papa)
    - Immensa majoria no hi seran a 2023
    - Tornaràn a casa i ... New Scientist 07/10/2015

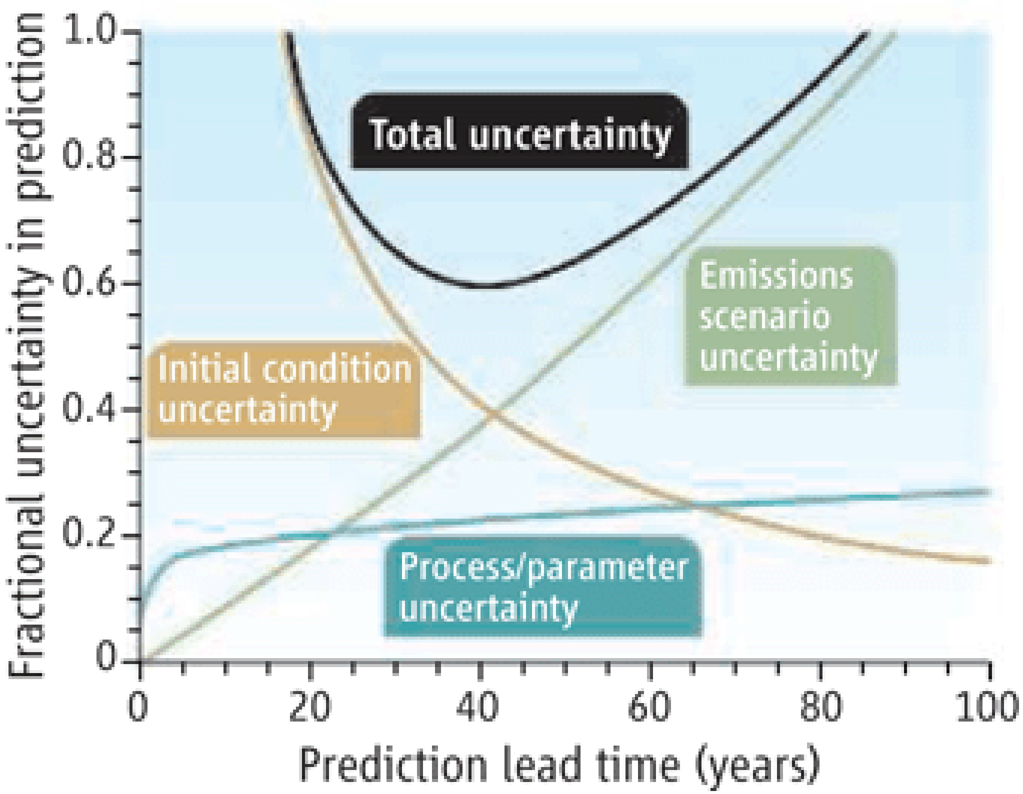
INTRODUCCIÓ

Història de la ciència climàtica

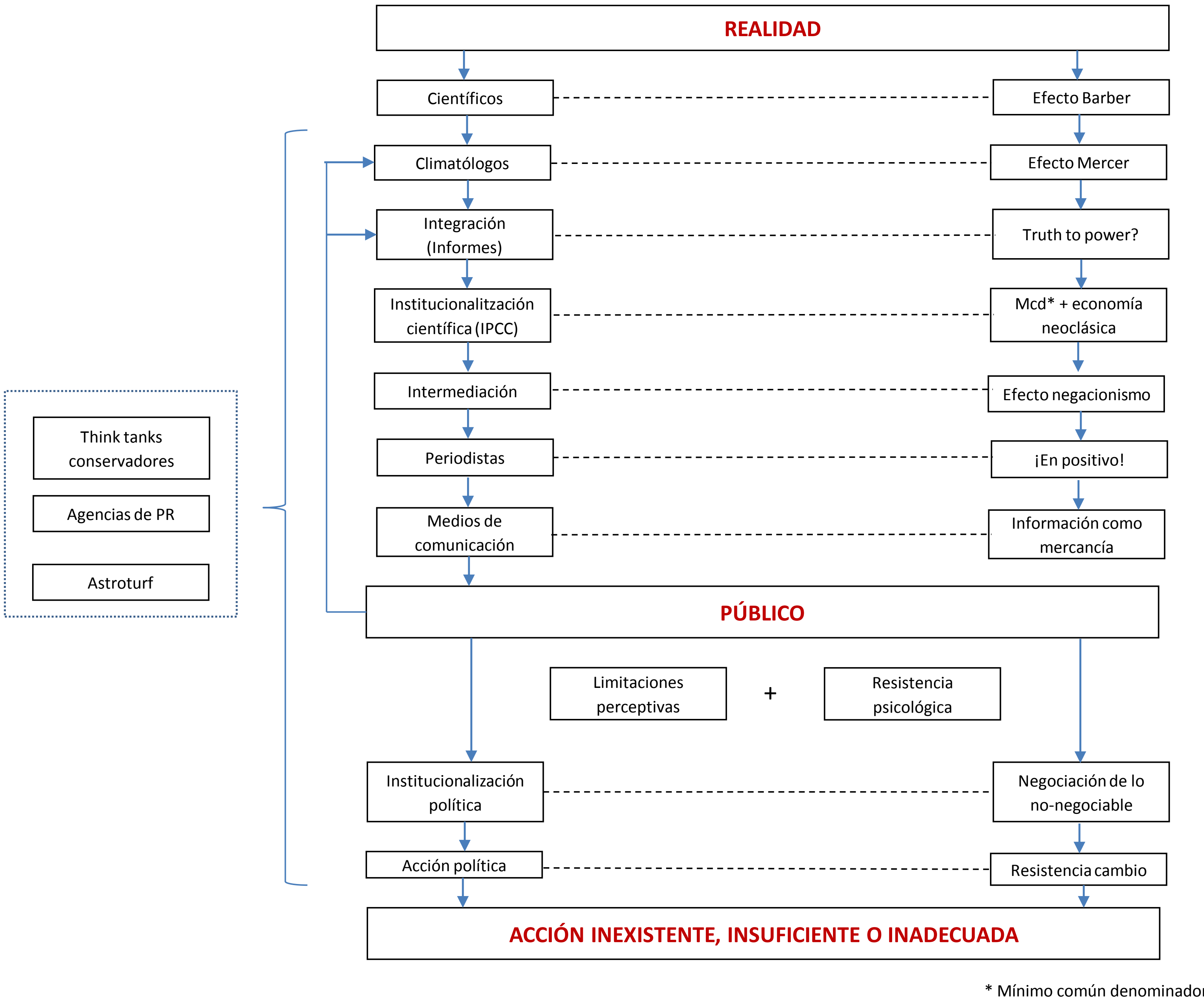


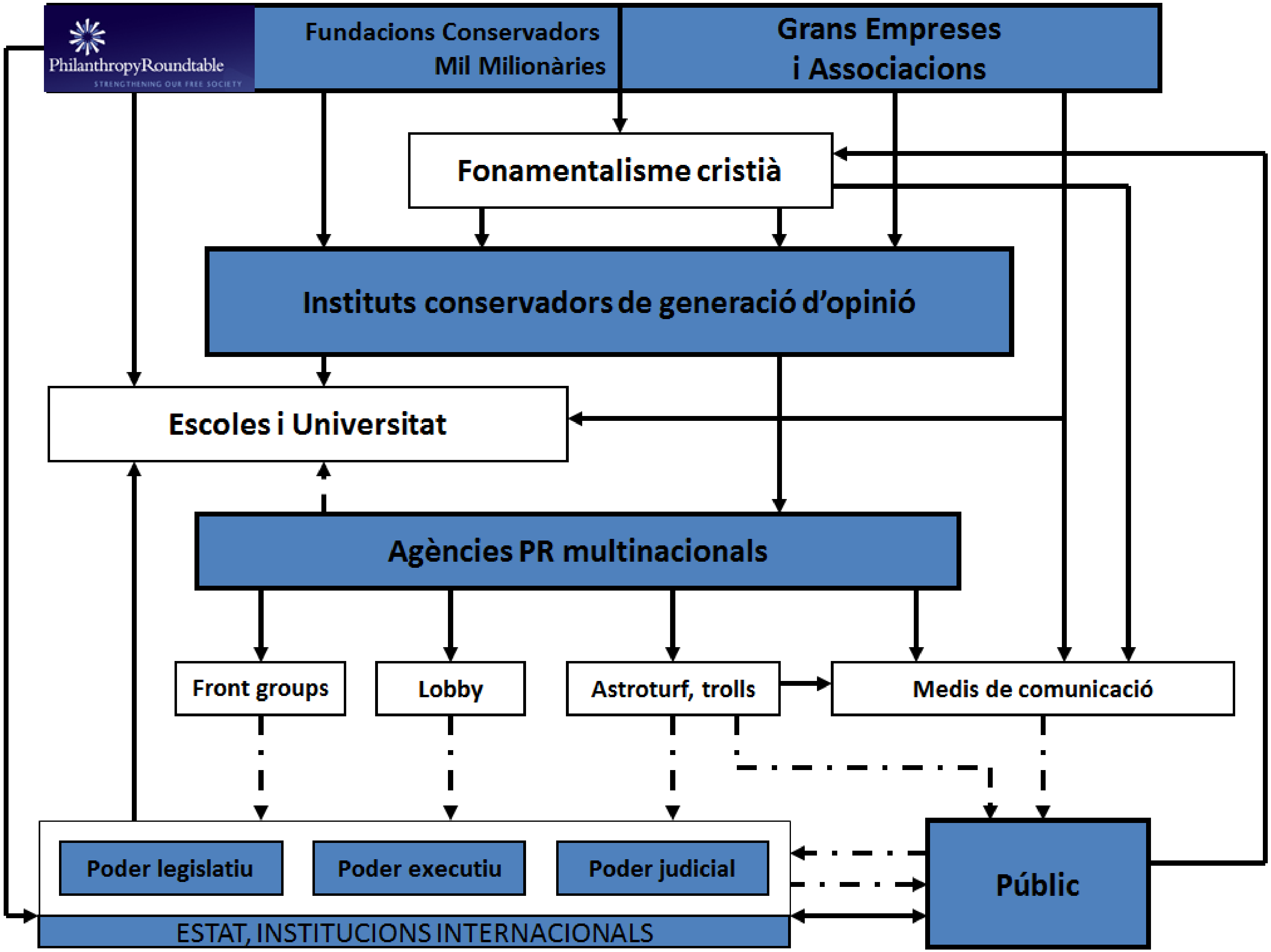
Font: Skeptical Science - http://www.skepticalscience.com – Imatge: John Garrett

Composició incertesa

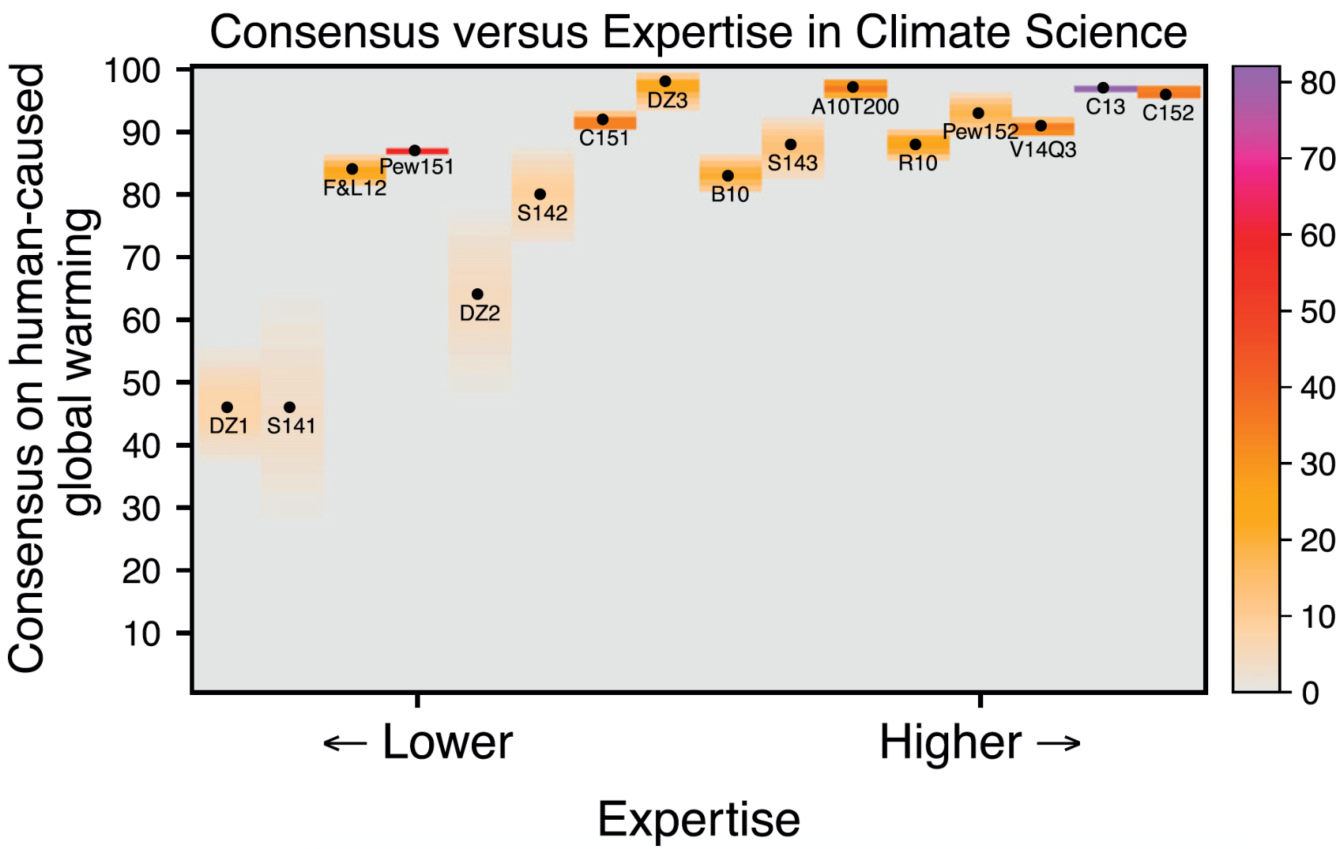


Peter Cox and David Stephenson (2007) - A Changing Climate for Prediction - Science 217:207-208 doi:10.1126/science.1145956 - 13/07/2007 - School of Engineering, Computing and Mathematics, University of Exeter - https://www.researchgate.net/publication/6211063_Climate_change_-_A_changing_climate_for_prediction

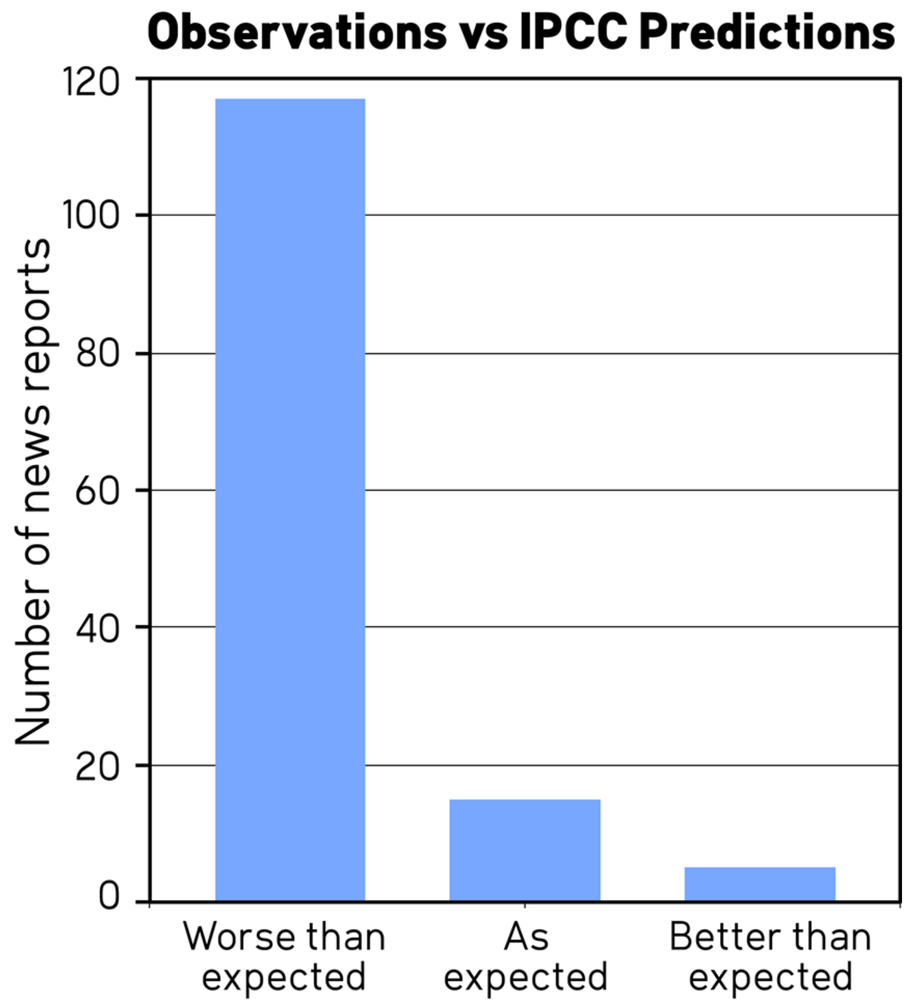

REALIDAD
Científicos
Efecto Barber
Climatólogos
Efecto Mercer
Integración (Informes)
Truth to power?
Institucionalitzación científica (IPCC)
Mcd* + economía neoclásica
Intermediación
Efecto negacionismo
Periodistas
¡En positivo!
Medios de comunicación
Información como mercancía
Think tanks conservadores
Agencias de PR
Astroturf
PÚBLICO
Limitaciones perceptivas
+
Resistencia psicológica
Institucionalización política
Negociación de lo no-negociable
Acción política
Resistencia cambio
ACCIÓN INEXISTENTE, INSUFICIENTE O INADECUADA
* Mínimo común denominador


PhilanthropyRoundtable
Fundacions Conservadors Mil Milionàries
Grans Empreses i Associacions
Fonamentalisme cristià
Instituts conservadors de generació d'opinió
Escoles i Universitat
Agències PR multinacionals
Front groups
Lobby
Astroturf, trolls
Medis de comunicació
Poder legislatiu
Poder executiu
Poder judicial
ESTAT, INSTITUCIONS INTERNACIONALS
Públic

Nivell de consens segons *expertise*



John Cook et al (2016) - Consensus on consensus: a synthesis of consensus estimates on human-caused global warming - Environmental Research Letters 11:048002 doi:10.1088/1748-9326/11/4/048002 - 13/04/2016 - Global Change Institute, University of Queensland + School of Psychology, University of Western Australia + Skeptical Science + - http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002/pdf - 16 authors


Observations vs IPCC Predictions
Number of news reports
120
100
80
60
40
20
0
Worse than expected
As expected
Better than expected

Kevin Anderson

“Ocurre simplemente que nosotros los científicos no estamos preparados para aceptar las revolucionarias implicaciones de nuestros propios hallazgos, e incluso cuando lo conseguimos somos reticentes a proclamar estos pensamientos abiertamente.

