An illustrated guide to the 1.5°C policy option

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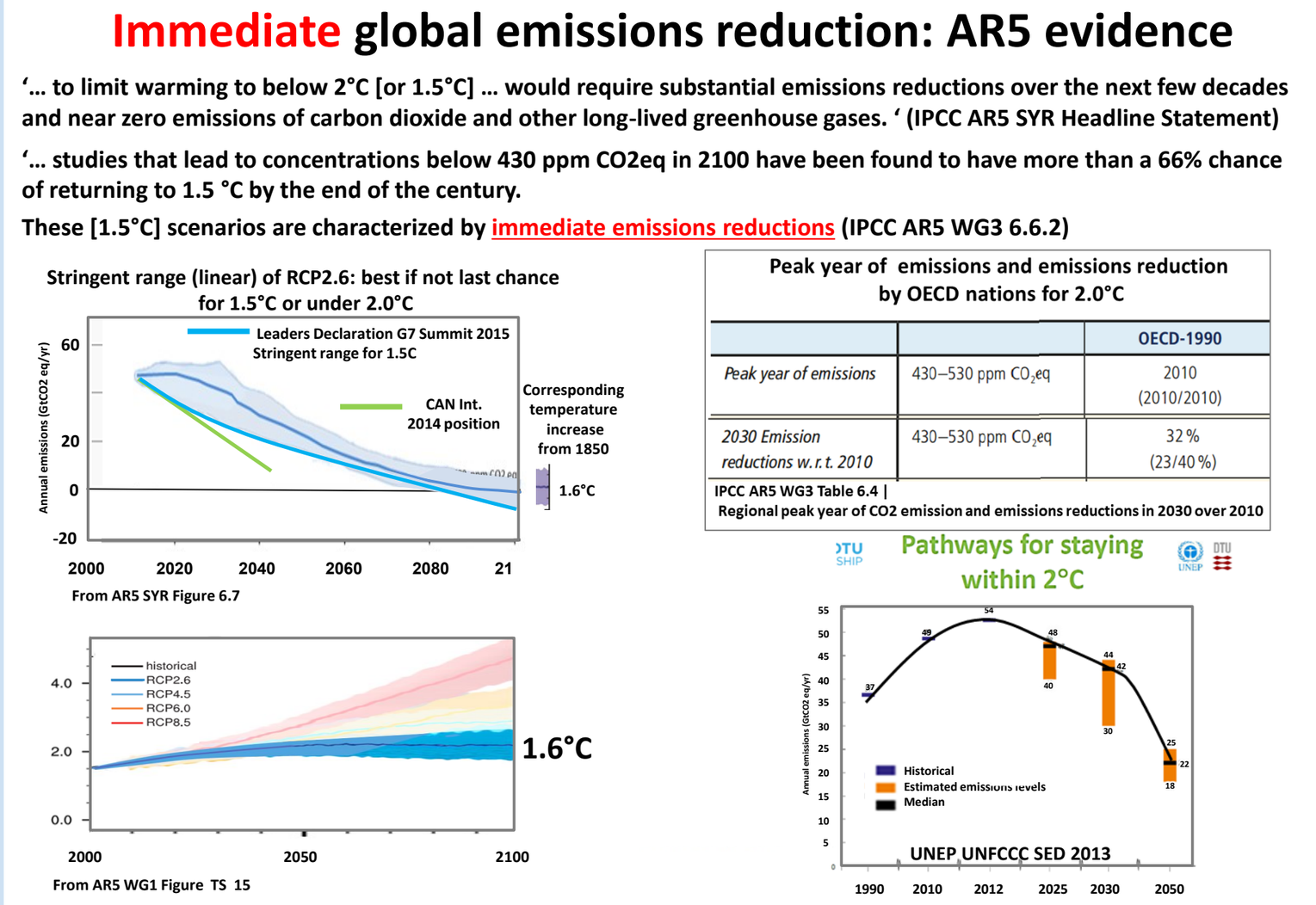
The Health and Human Rights Approach to Greenhouse Gas Pollution

Oxford University Conference 20-22 Sept 2016 1.5 Degrees: Meeting the challenges of the Paris Agreement