En cambio, mi longeva implicación con muchos colegas científicos hace que no tenga ninguna duda de que, aun cuando trabajan con diligencia, muchos eligen al final censurar su propia investigación.” [énfasis añadido]

Kevin Anderson (2015) - Duality in climate science - Nature Geoscience 8:898–900 doi:10.1038/ngeo2559 - 12/10/2015 - Tyndall Centre for Climate Change Research, University of Manchester - http://goo.gl/gbWEWD

Kevin Anderson

"Fuera de micrófono y a pesar de las concesiones al 'crecimiento verde' pocos, o ningún científico que trabaje en cambio climático, estaría en desacuerdo con el amplio alcance de esta conclusión [que los compromisos de reducción de emisiones son incompatibles con el crecimiento económico].

El elefante en la habitación permanece impasible, mientras la aquiescencia colectiva y la disonancia cognitiva bloquean a todo aquél que se atreva a plantear las preguntas difíciles." [corchetes añadidos]

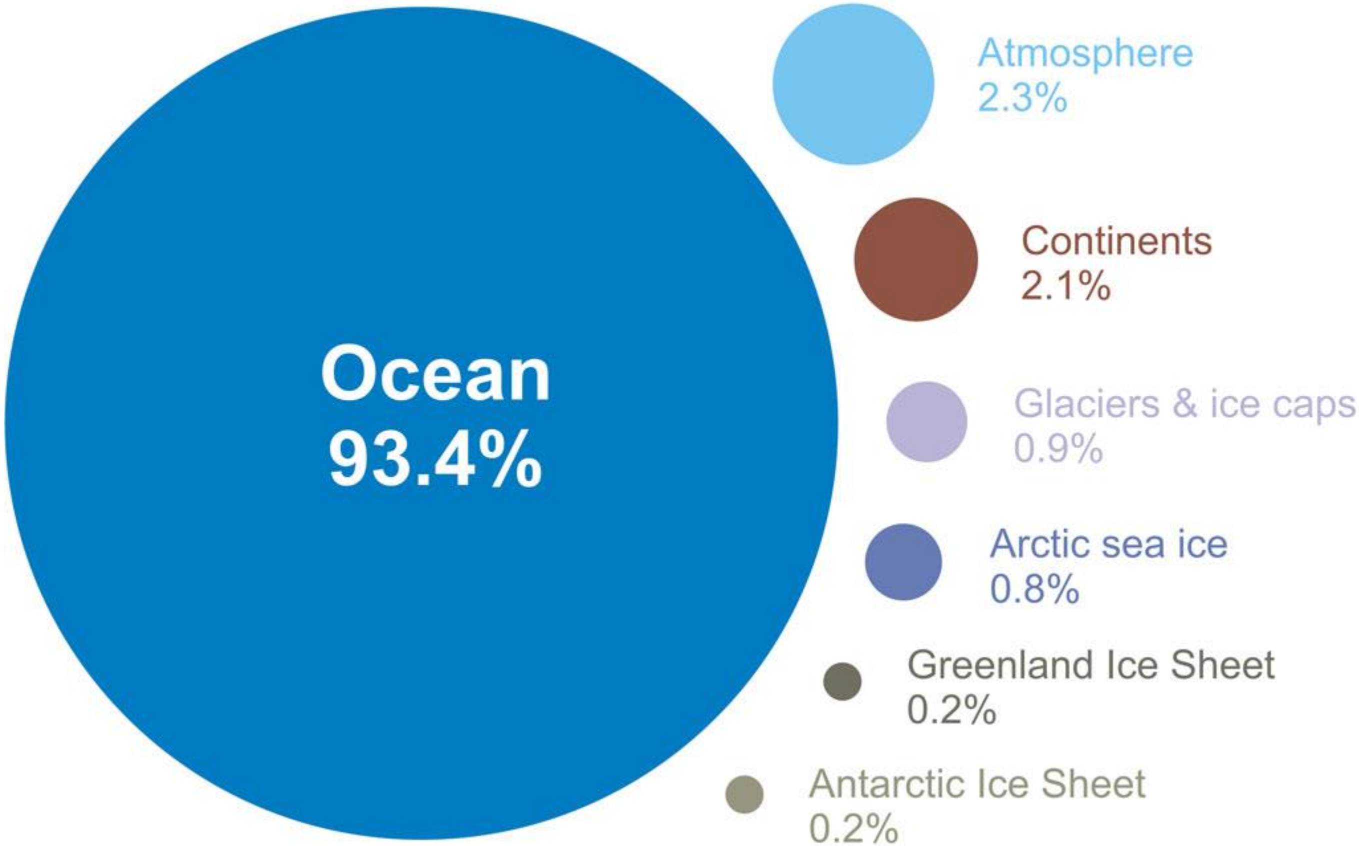
Kevin Anderson and Alice Bows (2012) - A new paradigm for climate change - Nature Climate Change 2:639–640 doi:10.1038/nclimate1646 - 28/08/2012 - Tyndall Centre for Climate Change Research, School of Mechanical Civil and Aerospace Engineering, University of Manchester; Sustainable Consumption Institute, School of Mechanical Civil and Aerospace Engineering, University of Manchester - http://kevinanderson.info/blog/wp-content/uploads/2012/08/Pre-edited-version-A-new-paradigm-for-climate-change-2012-.pdf

Ecology Community
@PLOSEcology

Follow

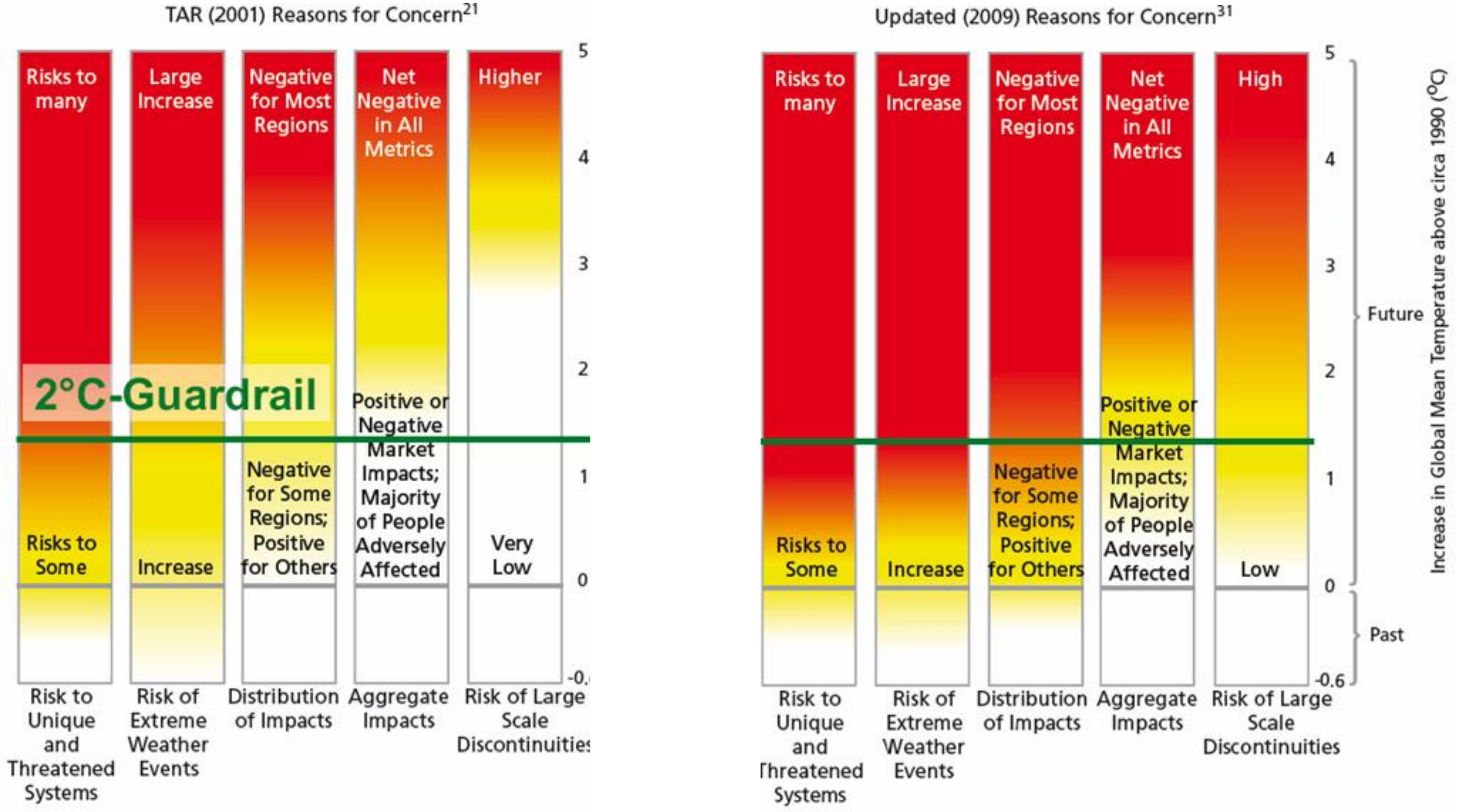
Good panel on "Reticent Researchers: Are we failing humanity!" #scicomm #climatechange #AGU15

Where is global warming going?



Font: Skeptical Science - http://www.skepticalscience.com

Son segurs +2˚C?



Joel B. Smith et al (2009) – Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) 'reasons for concern' - Proceedings of the National Academy of Sciences PNAS 106:4133–4137 doi:10.1073/pnas.0812355106 – 15 autores

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www.atmos-chem-phys-discuss.net/15/20059/2015/
doi:10.5194/acpd-15-20059-2015

Atmospheric Chemistry and Physics Discussions
Open Access

Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming is highly dangerous

J. Hansen[1], M. Sato[1], P. Hearty[2], R. Ruedy[3,4], M. Kelley[3,4], V. Masson-Delmotte[5], G. Russell[4], G. Tselioudis[4], J. Cao[6], E. Rignot[7,8], I. Velicogna[8,7], E. Kandiano[9], K. von Schuckmann[10], P. Kharecha[1,4], A. N. Legrande[4], M. Bauer[11], and K.-W. Lo[3,4]

[1]Climate Science, Awareness and Solutions, Columbia University Earth Institute, New York, NY 10115, USA
[2]Department of Environmental Studies, University of North Carolina at Wilmington, North Carolina 28403, USA
[3]Trinnovium LLC, New York, NY 10025, USA
[4]NASA Goddard Institute for Space Studies, 2880 Broadway, New York, NY 10025, USA
[5]Institut Pierre Simon Laplace, Laboratoire des Sciences du Climat et de l'Environnement (CEA-CNRS-UVSQ), Gif-sur-Yvette, France

Atmos. Chem. Phys., 16, 3761–3812, 2016
www.atmos-chem-phys.net/16/3761/2016/
doi:10.5194/acp-16-3761-2016

Atmospheric Chemistry and Physics
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Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous

James Hansen[1], Makiko Sato[1], Paul Hearty[2], Reto Ruedy[3,4], Maxwell Kelley[3,4], Valerie Masson-Delmotte[5], Gary Russell[4], George Tselioudis[4], Junji Cao[6], Eric Rignot[7,8], Isabella Velicogna[7,8], Blair Tormey[9], Bailey Donovan[10], Evgeniya Kandiano[11], Karina von Schuckmann[12], Pushker Kharecha[1,4], Allegra N. Legrande[4], Michael Bauer[4,13], and Kwok-Wai Lo[3,4]

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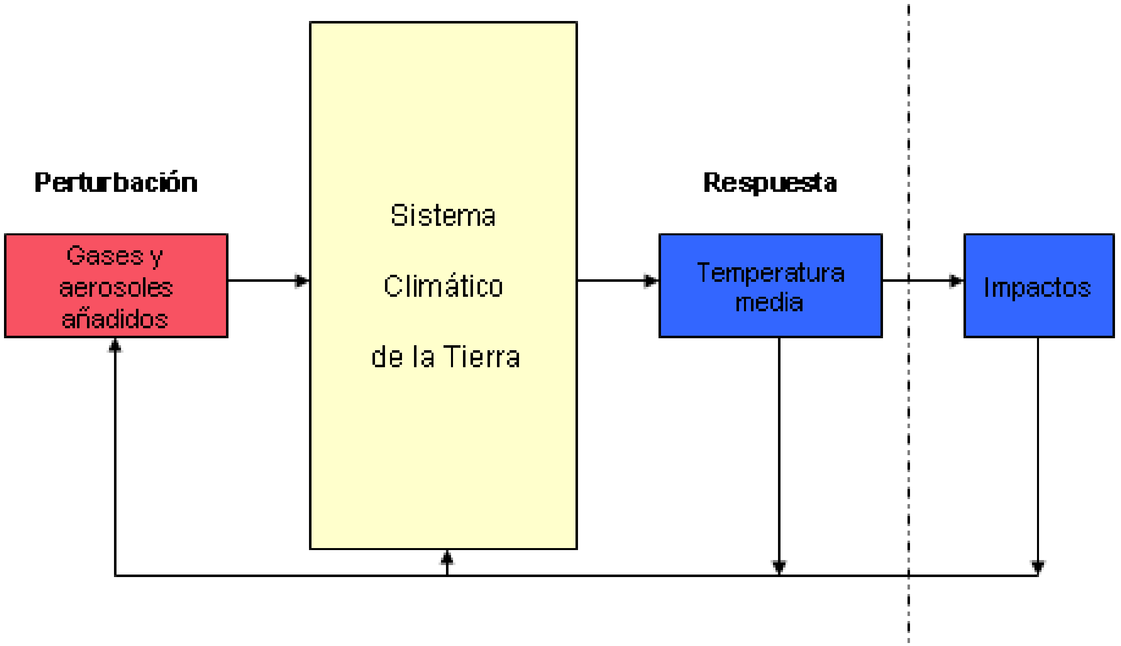
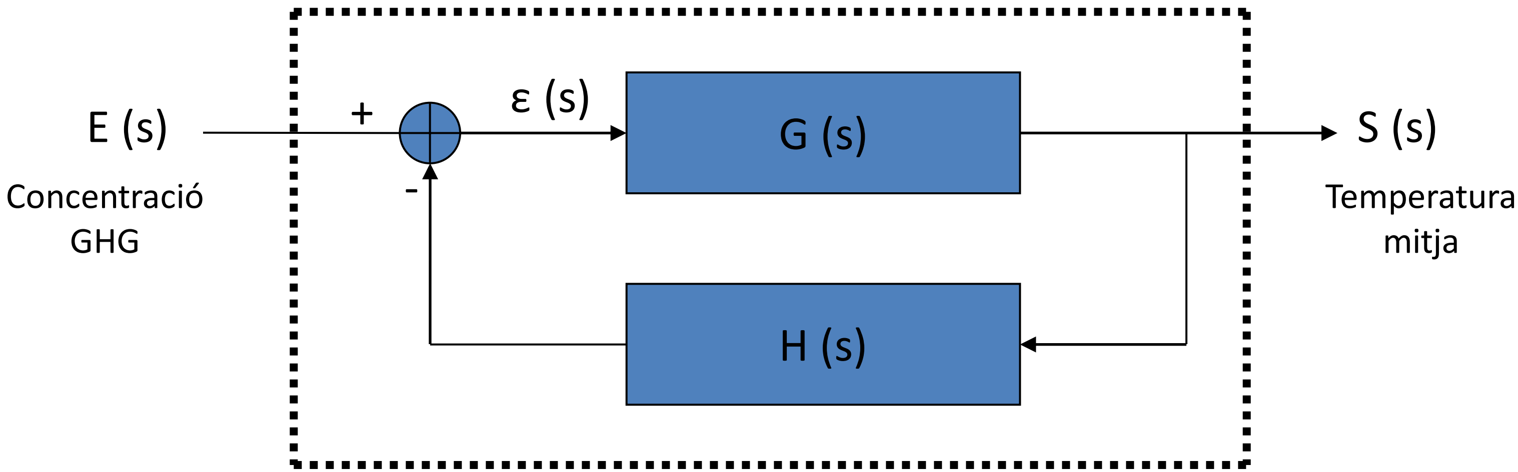
[5]Institut Pierre Simon Laplace, Laboratoire des Sciences du Climat et de l'Environnement (CEA-CNRS-UVSQ), Gif-sur-Yvette, France
[6]Key Lab of Aerosol Chemistry & Physics, Institute of Earth Environment, Chinese Academy of Sciences, Xi'an 710075, China
[7]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109, USA
[8]Department of Earth System Science, University of California, Irvine, CA 92697, USA

SYSTEMS VIEW

Pertorbació – Resposta



Realimentació

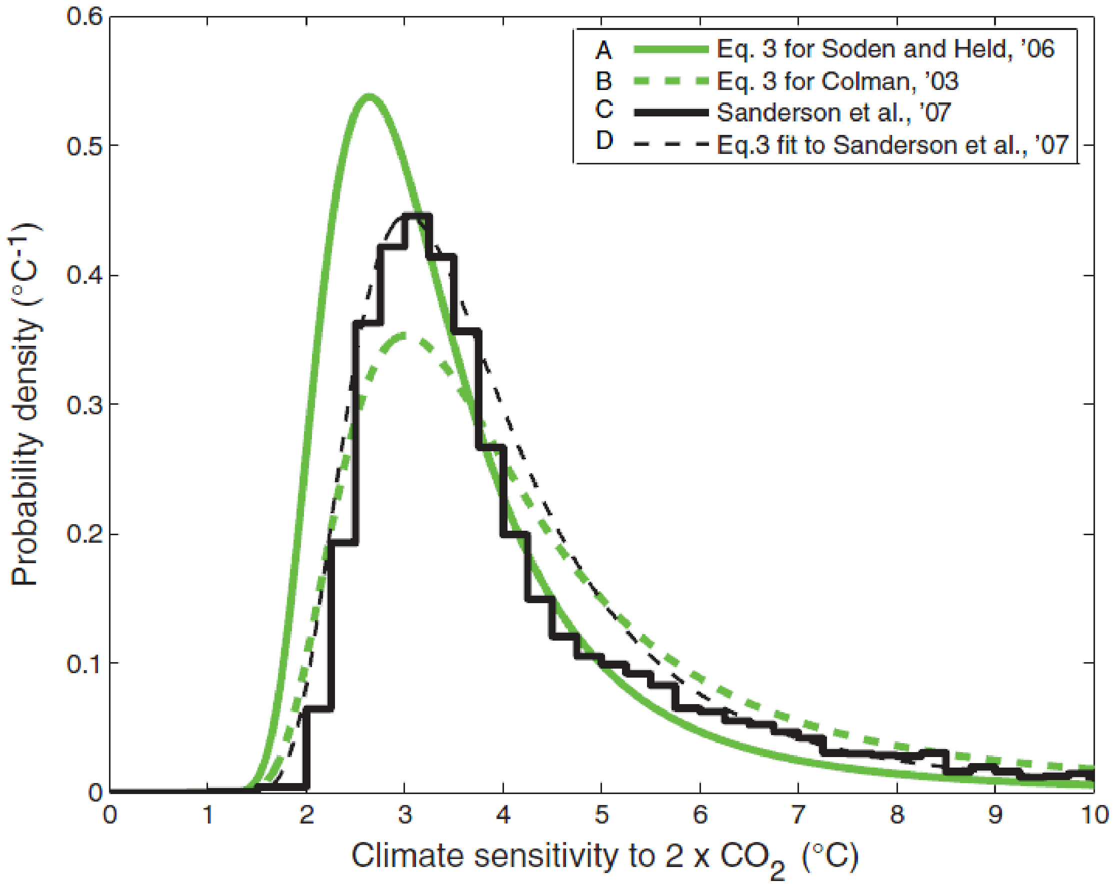


$S(s) = \varepsilon(s) \times G(s) \longrightarrow \varepsilon(s) = G(s) / S(s)$

$\varepsilon(s) = E(s) - S(s) \times H(s)$

$$\boxed{S(s) = \frac{G(s)}{1+G(s)H(s)} \times E(s)}$$

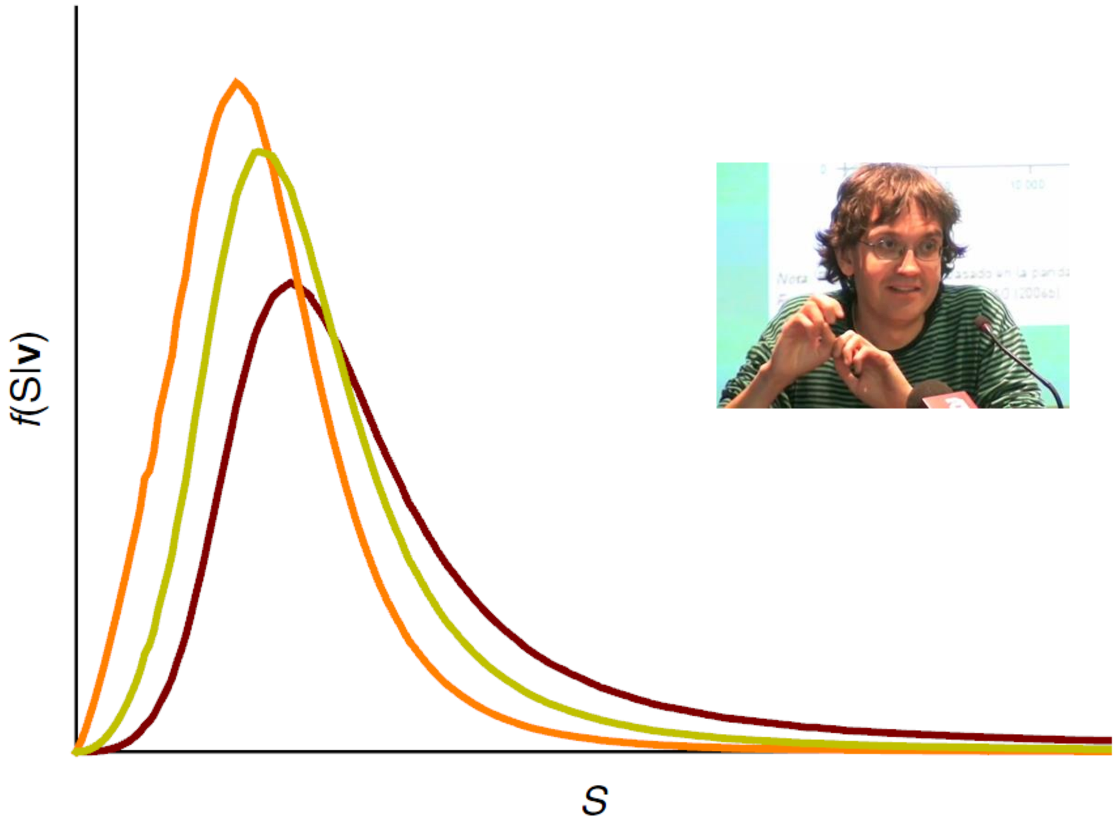
Sensibilitat climàtica



Excés de curtosi

Gerard H. Roe and Marcia B. Baker (2007) - Why Is Climate Sensitivity So Unpredictable? - Science 318:629-632 doi:10.1126/science.1144735 - Department of Earth and Space Sciences, University of Washington

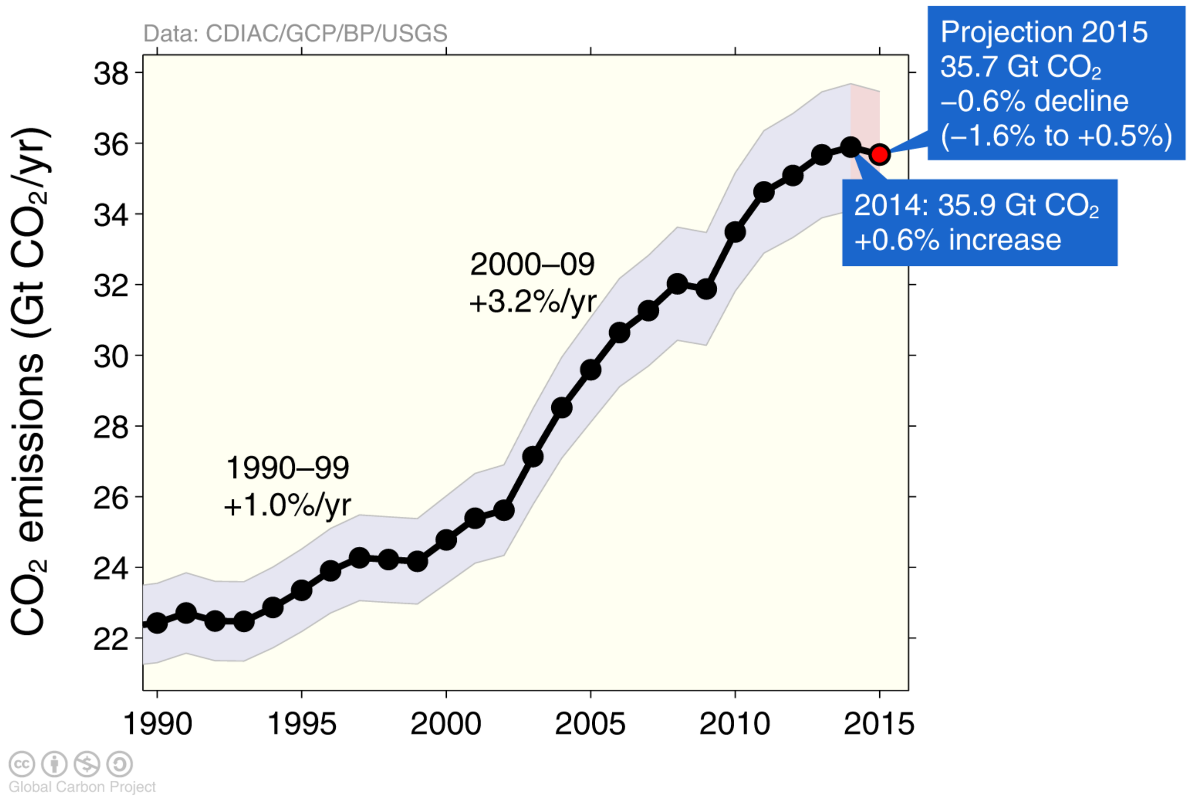
Salvador Pueyo, 2012



Salvador Pueyo (2012) - Solution to the paradox of climate sensitivity - Climatic Change doi:10.1007/s10584-011-0328-x - Institut Català de Ciències del Clima (IC3) - http://link.springer.com/content/pdf/10.1007%2Fs10584-011-0328-x

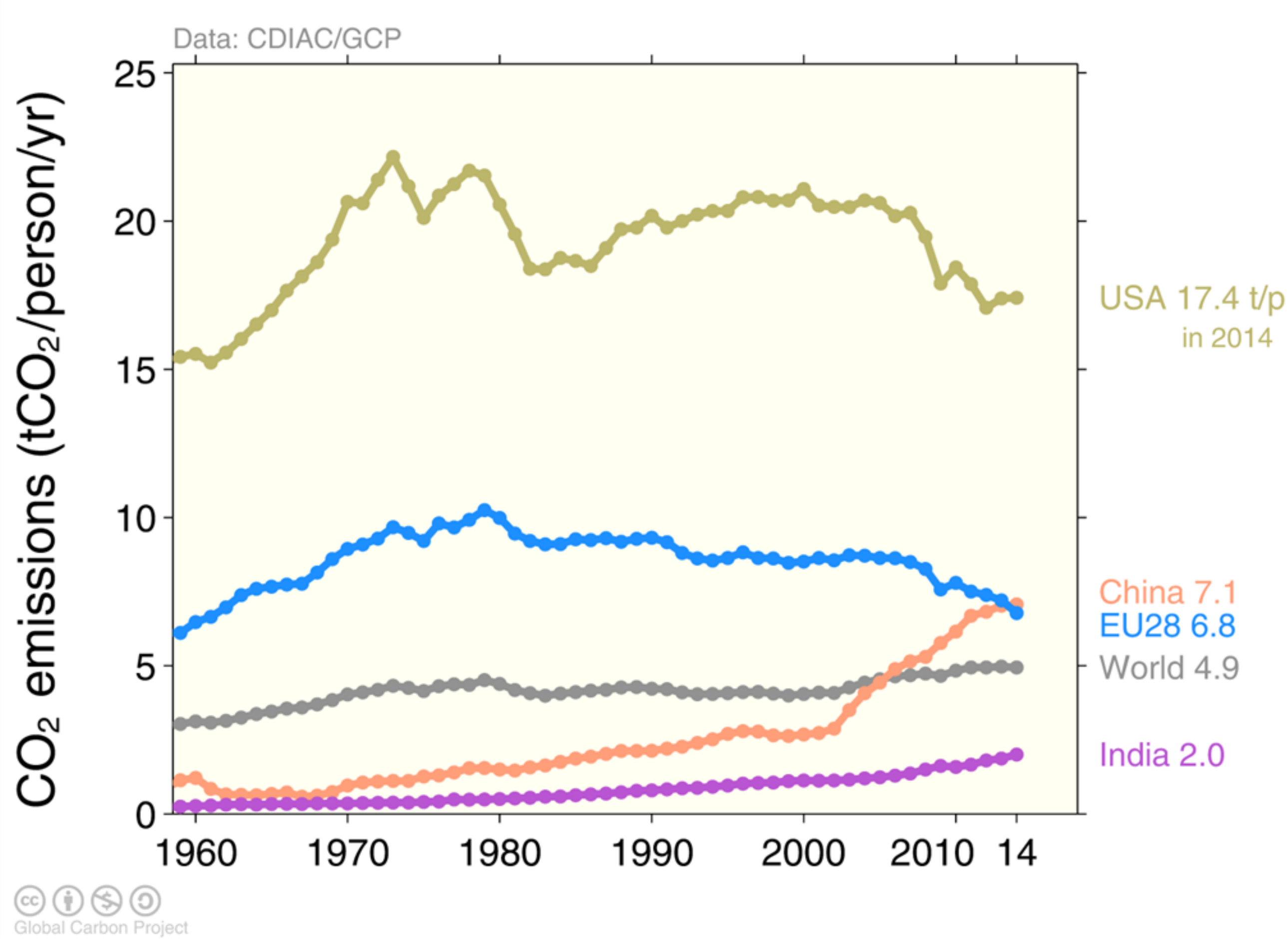
EMISSIONS

Emisiones de origen fósil e industriales



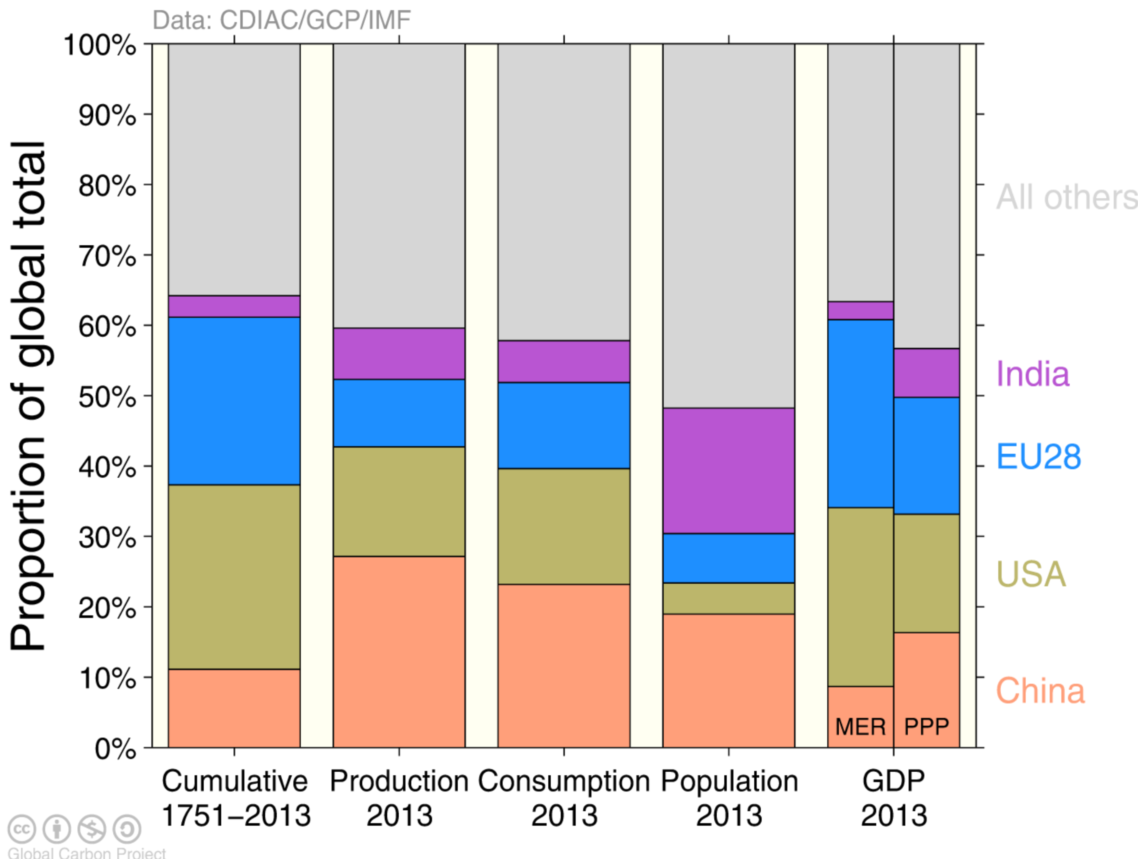
Corinne Le Quéré et al (2015) - Global Carbon Budget 2015 - Earth System Science and Data 7:349-396
doi:10.5194/essd-7-349-2015 - 07/12/2015 - Tyndall Centre for Climate Change Research, University of East Anglia -
http://www.earth-syst-sci-data.net/7/349/2015/essd-7-349-2015.pdf - 71 authors