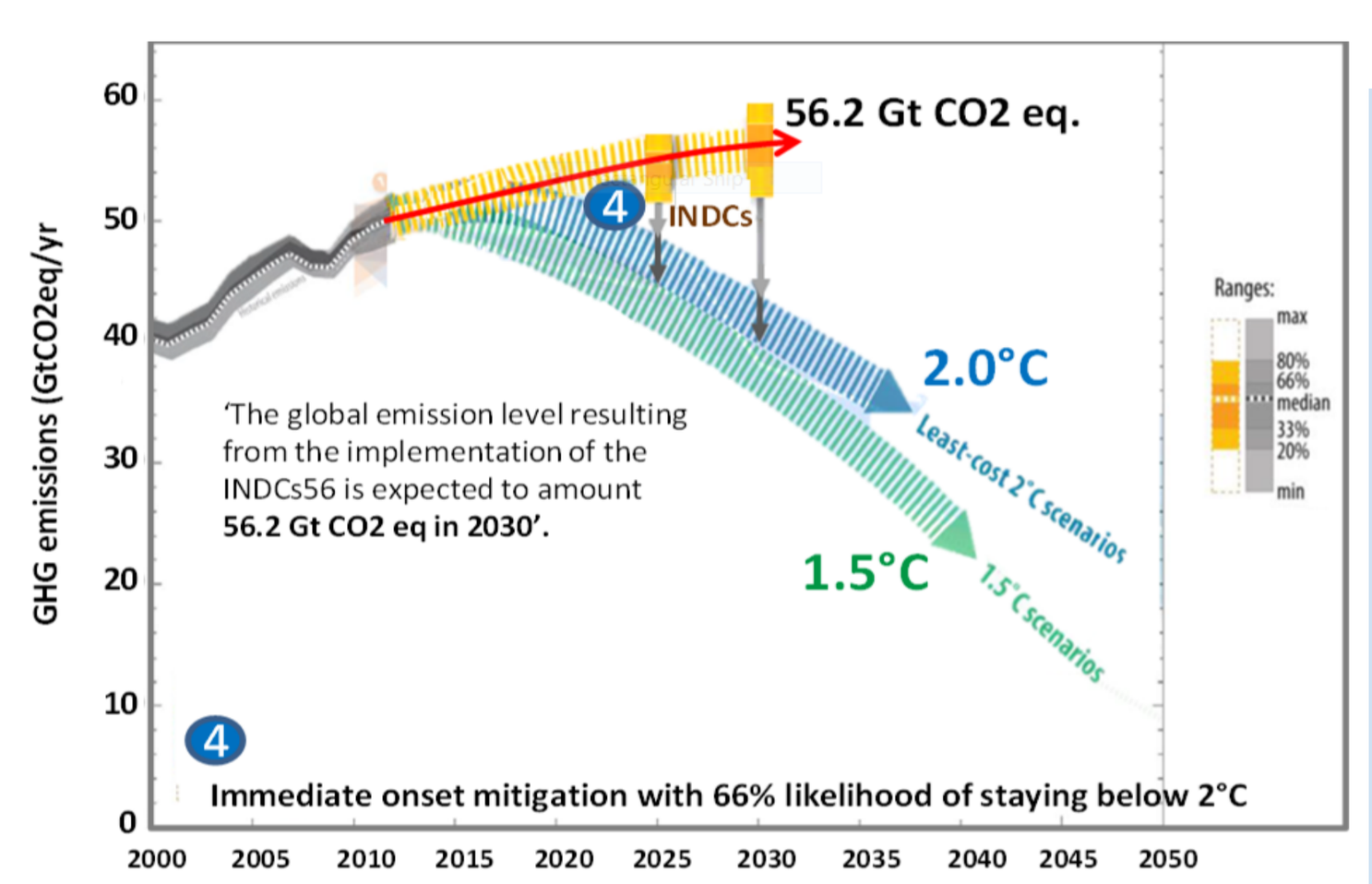
Emissions for 1.5°C

Immediate global emissions reduction: AR5 evidence



The Paris Agreement commitment