Los mayores emisores per cápita



Corinne Le Quéré et al (2015) - Global Carbon Budget 2015 - Earth System Science and Data 7:349-396
doi:10.5194/essd-7-349-2015 - 07/12/2015 - Tyndall Centre for Climate Change Research, University of East Anglia
- http://www.earth-syst-sci-data.net/7/349/2015/essd-7-349-2015.pdf - 71 authors

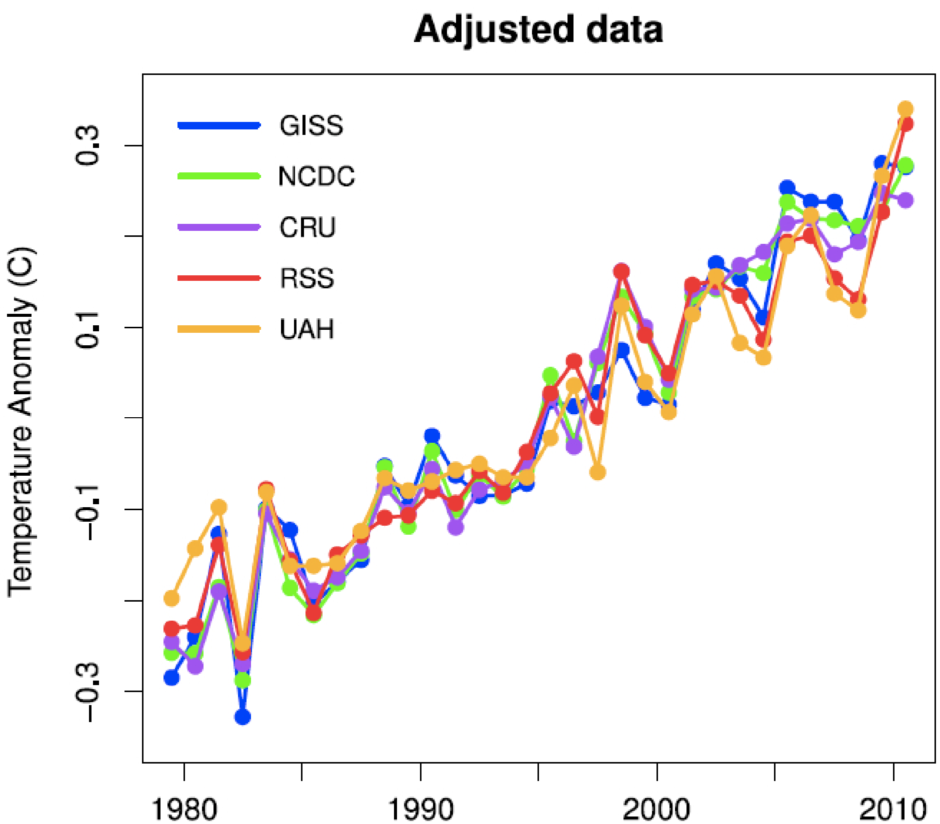
Significación de los distintos países según perspectiva adoptada



Corinne Le Quéré et al (2015) - Global Carbon Budget 2015 - Earth System Science and Data 7:349-396 doi:10.5194/essd-7-349-2015 - 07/12/2015 - Tyndall Centre for Climate Change Research, University of East Anglia - http://www.earth-syst-sci-data.net/7/349/2015/essd-7-349-2015.pdf - 71 authors

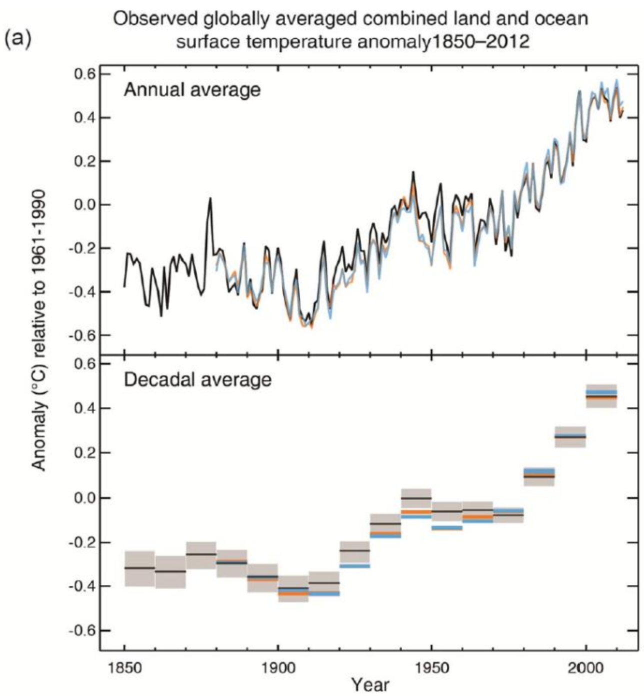
TEMPERATURA RECENT

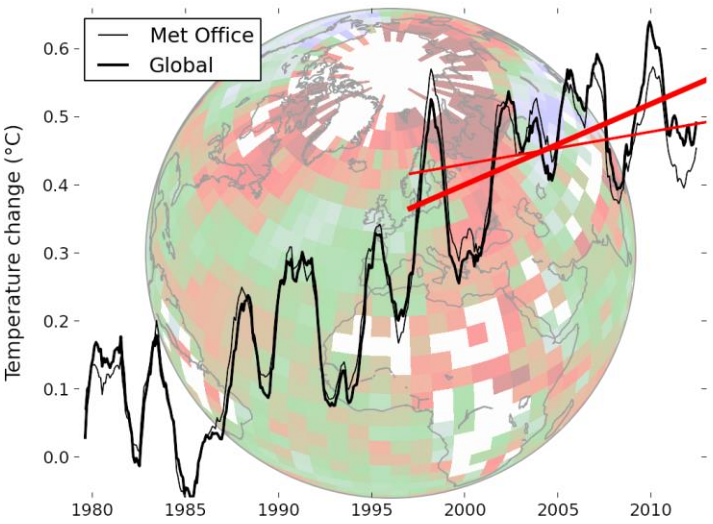
Temperatura global 1979–2010



Grant Foster and Stefan Rahmstorf (2011) - Global temperature evolution 1979–2010 - Environmental Research Letters 6 044022 doi:10.1088/1748-9326/6/4/044022 - 06/12/2011 - Tempo Analytics; Potsdam Institute for Climate Impact Research - http://iopscience.iop.org/1748-9326/6/4/044022/pdf/1748-9326_6_4_044022.pdf

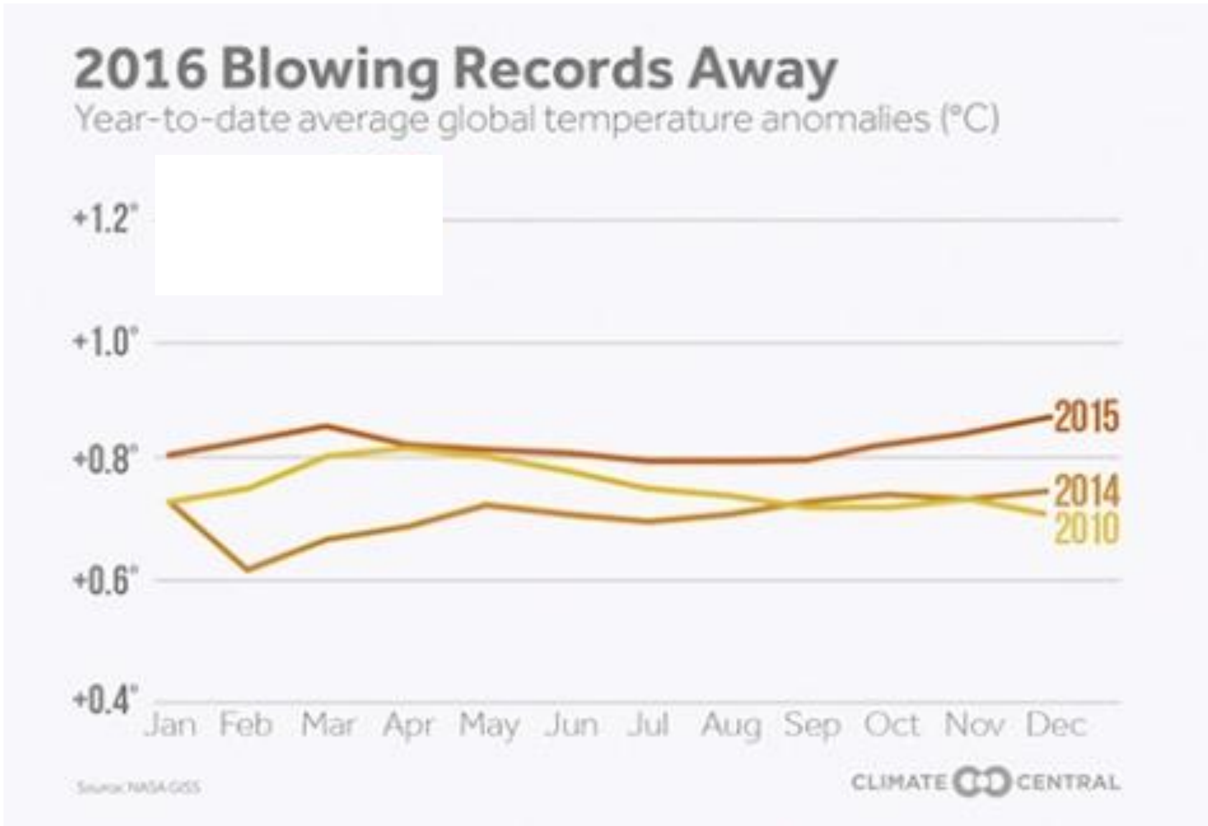
No hi ha «pausa»

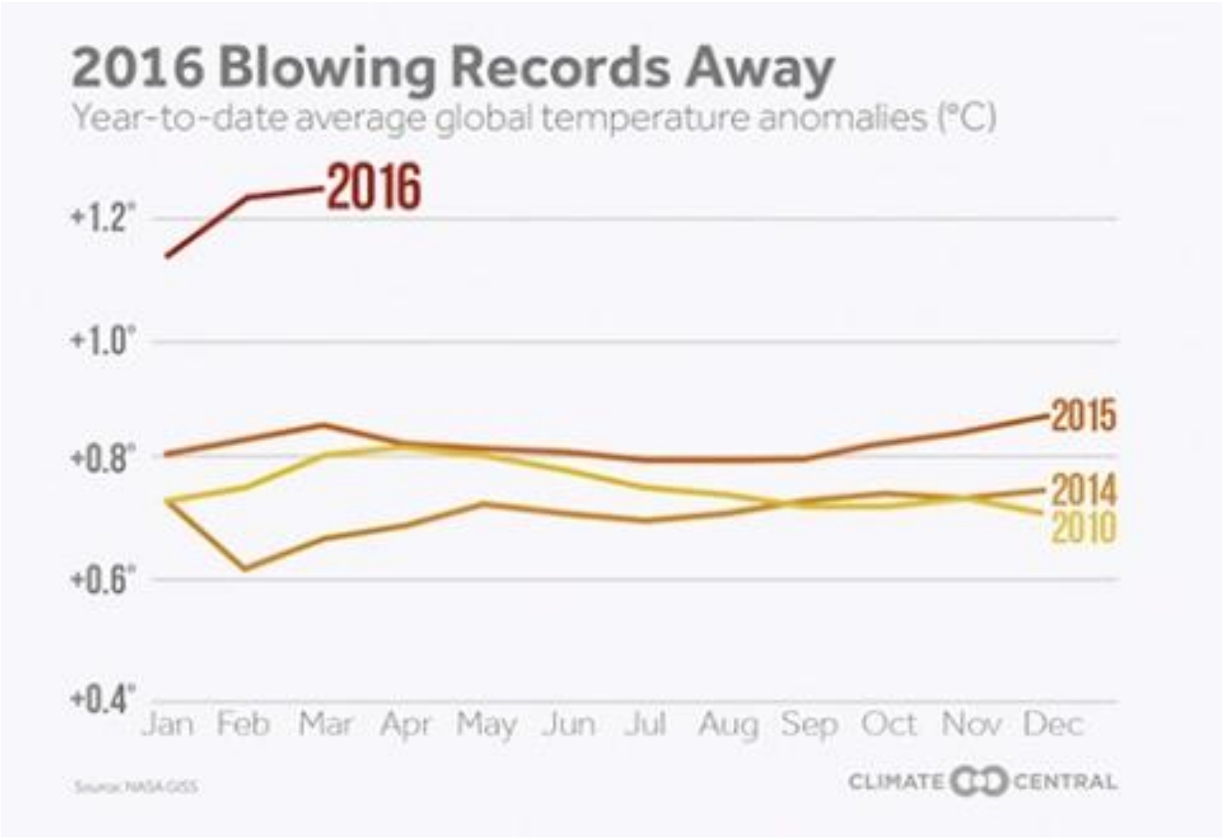




IPCC AR5 WGI SPM 09.2013

Kevin Cowtan and Robert G. Way (2013) - Coverage bias in the HadCRUT4 temperature series and its impact on recent temperature trends - Quarterly Journal of the Royal Meteorological Society doi:10.1002/qj.2297 - Published online: 15/11/2013 - Department of Chemistry, University of York; Department of Geography, University of Ottawa


2016 Blowing Records Away
Year-to-date average global temperature anomalies (°C)
+1.2°
+1.0°
+0.8°
+0.6°
+0.4°
2015
2014
2010
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Source: NASA GISS
CLIMATE CENTRAL



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+1.0°
+0.8°
+0.6°
+0.4°
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Source: NASA GISS
CLIMATE CENTRAL

ANOMALIA TÈRMICA RECENT SEGONS NASA-GISS

data.giss.nasa.gov/gistemp/tabledata_v3/GLB.Ts+dSST.txt

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	55	41	49	32	23	31	35	33	18	14	22	40	33	31	39	35	33	18	1981
1982	9	16	-2	9	15	4	13	9	16	14	13	43	13	13	21	7	9	14	1982
1983	51	40	42	30	36	19	15	31	38	16	31	17	30	33	45	36	22	28	1983
1984	30	16	28	9	34	5	15	15	19	15	3	-6	15	17	21	24	12	13	1984
1985	21	-5	17	10	18	17	1	14	15	13	10	16	12	10	3	15	11	12	1985
1986	30	38	29	25	26	13	13	12	1	14	11	15	19	19	28	27	13	9	1986
1987	36	46	17	26	26	35	46	27	39	32	25	47	34	31	32	23	36	32	1987
1988	57	42	49	44	44	41	35	44	40	37	11	33	40	41	49	46	40	30	1988
1989	16	35	36	33	17	15	33	35	37	33	19	36	29	28	28	29	27	29	1989
1990	40	41	76	54	46	37	43	30	30	42	45	41	44	43	39	58	37	39	1990
1991	42	50	35	51	39	54	51	42	49	31	31	33	42	43	44	42	49	37	1991
1992	45	43	47	23	32	24	13	10	0	10	4	22	23	24	40	34	16	5	1992
1993	37	38	36	27	26	23	27	14	11	23	7	19	24	24	32	30	21	13	1993
1994	31	3	26	40	28	41	31	22	33	42	46	36	32	30	18	31	31	40	1994
1995	51	78	45	47	29	44	49	49	34	49	44	30	46	46	55	40	47	42	1995
1996	27	49	34	36	29	26	35	50	26	20	41	40	34	34	35	33	37	29	1996
1997	32	37	51	37	38	54	36	41	56	64	65	59	48	46	36	42	44	62	1997
1998	61	88	61	64	71	77	70	69	46	46	49	57	63	63	69	65	72	47	1998
1999	48	67	33	34	32	37	41	35	43	42	40	47	42	42	57	33	38	42	1999
2000	26	59	59	59	39	43	42	42	43	28	33	30	42	43	44	52	42	35	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	44	46	57	52	59	54	60	49	55	51	70	54	54	52	40	56	54	59	2001
2002	74	76	90	58	65	55	60	54	64	56	59	42	63	64	68	71	56	59	2002
2003	72	54	56	54	62	48	55	65	66	75	54	73	61	59	56	58	56	65	2003
2004	57	69	65	62	41	42	26	44	53	66	72	51	54	56	67	56	38	63	2004
2005	72	58	69	69	64	66	65	63	76	79	75	67	69	67	60	67	65	77	2005
2006	56	71	64	49	47	64	55	71	64	70	73	78	63	62	65	53	63	69	2006
2007	96	69	71	75	68	58	62	61	64	60	57	48	66	68	81	71	60	61	2007
2008	26	35	74	53	51	47	60	45	64	67	66	54	54	53	37	59	51	66	2008
2009	61	53	53	60	63	66	72	67	70	65	78	65	64	64	56	59	69	71	2009
2010	73	79	92	87	75	65	62	65	62	71	80	49	72	73	72	85	64	71	2010
2011	51	51	64	66	54	59	74	73	56	66	56	53	60	60	50	61	69	59	2011
2012	46	49	57	68	76	62	57	64	75	78	74	52	63	63	49	67	61	76	2012
2013	67	56	64	53	61	65	59	65	77	69	80	66	65	64	58	60	63	75	2013
2014	73	50	77	78	86	66	58	81	90	85	69	79	74	73	63	80	68	81	2014
2015	81	87	90	73	78	78	73	78	82	106	102	110	86	84	82	80	76	96	2015
2016	113	134	128	****	****	****	****	****	****	****	****	****	****	***	119	****	****	****	2016
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

data.giss.nasa.gov/gistemp/tabledata_v3/NH.Ts+dSST.txt

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	85	63	69	38	15	29	11	18	17	24	38	56	39	35	52	41	20	26	1981
1982	-9	17	4	14	7	1	5	-6	9	2	-13	37	6	7	22	8	0	0	1982
1983	54	36	43	7	5	12	21	26	28	12	53	13	26	28	42	18	20	31	1983
1984	33	5	20	-8	22	11	9	3	-2	7	-12	-43	4	8	17	11	8	-2	1984
1985	8	-31	-1	-6	9	4	-11	-2	1	2	4	15	-1	-5	-22	1	-3	3	1985
1986	37	33	26	16	18	13	-2	3	0	6	2	7	13	14	28	20	4	3	1986
1987	28	55	1	9	23	18	29	28	41	23	8	52	26	22	30	11	25	24	1987
1988	60	42	47	43	42	39	40	25	27	24	4	48	37	37	51	44	35	18	1988
1989	11	48	44	36	22	25	30	28	27	27	11	37	29	30	36	34	28	22	1989
1990	43	50	116	66	47	49	30	36	40	47	48	38	51	51	44	76	38	45	1990
1991	55	52	45	54	37	44	45	35	39	30	35	22	41	42	49	45	41	35	1991
1992	54	48	48	9	18	4	-8	-6	-20	-15	-8	21	12	12	42	25	-3	-14	1992
1993	42	53	41	21	30	22	12	2	-5	14	-14	21	20	20	39	30	12	-2	1993
1994	38	-3	44	48	38	42	34	31	30	53	51	34	37	36	19	43	36	45	1994
1995	74	117	58	72	41	48	41	56	42	62	56	32	58	58	75	57	48	54	1995
1996	30	58	30	20	36	24	29	18	5	4	37	39	28	27	40	29	24	15	1996
1997	38	56	77	52	44	50	44	47	55	69	60	53	54	53	44	58	47	61	1997
1998	66	105	71	88	66	74	78	73	62	55	59	78	73	71	74	75	75	59	1998
1999	60	104	30	55	43	39	38	37	41	44	54	75	52	52	81	43	38	46	1999
2000	35	90	87	89	57	47	43	49	39	31	21	29	51	55	67	78	46	30	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	55	50	78	59	63	55	64	67	56	60	96	66	64	61	45	67	62	70	2001
2002	99	109	114	51	50	70	68	53	58	54	76	45	71	72	91	72	64	63	2002
2003	89	50	60	59	71	54	64	81	77	95	67	96	72	68	61	63	66	80	2003
2004	68	88	91	76	56	48	50	54	60	74	95	46	67	71	84	74	50	77	2004
2005	89	67	84	92	77	80	76	70	90	95	103	79	83	81	67	84	75	96	2005
2006	63	93	80	59	73	78	67	66	74	97	95	113	80	77	78	71	71	89	2006
2007	135	92	95	107	72	65	63	71	68	84	79	73	84	87	113	91	66	77	2007
2008	24	50	112	65	60	62	58	59	58	86	91	66	66	66	49	79	60	78	2008
2009	79	71	59	68	64	70	63	69	78	75	82	67	71	70	72	64	67	79	2009
2010	78	88	111	115	92	82	84	82	65	88	118	57	88	89	78	106	83	90	2010
2011	57	59	88	83	63	73	71	68	69	88	61	76	71	70	58	78	71	73	2011
2012	60	57	72	103	92	87	81	71	85	85	90	44	77	80	64	89	80	87	2012
2013	78	66	81	67	76	73	69	68	68	82	105	77	76	73	63	75	70	85	2013
2014	95	66	117	105	90	82	74	90	86	96	84	109	91	88	79	104	82	88	2014
2015	114	115	123	101	99	104	88	99	112	123	132	144	113	110	113	108	97	123	2015
2016	150	189	178	****	****	****	****	****	****	****	****	****	****	***	161	****	****	****	2016
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

Divide by 100 to get changes in degrees Celsius (deg-C).

data.giss.nasa.gov/gistemp/tabledata_v3/GLB.Ts.txt

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	62	57	69	51	32	40	52	53	29	13	25	49	44	42	46	50	48	22	1981
1982	13	27	-2	3	25	4	20	10	10	3	11	40	14	14	29	9	11	8	1982
1983	49	41	47	40	50	29	21	48	57	32	33	17	39	41	43	46	33	41	1983
1984	24	15	38	17	48	5	18	28	27	23	10	3	21	23	19	34	17	20	1984
1985	31	5	27	19	23	28	6	35	26	16	10	16	20	19	13	23	23	17	1985
1986	38	50	38	42	33	16	16	20	1	12	12	19	25	25	35	38	17	8	1986
1987	43	53	24	39	29	55	59	26	35	34	30	56	40	37	39	31	47	33	1987
1988	66	48	56	49	62	58	44	55	54	52	15	36	50	51	56	56	53	40	1988
1989	28	45	46	43	22	18	46	51	53	44	21	38	38	38	36	37	38	40	1989
1990	51	42	86	62	53	47	63	43	30	52	52	46	52	52	44	67	51	45	1990
1991	49	61	47	71	43	69	63	56	61	34	33	33	52	53	52	54	63	43	1991
1992	50	43	55	24	27	30	8	14	-5	8	2	25	23	24	42	35	17	2	1992
1993	39	41	34	31	28	27	38	23	11	23	9	21	27	27	35	31	29	14	1993
1994	40	8	26	52	26	57	41	24	45	41	51	44	38	36	23	35	41	46	1994
1995	57	91	52	59	39	51	63	59	47	68	52	41	57	57	64	50	58	56	1995
1996	42	60	46	49	35	34	55	78	42	33	50	53	48	47	48	43	56	42	1996
1997	48	55	66	39	44	67	36	45	52	62	72	70	55	53	52	50	49	62	1997
1998	72	120	83	84	95	105	91	87	60	69	66	81	84	83	87	87	94	65	1998
1999	69	88	49	43	49	63	66	56	67	64	58	54	61	63	79	47	62	63	1999
2000	31	80	71	77	57	70	65	61	59	34	48	48	58	59	55	68	65	47	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	60	65	70	63	75	67	72	67	72	63	85	74	69	67	58	69	69	73	2001
2002	98	92	114	82	89	68	83	70	83	65	70	55	81	82	88	95	74	73	2002
2003	93	76	73	70	88	66	67	88	85	91	67	88	79	77	75	77	74	81	2003
2004	73	94	88	78	50	65	26	60	61	85	89	69	70	71	85	72	50	78	2004
2005	99	90	95	86	76	83	82	77	98	101	92	92	89	87	86	86	81	97	2005
2006	76	95	84	69	52	79	70	86	75	87	89	95	80	79	88	68	78	83	2006
2007	125	94	95	96	96	68	81	89	85	82	72	72	88	90	105	96	79	80	2007
2008	51	47	93	68	60	54	75	42	82	76	83	75	67	67	57	74	57	80	2008
2009	77	78	67	77	82	84	89	89	93	76	87	78	81	81	77	75	87	85	2009
2010	98	108	114	104	98	89	78	86	91	99	103	72	95	95	95	105	84	97	2010
2011	76	69	80	86	67	76	94	99	81	87	80	80	81	80	72	78	89	82	2011
2012	64	61	73	82	98	74	60	89	92	97	96	73	80	80	68	84	74	95	2012
2013	99	79	87	68	70	89	68	80	101	87	89	85	84	83	84	75	79	92	2013
2014	97	67	80	91	105	78	75	87	111	105	83	100	90	89	83	92	80	100	2014
2015	97	110	112	81	89	89	79	90	82	119	123	143	101	98	102	94	86	108	2015
2016	139	171	165	****	****	****	****	****	****	****	****	****	****	***	151	****	****	****	2016
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

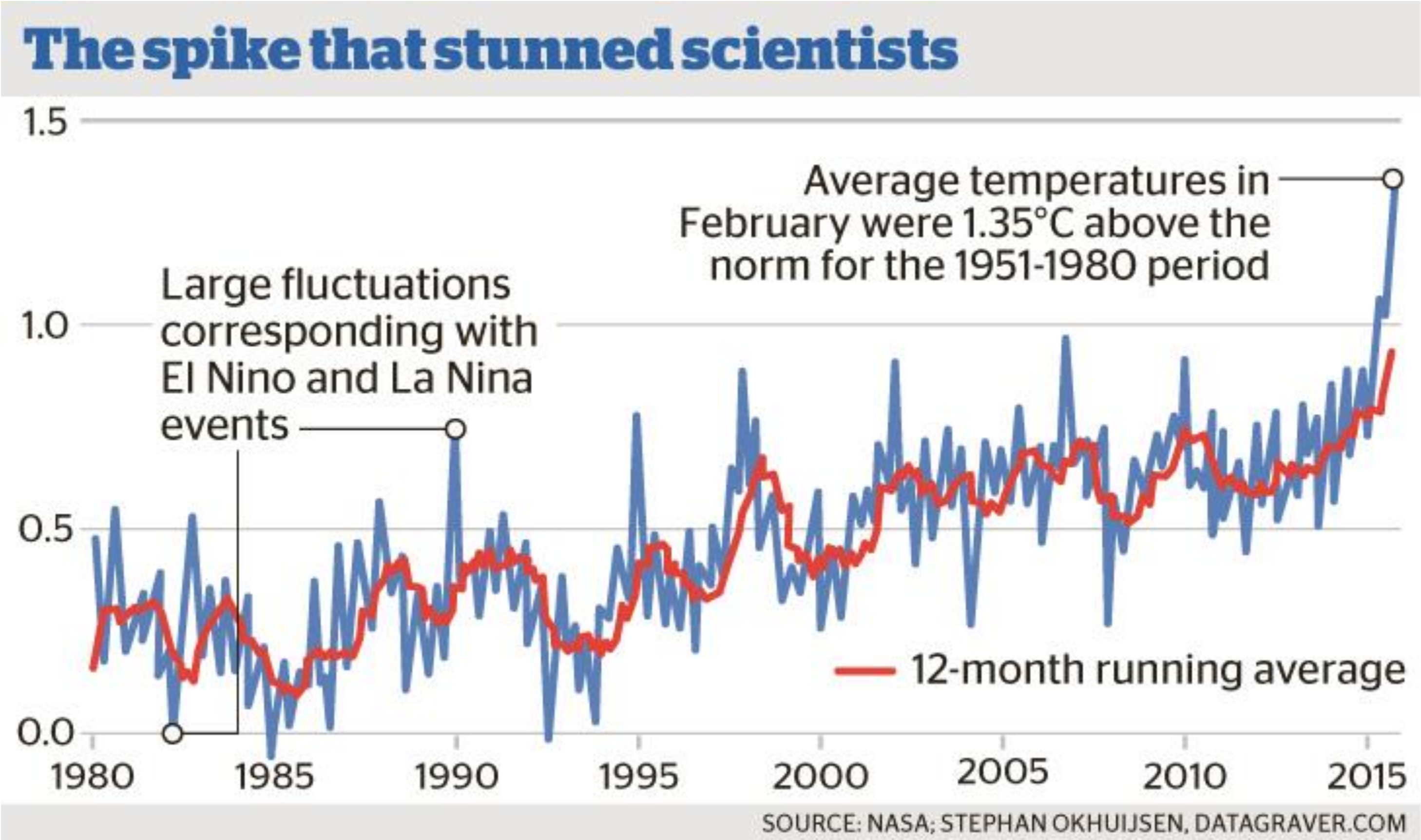
Divide by 100 to get changes in degrees Celsius (deg-C).

data.giss.nasa.gov/gistemp/tabledata_v3/NH.Ts.txt

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	97	85	94	60	23	41	21	33	23	25	46	66	51	46	62	59	31	31	1981
1982	-14	24	9	7	3	-1	15	4	18	0	-16	37	7	10	26	6	6	1	1982
1983	57	41	61	21	19	25	40	45	45	27	64	18	38	40	45	34	36	45	1983
1984	28	7	32	8	34	29	24	25	4	20	-3	-26	15	19	17	25	26	7	1984
1985	17	-19	10	0	22	8	-2	12	10	16	0	18	8	4	-9	11	6	9	1985
1986	49	41	34	31	26	19	5	13	0	9	6	17	21	21	36	30	12	5	1986
1987	35	71	16	26	28	33	48	42	52	30	15	63	38	34	41	23	41	32	1987
1988	70	57	63	55	62	54	49	38	36	34	6	58	49	49	64	60	47	26	1988
1989	21	60	55	49	33	33	40	37	36	35	12	34	37	39	46	46	37	28	1989
1990	61	51	137	81	55	68	40	55	48	54	56	46	63	62	49	91	54	52	1990
1991	63	61	60	67	45	54	58	46	56	40	41	33	52	53	56	58	53	46	1991
1992	65	59	61	20	23	10	-8	2	-16	-19	-7	33	19	19	52	35	2	-14	1992
1993	43	60	49	28	40	34	23	12	-1	18	-14	29	27	27	46	39	23	1	1993
1994	45	5	52	65	49	55	53	42	38	60	60	47	48	46	27	55	50	53	1994
1995	94	140	72	91	62	66	59	75	58	87	74	43	77	77	94	75	66	73	1995
1996	52	77	52	34	52	37	45	28	7	13	49	61	42	41	57	46	37	23	1996
1997	58	83	108	62	56	55	52	60	63	72	72	67	67	67	67	75	56	69	1997
1998	86	140	104	124	91	97	97	88	81	73	75	104	97	94	98	106	94	76	1998
1999	83	123	47	77	56	55	54	50	64	55	76	88	69	71	103	60	53	65	1999
2000	51	126	120	115	77	64	53	62	45	37	33	55	70	73	88	104	60	38	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	80	73	105	84	84	70	75	89	67	78	113	94	84	81	69	91	78	86	2001
2002	136	136	149	79	72	88	94	68	77	69	97	71	95	97	122	100	83	81	2002
2003	117	77	85	85	98	71	78	101	89	115	89	116	94	90	88	90	83	98	2003
2004	82	118	129	106	79	65	62	71	71	88	115	61	87	92	106	105	66	91	2004
2005	113	94	115	120	96	102	95	88	111	118	123	104	107	103	89	110	95	117	2005
2006	87	124	107	79	90	103	90	79	85	115	115	142	101	98	105	92	91	105	2006
2007	170	128	125	134	95	88	84	96	85	110	106	103	110	114	147	118	90	100	2007
2008	44	65	139	86	79	76	68	66	68	90	103	90	81	82	71	101	70	87	2008
2009	92	98	74	88	88	85	74	84	99	92	98	94	89	89	93	83	81	96	2009
2010	111	127	144	146	122	109	106	108	92	120	149	85	118	119	111	137	108	120	2010
2011	76	82	113	110	85	96	93	90	98	116	83	102	95	94	81	103	93	99	2011
2012	77	75	97	133	122	113	97	95	102	108	113	63	100	103	84	117	102	108	2012
2013	112	97	112	86	91	93	82	79	78	100	116	96	95	92	91	96	85	98	2013
2014	121	92	138	135	112	99	95	96	93	116	103	137	112	108	103	129	97	104	2014
2015	136	134	152	121	119	120	102	112	120	137	158	189	133	129	136	131	111	138	2015
2016	192	245	236	****	****	****	****	****	****	****	****	****	****	***	209	****	****	****	2016
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

Divide by 100 to get changes in degrees Celsius (deg-C).