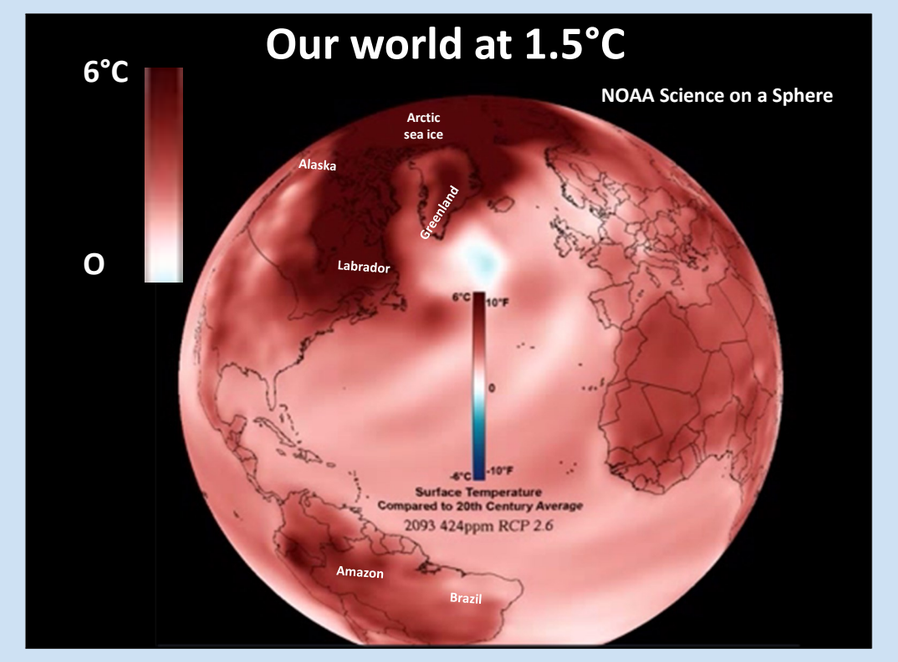
More emissions in 2030



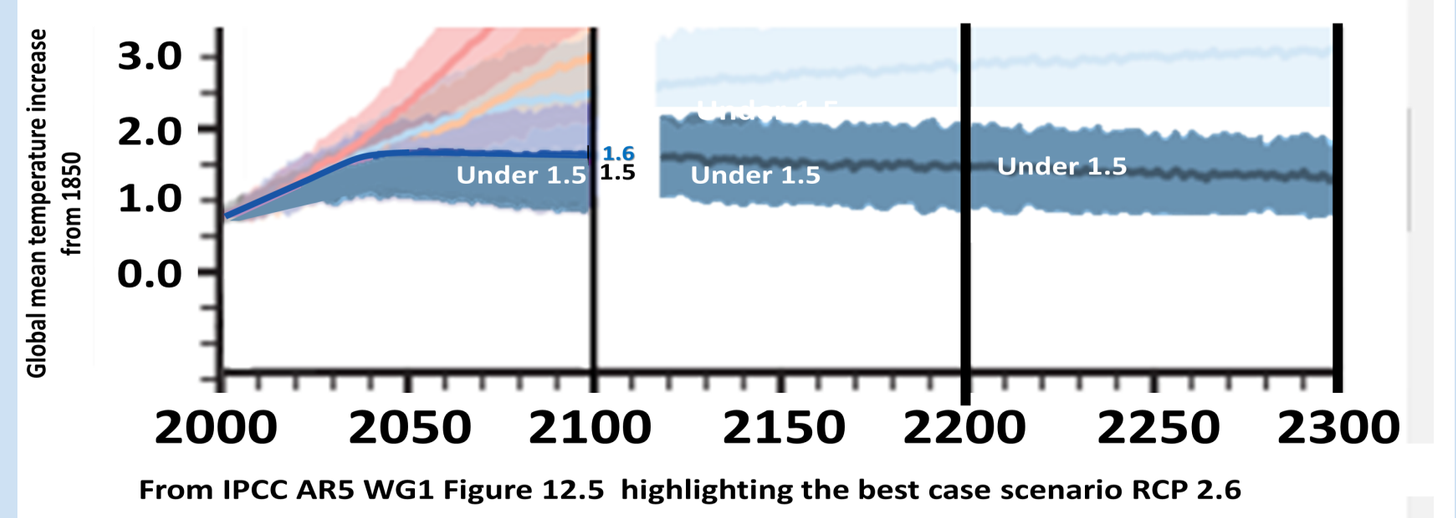
Peak year of emissions and emissions reduction by OECD nations for 2.0°C