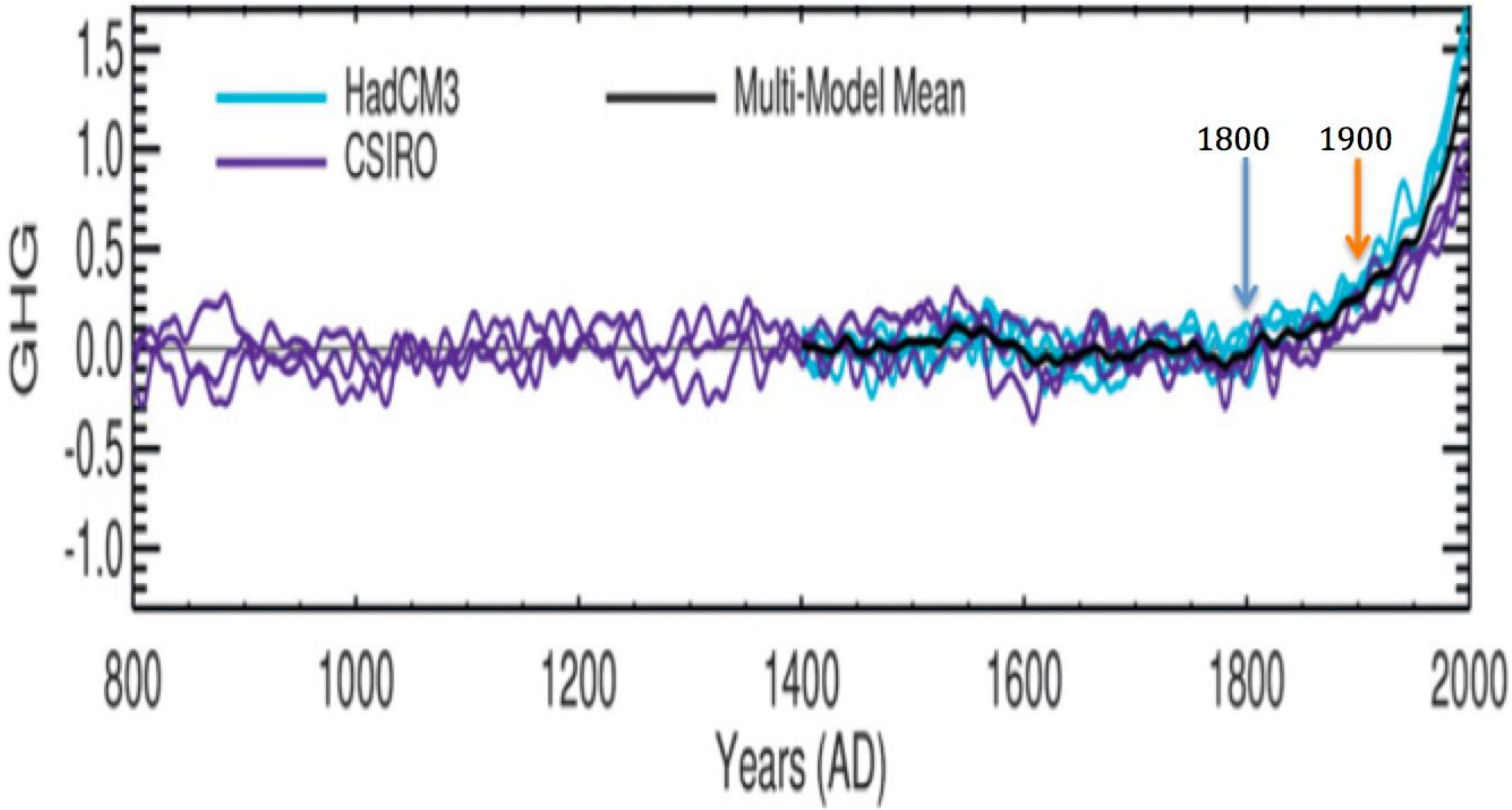


"We are in a kind of climate emergency now,"

Stefan Rahmstorf , Potsdam Institute of Climate Impact Research + University of NSW

Peter Hannam - True shocker': February spike in global temperatures stuns scientists - The Sidney Morning Herald - 14/04/2016 - - http://www.smh.com.au/environment/climate-change/true-shocker-spike-in-global-temperatures-stuns-scientists-20160313-gni10t.html

Reconstrucció preindustrial



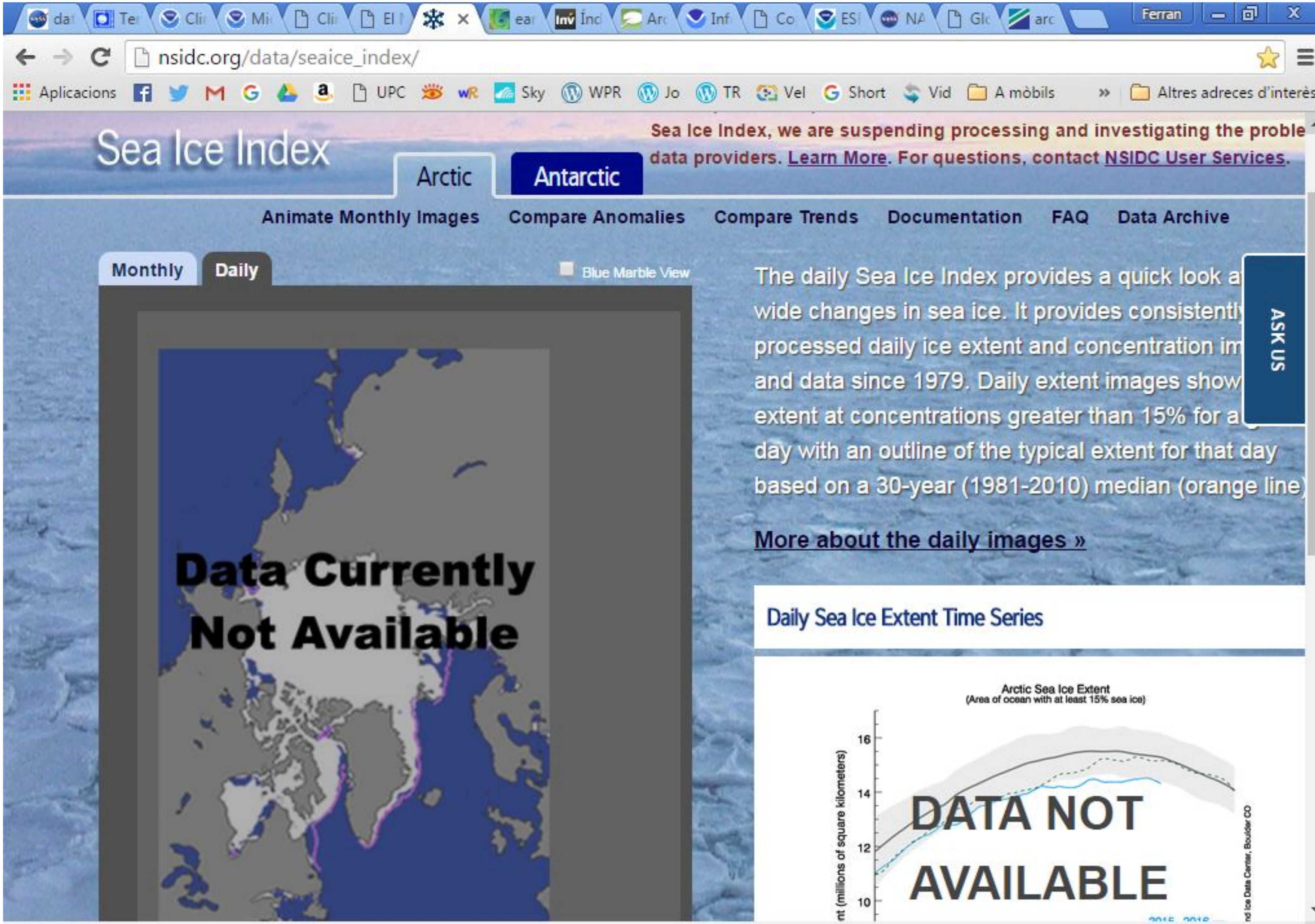
P. Schurer et al (2013) – Separating Forced from Chaotic Climate Variability over the Past Millennium – Journal of Climate 26:6954-6973 doi:10.1175/JCLI-D-12-00826.1 – School of GeoSciences, The University of Edinburgh – http://www.geos.ed.ac.uk/homes/ghegerl/Schureretal_JCli.pdf

Geophysical Research Abstracts
Vol. 18, EGU2016-3081, 2016
EGU General Assembly 2016

Estimating pre-industrial global temperature

Ed Hawkins (1), Pablo Ortega (1), Emma Suckling (1), Andrew Schurer (2), Gabi Hegerl (2), Phil Jones (3), Manoj Joshi (3), Tim Osborn (3), Juliette Mignot (4), Peter Thorne (5), and Geert Jan van Oldenborgh (6)
(1) NCAS-Climate, University of Reading, UK, (2) University of Edinburgh, UK, (3) University of East Anglia, UK, (4) IPSL, Paris, France, (5) University of Maynooth, Ireland, (6) KNMI, Netherlands

The United Nations Framework Convention on Climate Change (UNFCCC) process has recently agreed to try and limit global temperature rise to 'well below 2°C above pre-industrial levels'. But what period is 'pre-industrial'? Remarkably, perhaps, this is not defined within the UNFCCC or its many agreements and protocols. Neither was the term used in the IPCC's fifth assessment report (AR5) when discussing when particular temperature levels might be reached, due to the lack of a robust definition. Here, we discuss the important factors to consider when defining a period to call pre-industrial, based on estimates of historical radiative forcings and the availability of climate observations. There is no perfect period to choose, but we suggest that 1720-1800 is the optimal choice. We also attempt to estimate the change in global temperatures since this pre-industrial period using a range of approaches based on observations, radiative forcings, global climate model simulations and proxy evidence. We discuss how such an assessment might be improved in future and conclude that 2015 was likely the first year in which global temperatures were more than 1°C above pre-industrial levels.


nsidc.org/data/seaice_index/
Sea Ice Index
Arctic
Antarctic
Sea Ice Index, we are suspending processing and investigating the proble
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Daily
Blue Marble View
Data Currently Not Available
The daily Sea Ice Index provides a quick look a
wide changes in sea ice. It provides consistentl
processed daily ice extent and concentration im
and data since 1979. Daily extent images show
extent at concentrations greater than 15% for a
day with an outline of the typical extent for that day
based on a 30-year (1981-2010) median (orange line)
More about the daily images »
ASK US
Daily Sea Ice Extent Time Series
Arctic Sea Ice Extent
(Area of ocean with at least 15% sea ice)
16
14
12
10
DATA NOT AVAILABLE

PERSPECTIVE
PUBLISHED ONLINE: 27 JANUARY 2016 | DOI: 10.1038/NCLIMATE2876

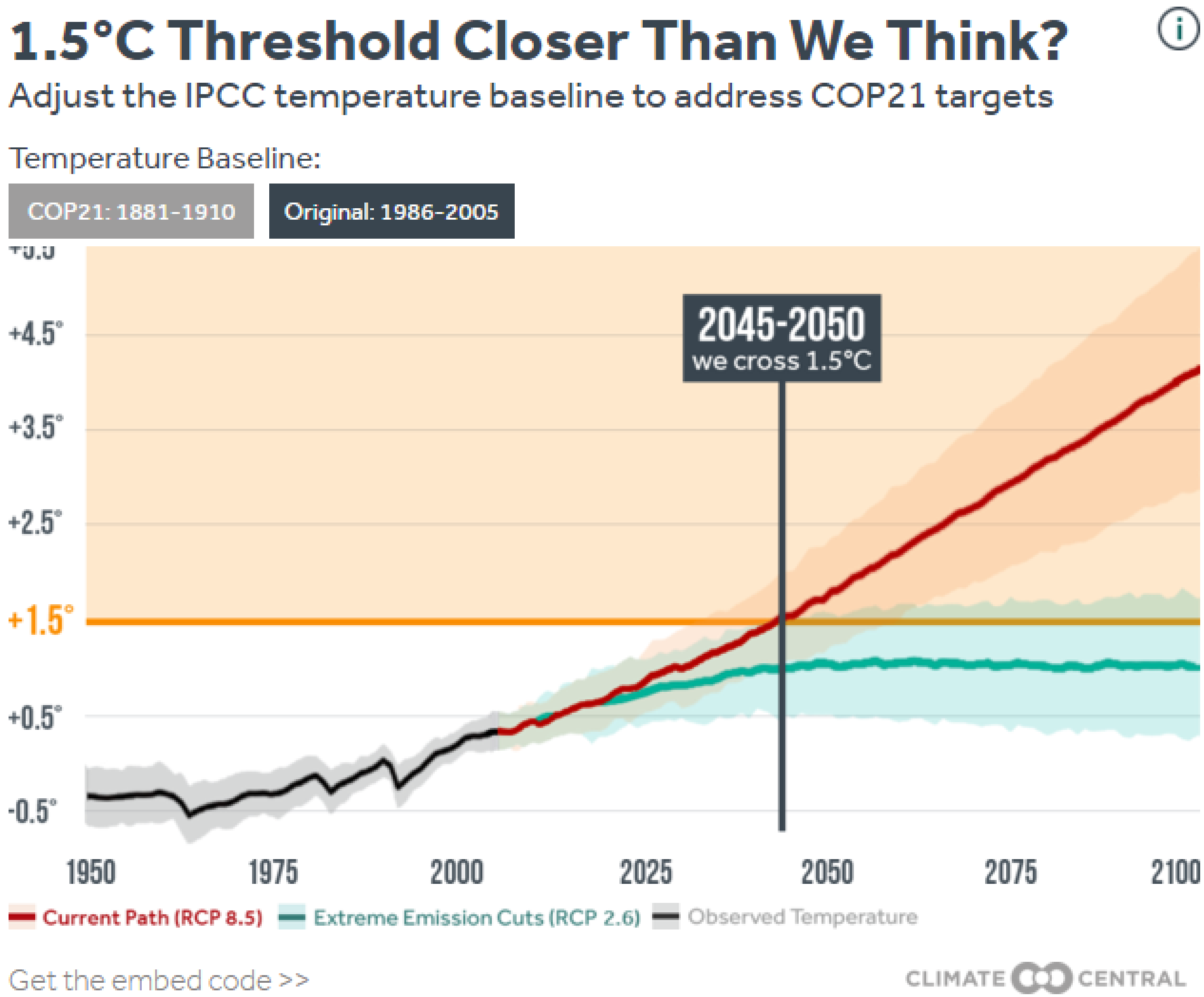
nature climate change

An imperative to monitor Earth's energy imbalance

K. von Schuckmann[1,2]*, M. D. Palmer[3], K. E. Trenberth[4], A. Cazenave[5,6], D. Chambers[7], N. Champollion[6], J. Hansen[8], S. A. Josey[9], N. Loeb[10], P.-P. Mathieu[11], B. Meyssignac[5] and M. Wild[12]

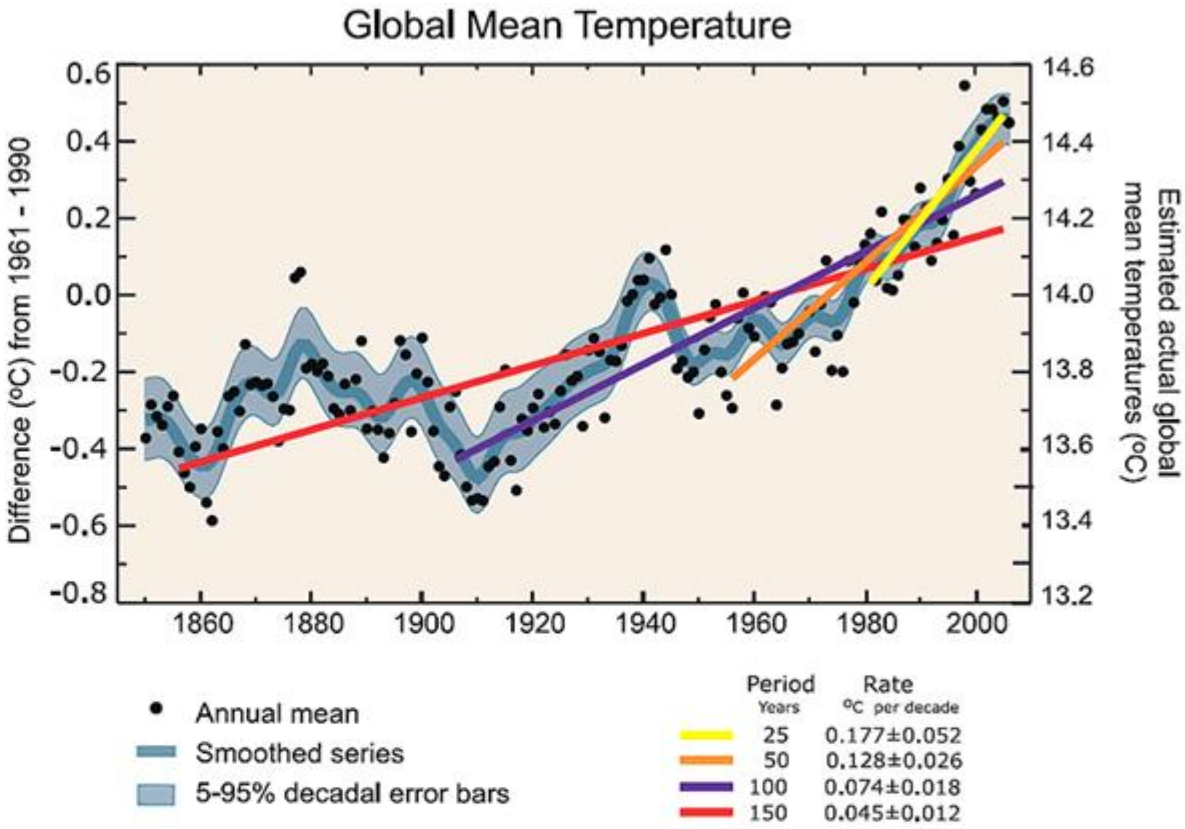
The current Earth's energy imbalance (EEI) is mostly caused by human activity, and is driving global warming. The absolute value of EEI represents the most fundamental metric defining the status of global climate change, and will be more useful than using global surface temperature. EEI can best be estimated from changes in ocean heat content, complemented by radiation measurements from space. Sustained observations from the Argo array of autonomous profiling floats and further development of the ocean observing system to sample the deep ocean, marginal seas and sea ice regions are crucial to refining future estimates of EEI. Combining multiple measurements in an optimal way holds considerable promise for estimating EEI and thus assessing the status of global climate change, improving climate syntheses and models, and testing the effectiveness of mitigation actions. Progress can be achieved with a concerted international effort.

PROJECCIONS



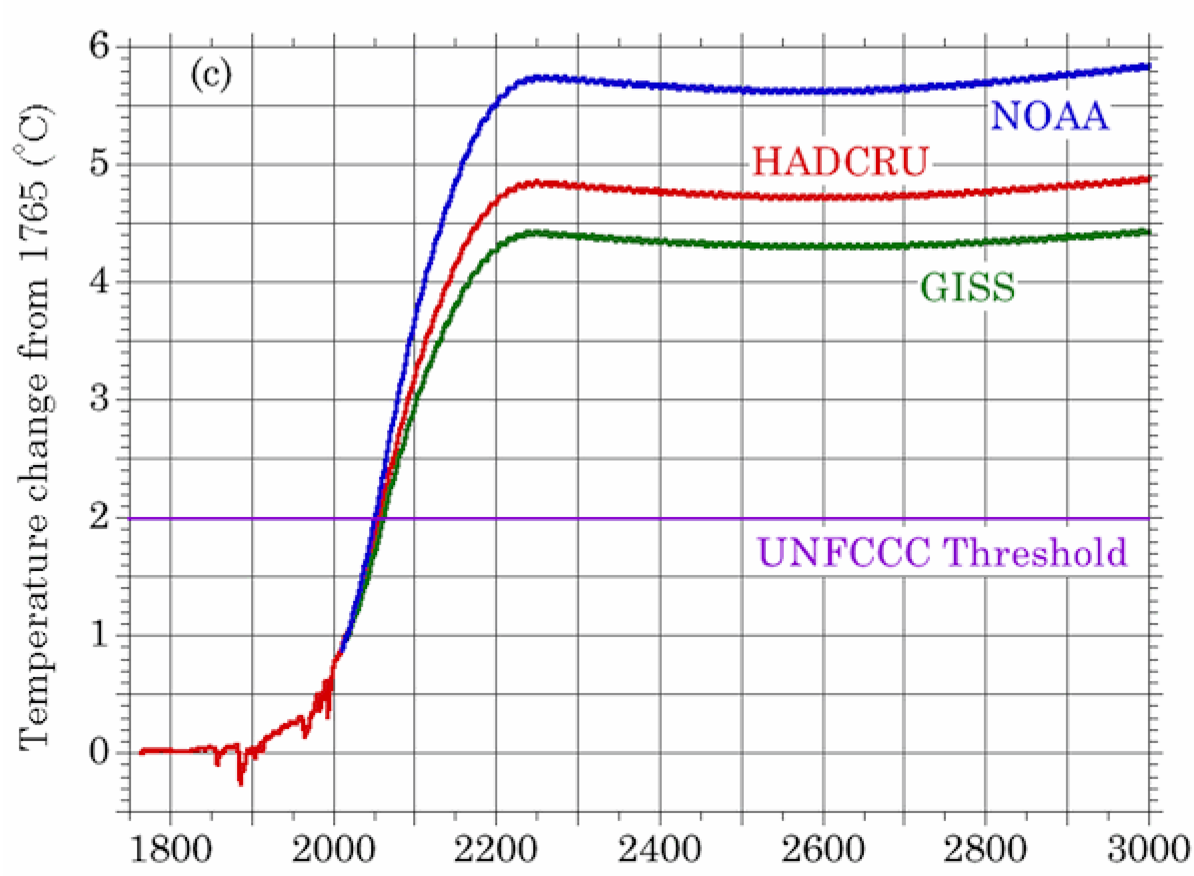
Flirting with the 1.5°C Threshold - Climate Central, 20/04/2016 -http://www.climatecentral.org/news/world-flirts-with-1.5C-threshold-20260

Resposta en temperatura



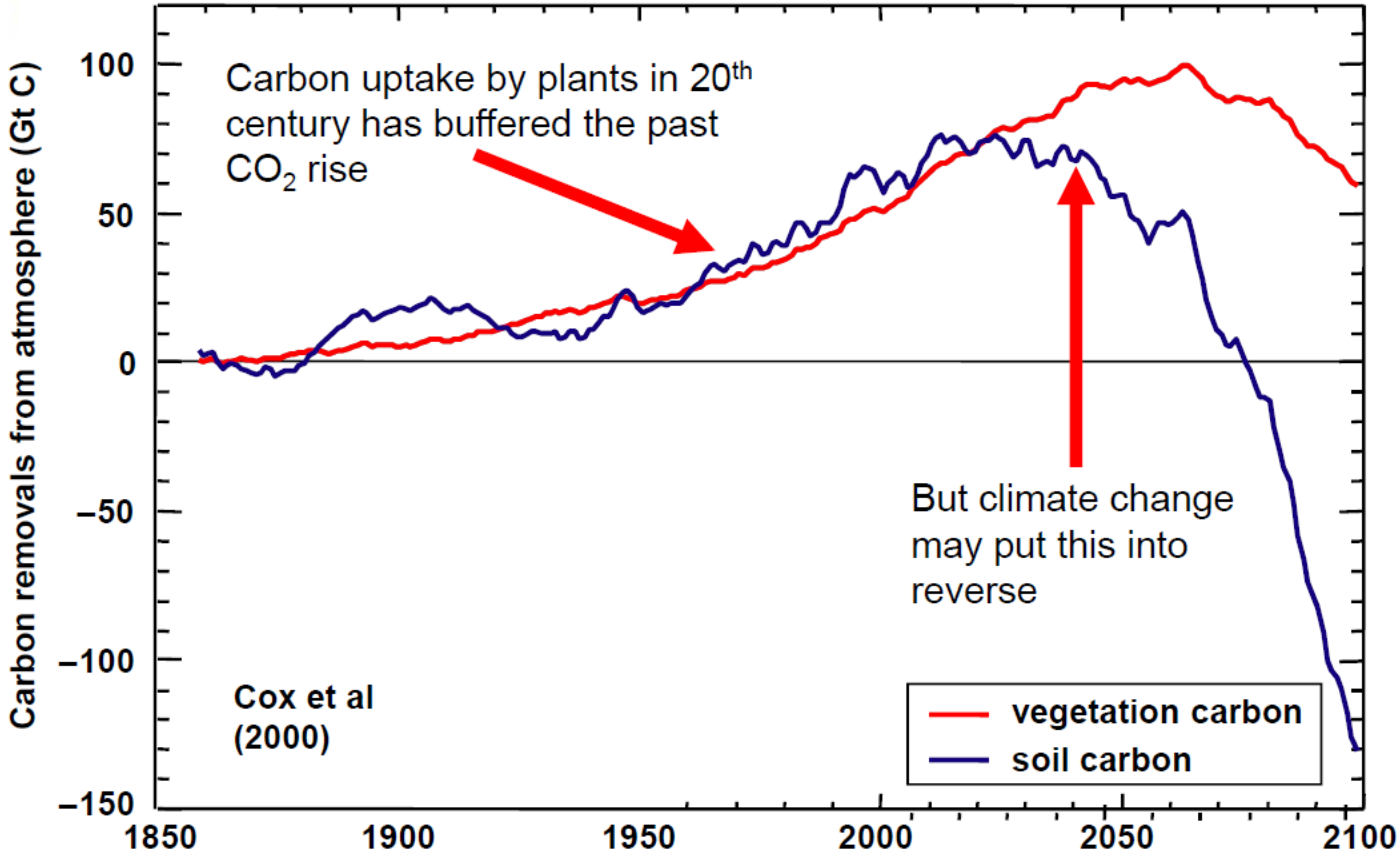
Font: IPCC, 2007

Projeccions S=1,5-2.0 °C



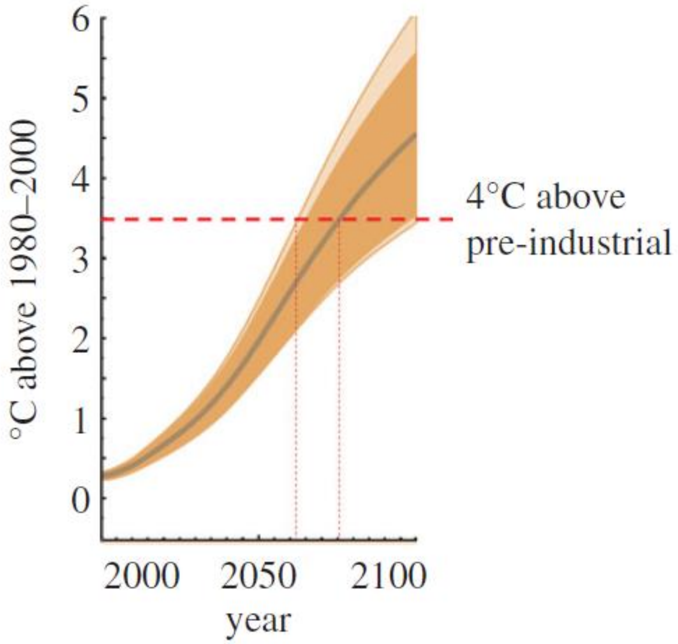
Michael E. Schlesinger et al (2012) - A Fair Plan to Safeguard Earth's Climate - Journal of Environmental Protection 3:455-461 doi: 10.4236/jep.2012.36055 - Climate Research Group, Department of Atmospheric Sciences, University of Illinois at Urbana-Champaign - http://www.scirp.org/journal/PaperDownload.aspx?paperID=20038 - 3 authors

The free ecosystem service that has been buying us time may not last…



Richard Betts et al (2009) - 4°C global warming: regional patterns and timing - International Climate Conference: 4 Degrees and Beyond - Published online: 30/09/2009 - Hadley Centre for Climate Prediction & Research, Met Office

Anys 2060



"Si la retroalimentación con el ciclo del carbono fuera más fuerte, cosa que parece menos probable pero todavía creíble, **el calentamiento de 4 ºC podría ser alcanzado en los primeros 2060**, en base a predicciones consistentes con el 'margen probable' del IPCC." [énfasis añadido]

Richard A. Betts et al (2011) – When could global warming reach 4°C? – Philosophical Transactions of the Royal Society of London A 369:67-84 doi:10.1098/rsta.2010.0292 –Met Office Hadley Centre – 6 authors

Gaia Vince (2009) - How to survive the coming century - New Scientist, Marzo 2009 - http://www.newscientist.com/article/mg20126971.700-how-to-survive-the-coming-century.html

RESPOSTES

World will not meet 2C warming target, climate change experts agree

Guardian poll reveals almost nine out of 10 climate experts do not believe current political efforts will keep warming below 2C

David Adam, environment correspondent
The Guardian, Tuesday 14 April 2009
Article history

Sciencexpress Perspectives

Irreversible Does Not Mean Unavoidable

H. Damon Matthews[1] and Susan Solomon[2]

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Carbon dioxide emissions cuts implemented today would affect the rate of future global warming immediately.

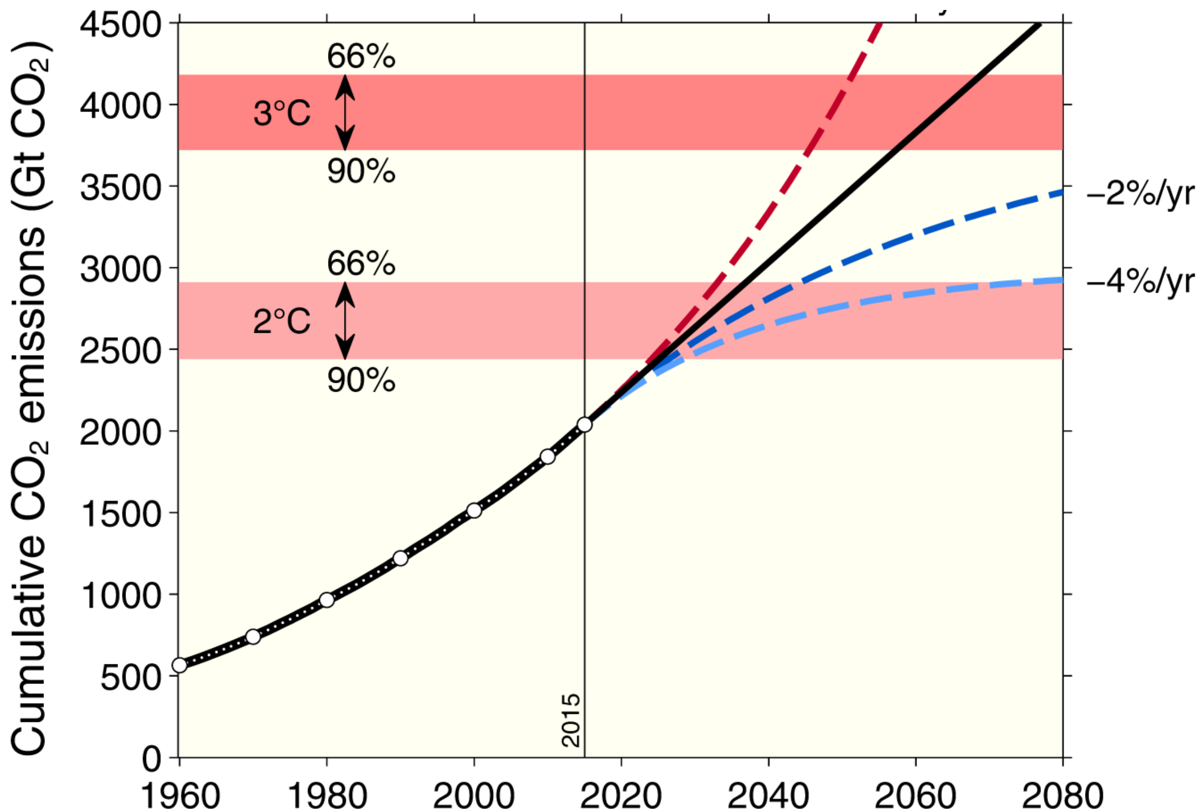
Understanding how decreases in CO_2 emissions would affect global temperatures has been hampered in recent years by confusion regarding issues of committed warming and irreversibility. The notion that there will be additional future warming or "warming in the pipeline" if the atmospheric concentrations of carbon dioxide were to remain fixed at current levels (*1*) has been misinterpreted to mean that the rate of increase in Earth's global temperature is inevitable, regardless of how much or how quickly emissions decrease (*2–4*). Further misunderstanding may stem from recent studies showing that the warming that has already occurred as a result of past anthropogenic carbon dioxide increases is irreversible on a time scale of at least 1000 years (*5*, *6*). But irreversibility of past changes does not mean that further warming is

CO_2 for many decades. It is this dependence on CO_2-emitting technology that generates a commitment to current and near-future emissions (*7*). Cleaner alternatives are being developed and carbon capture and storage technologies are being tested, but technological development and diffusion are subject to substantial inertia (*8*). Societal inertia, rather than the inertia of the climate system, is thus the critical challenge if we wish to begin to decrease the rate of CO_2-induced global warming in the near future.

The strong dependence of future warming on future cumulative carbon emissions implies that there is a quantifiable cumulative amount of CO_2 emissions that we must not exceed if we wish to keep global temperature below 2°C above pre-industrial temperatures. Several recent analyses have suggested that total CO_2 emissions of ~1000 Pg C (~3700 Pg CO_2; 1 Pg = 10^{15} g) would give us about even odds of meeting the 2°C target (*9–12*). To meet such a target given historical emissions would mean that the world has roughly half of the allowable emissions budget remaining. This is equivalent to 50 years of emissions at current levels and carries the implication that the longer we delay before beginning to decrease emissions, the faster the rate of decrease must be to stay within this total allowable budget (*13*).

Emissions differ widely between countries, particularly between

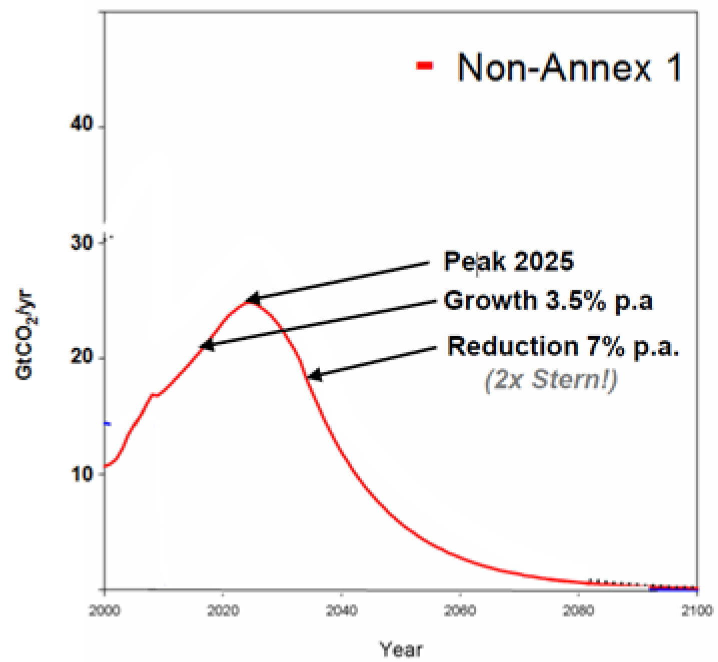
Cumulative global CO_2 emissions and temperature

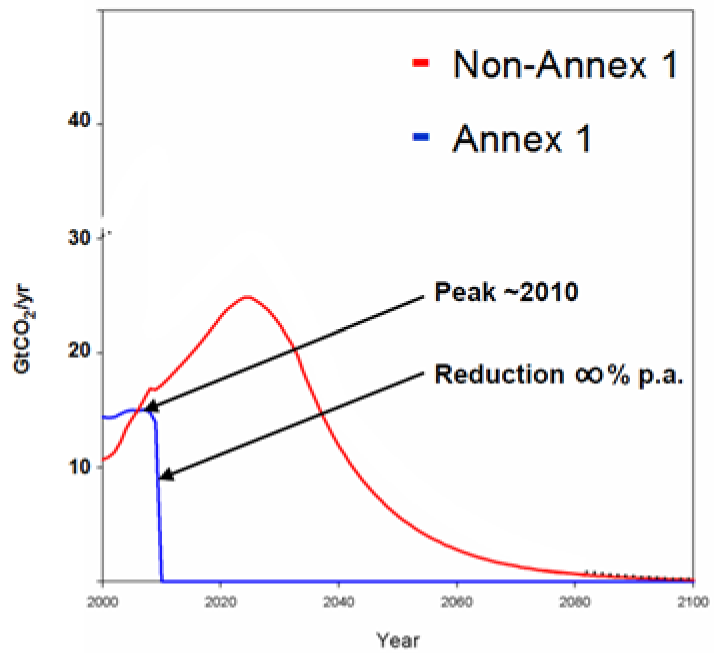


Cumulative global CO_2 emissions from fossil fuels, industry, and land use change and four simplified future pathways compared to probability of exceeding different temperatures (red)

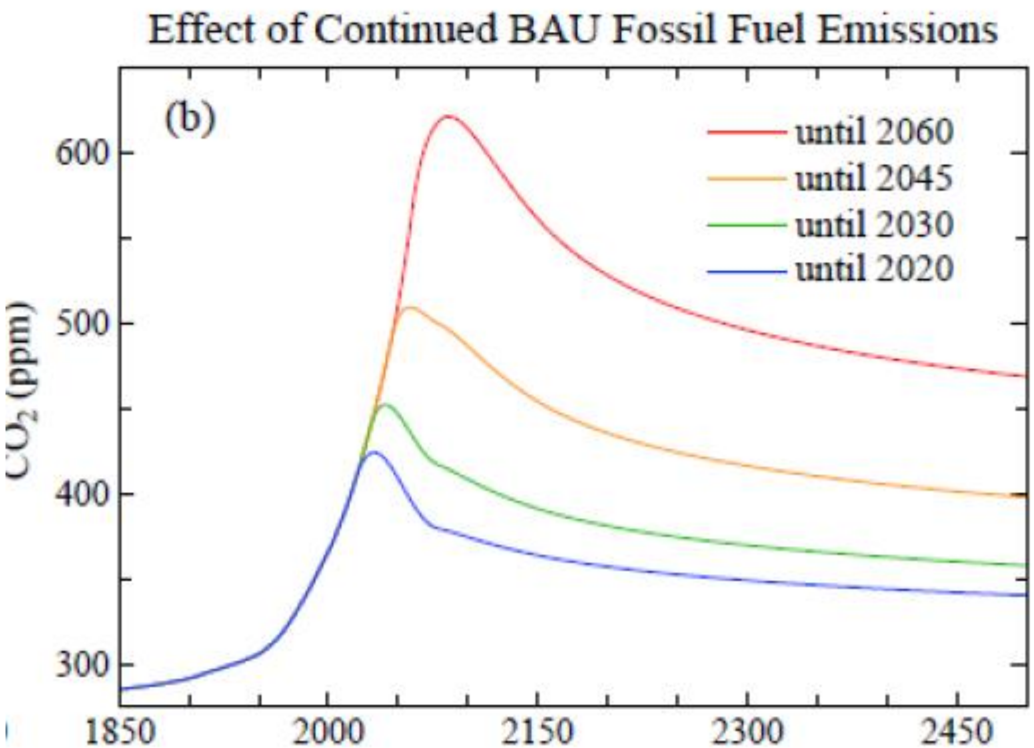
Jackson et al 2015b; Global Carbon Budget 2015

¿Solució?





Kevin Anderson and Alice Bows (2011) - Beyond 'dangerous' climate change: emission scenarios for a new world - Philosophical Transactions of the Royal Society of London A 369:20-44 doi:10.1098/rsta.2010.0290 - Tyndall Centre for Climate Change Research + School of Mechanical, Aerospace and Civil Engineering + School of Environmental Sciences and School of Development, University of East Anglia; Sustainable Consumption Institute, School of Earth, Atmospheric and Environmental Sciences, University of Manchester



James Hansen et al (2013) – Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature – PLOS ONE, in press – Columbia University Earth Institute, New York – http://www.columbia.edu/~jeh1/mailings/2011/20110505_CaseForYoungPeople.pdf - 15 autors

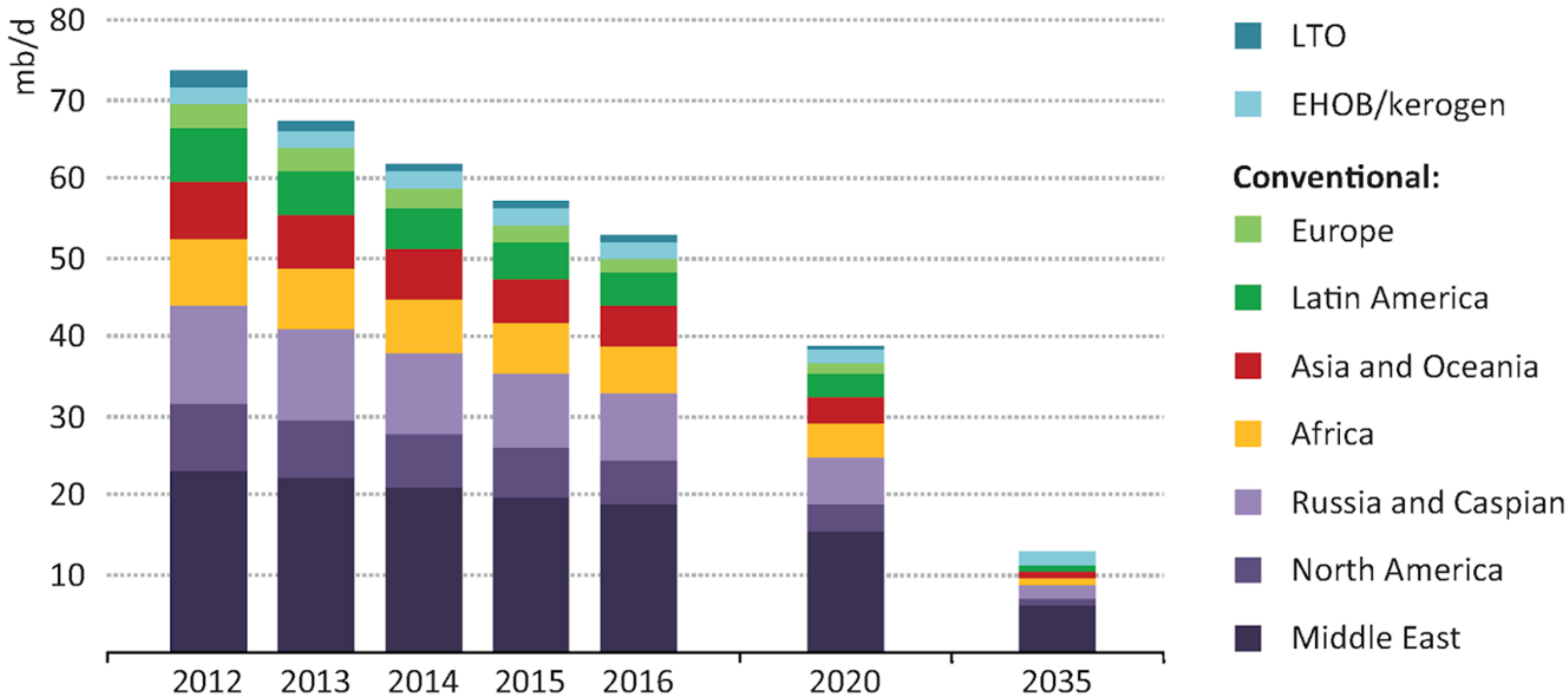
Duality

AIE, noviembre 2013

"En nuestro escenario central, que tiene en cuenta el efecto de las medidas ya anunciadas por los gobiernos para mejorar la eficiencia energética, apoyar las energías renovables, reducir las subvenciones a los combustibles fósiles y, en ciertos casos, fijar un precio a las emisiones de CO2, las emisiones de CO2 relacionadas con la energía subirán con todo cerca de un 20% hasta 2035.

Esto encaminará al mundo por una senda que supondrá una elevación de la temperatura media a largo plazo de 3,6 °C, es decir, muy por encima del objetivo de 2 °C acordado internacionalmente."

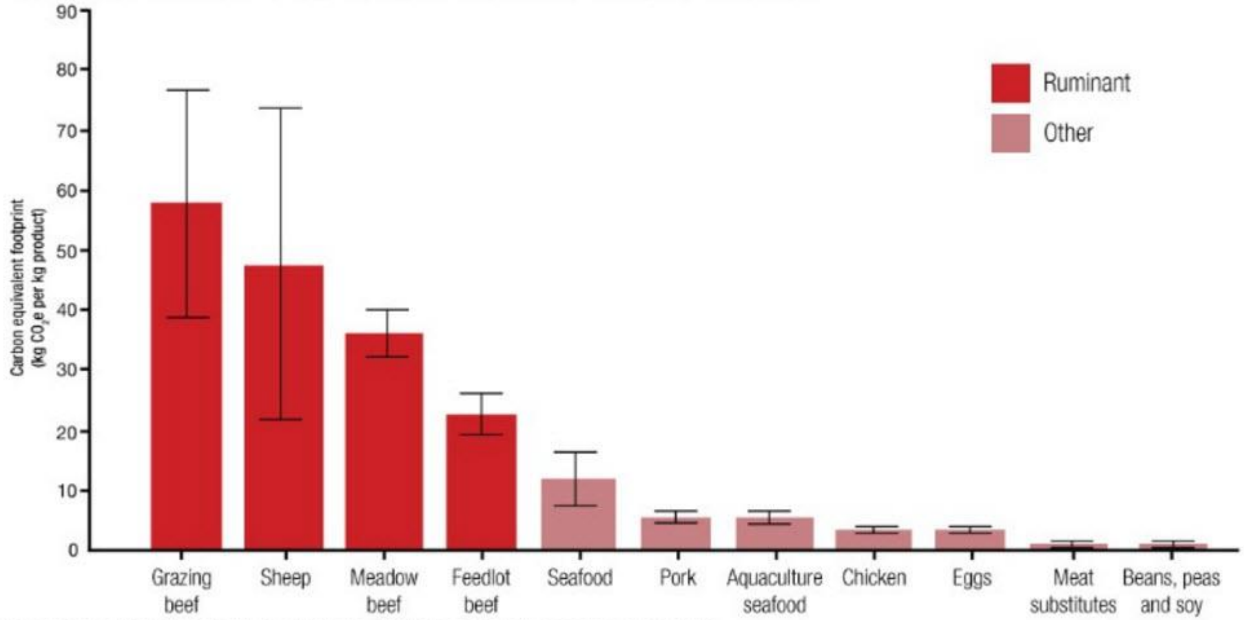
Figure 14.6 ▷ Production that would be observed from all currently producing fields in the absence of further investment (excluding NGLs)



Note: EHOB = extra-heavy oil and bitumen.

Fuente: World Energy Outlook, 2013. Agencia Internacional de la Energía

YOUR FOOD'S CARBON FOOTPRINT



Reproduced from Nature Climate Change: Ruminants, climate change and climate policy; January 2014

Contenido Acuerdo de París

- Muy por debajo 2C, proseguir esfuerzos 1,5 ºC
- Compromisos no vinculantes
  - 2,7 ºC
  - Pico lo antes possible (ja estancada) i reduir depressa
  - Primer balanç a 2023 – cada 5 anys
  - Moving targets
- Neutralitat segona meitat: tecnologia
- No responsabilitat , no equity [Xercavins]
- Permís per a seguir emitint
- Fons verd no se sap d'on surt

Acord de Paris (1)

- “Artículo 2 1. El presente Acuerdo, al mejorar la aplicación de la Convención, incluido el logro de su objetivo, tiene por objeto reforzar la respuesta mundial a la amenaza del cambio climático, en el contexto del desarrollo sostenible y de los esfuerzos por erradicar la pobreza, y para ello: a) Mantener el aumento de la temperatura media mundial muy por debajo de 2 ºC con respecto a los niveles preindustriales, y proseguir los esfuerzos para limitar ese aumento de la temperatura a 1,5 ºC con respecto a los niveles preindustriales, reconociendo que ello reduciría considerablemente los riesgos y los efectos del cambio climático; ”

Acord de Paris (2)

- Para cumplir el objetivo a largo plazo referente a la temperatura que se establece en el artículo 2, las Partes se proponen lograr que las emisiones mundiales de gases de efecto invernadero alcancen su punto máximo lo antes posible, teniendo presente que los países en desarrollo tardarán más en lograrlo, y a partir de ese momento reducir rápidamente las emisiones de gases de efecto invernadero, de conformidad con la mejor información científica disponible, para alcanzar un equilibrio entre las emisiones antropógenas por las fuentes y la absorción antropógena por los sumideros en la segunda mitad del siglo, sobre la base de la equidad y en el contexto del desarrollo sostenible y de los esfuerzos por erradicar la pobreza. ”

GLOBAL CARBON PROJECT

nature climate change

REVIEW ARTICLE

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Biophysical and economic limits to negative CO_2 emissions

Pete Smith[1*], Steven J. Davis[2], Felix Creutzig[3,4], Sabine Fuss[3], Jan Minx[3,5,6], Benoit Gabrielle[7,8], Etsushi Kato[9], Robert B. Jackson[10], Annette Cowie[11], Elmar Kriegler[5], Detlef P. van Vuuren[12,13], Joeri Rogelj[14,15], Philippe Ciais[16], Jennifer Milne[17], Josep G. Canadell[18], David McCollum[15], Glen Peters[19], Robbie Andrew[19], Volker Krey[15], Gyami Shrestha[20], Pierre Friedlingstein[21], Thomas Gasser[16,22], Arnulf Grübler[15], Wolfgang K. Heidug[23], Matthias Jonas[15], Chris D. Jones[24], Florian Kraxner[15], Emma Littleton[25], Jason Lowe[24], José Roberto Moreira[26], Nebojsa Nakicenovic[15], Michael Obersteiner[15], Anand Patwardhan[27], Mathis Rogner[15], Ed Rubin[28], Ayyoob Sharifi[29], Asbjørn Torvanger[19], Yoshiki Yamagata[30], Jae Edmonds[31] and Cho Yongsung[32]

Acord de Paris (3)

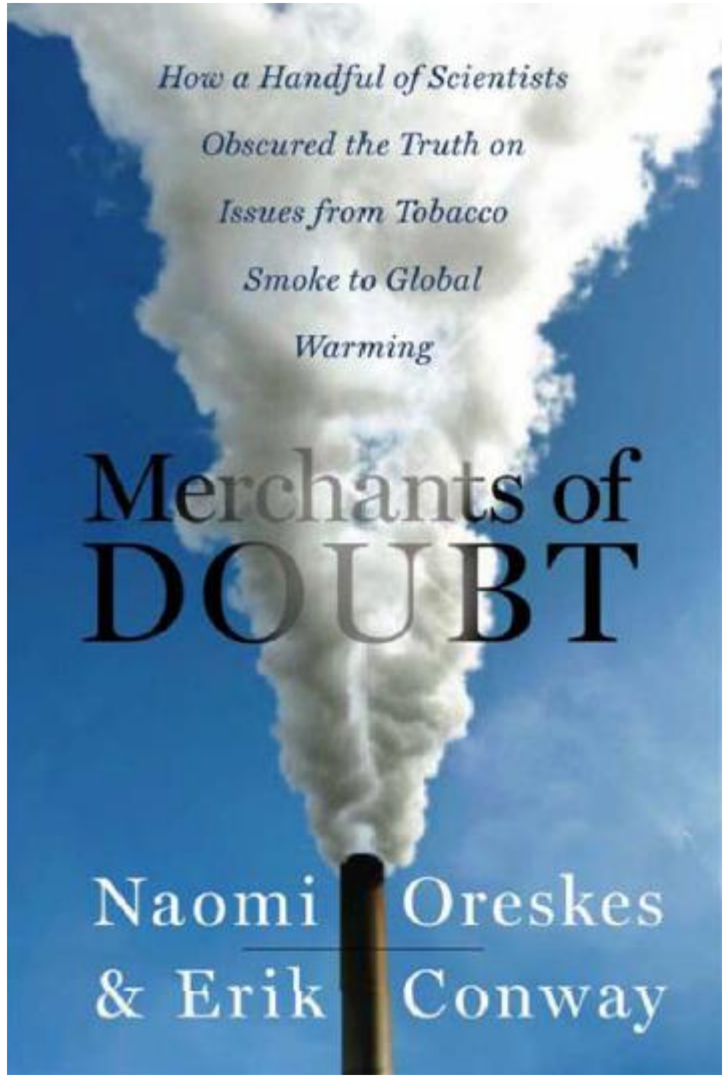
- «… y observando también la importancia que tiene para algunos del concepto de "justicia climática", al adoptar medidas para hacer frente al cambio climático …»
- «Conviene en que el artículo 8 del Acuerdo no implica ni da lugar a ninguna forma de responsabilidad jurídica o indemnización»

Lectures recomanades

James Hansen et al (2015) - Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 C global warming could be dangerous - Atmospheric Chemistry and Physics Discussions 15:20059–20179 doi:10.5194/acpd-15-20059-2015 - 23/07/2015 - Climate Science, Awareness and Solutions, Columbia University Earth Institute - http://www.atmos-chem-phys.net/16/3761/2016/acp-16-3761-2016.xml - 17 authors

Corinne Le Quéré et al (2015) - Global Carbon Budget 2015 - Earth System Science and Data 7:349-396 doi:10.5194/essd-7-349-2015 - 07/12/2015 - Tyndall Centre for Climate Change Research, University of East Anglia - http://www.earth-syst-sci-data.net/7/349/2015/essd-7-349-2015.pdf - 71 authors

Raymond Clémençon (2016) - The Two Sides of the Paris Climate Agreement: Dismal Failure or Historic Breakthrough? - Journal of Environment & Development 25:3–24 doi:10.1177/1070496516631362 - 10/02/2016 - Global Studies Department and Department of Sociology, University of California


How a Handful of Scientists
Obscured the Truth on
Issues from Tobacco
Smoke to Global
Warming
Merchants of
DOUBT
Naomi Oreskes
& Erik Conway

Gràcies.

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