2°C peak year	430-530 ppm CO2 eq.	OECD 2010

IPCC AR5 WG3 Table 6.4 | Regional peak year of CO2 emission and emissions reductions in 2030 over 2010

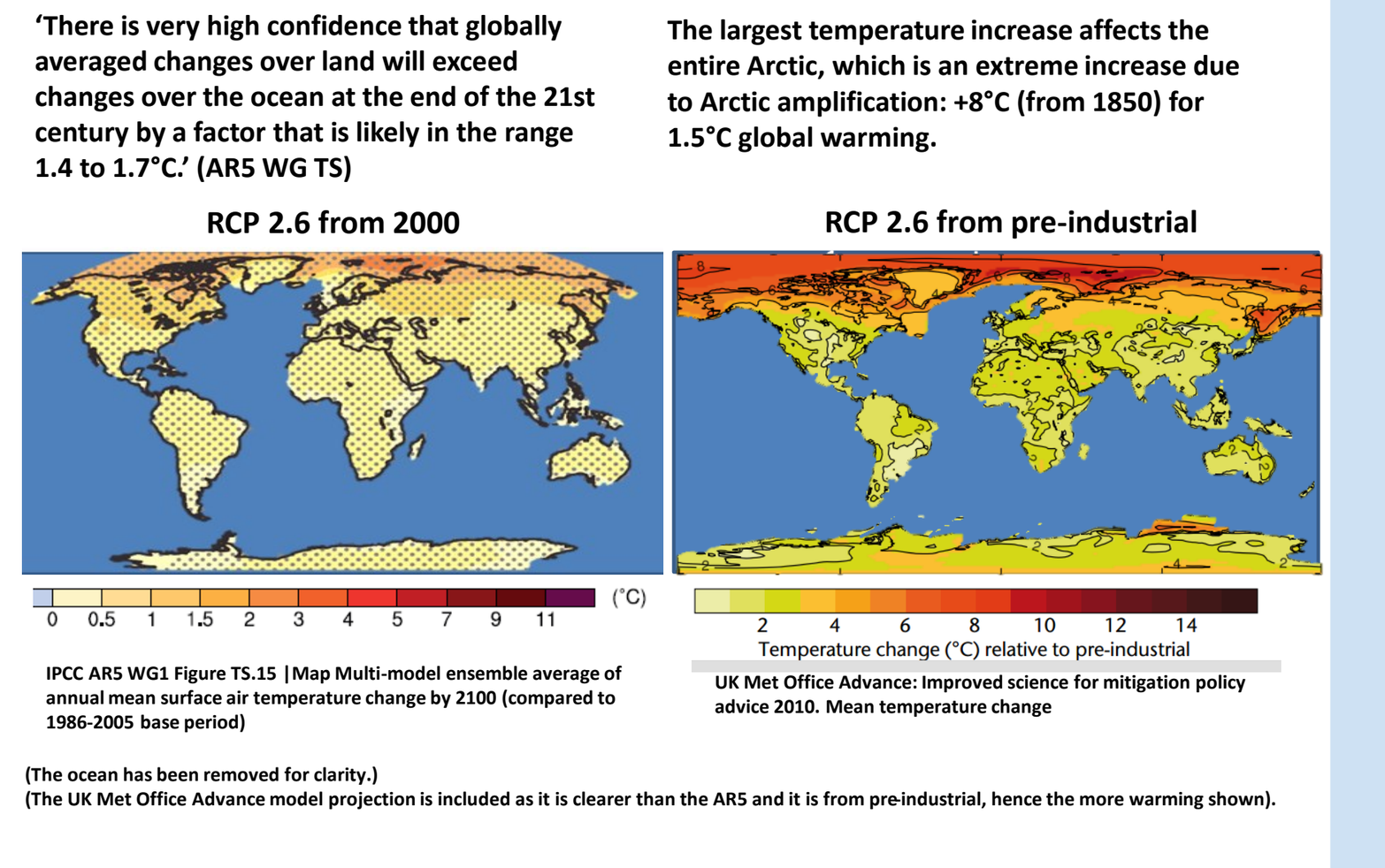


The 1.5°C scenario

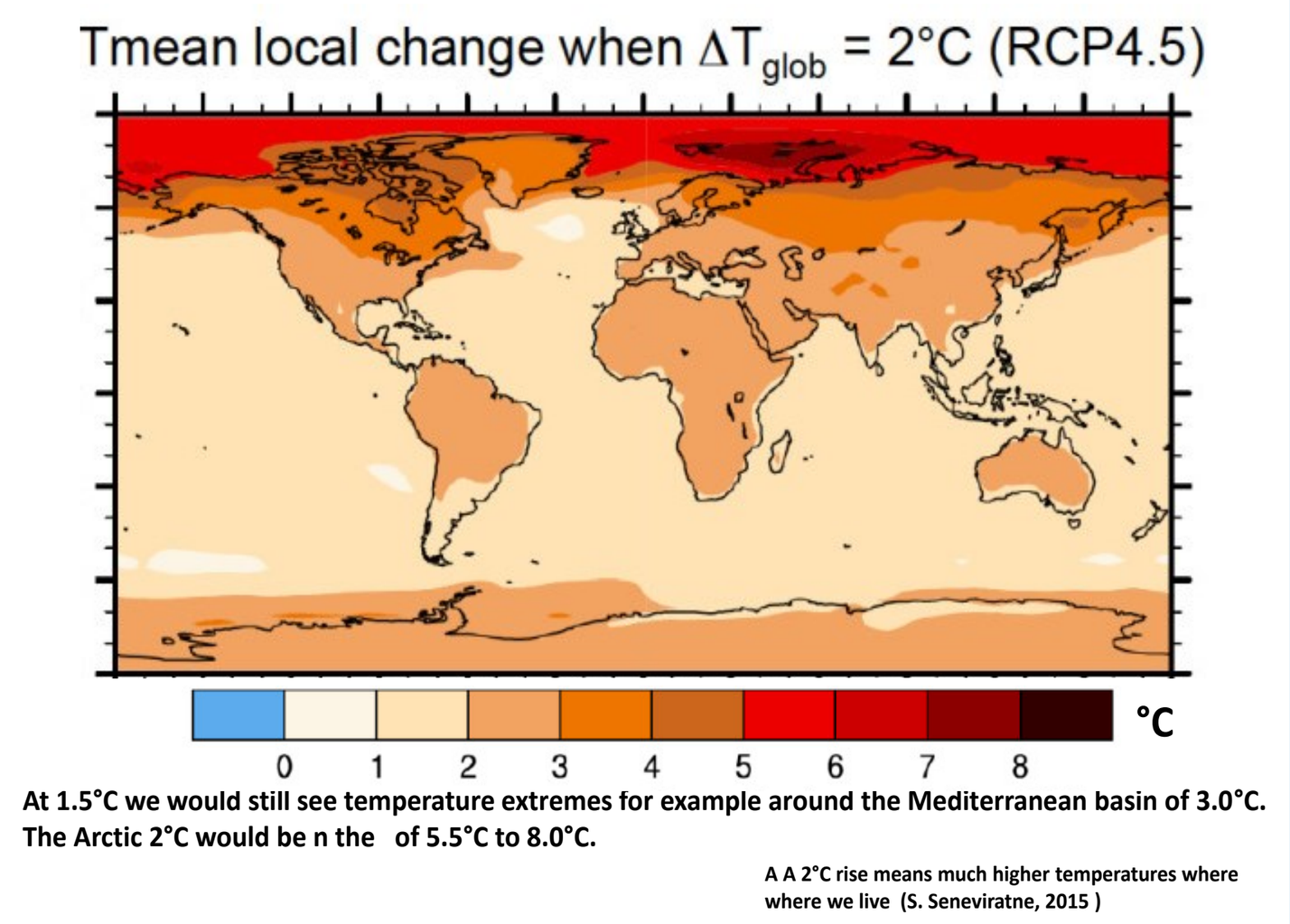


From IPCC AR5 WG1 Figure 12.5 highlighting the best case scenario RCP 2.6

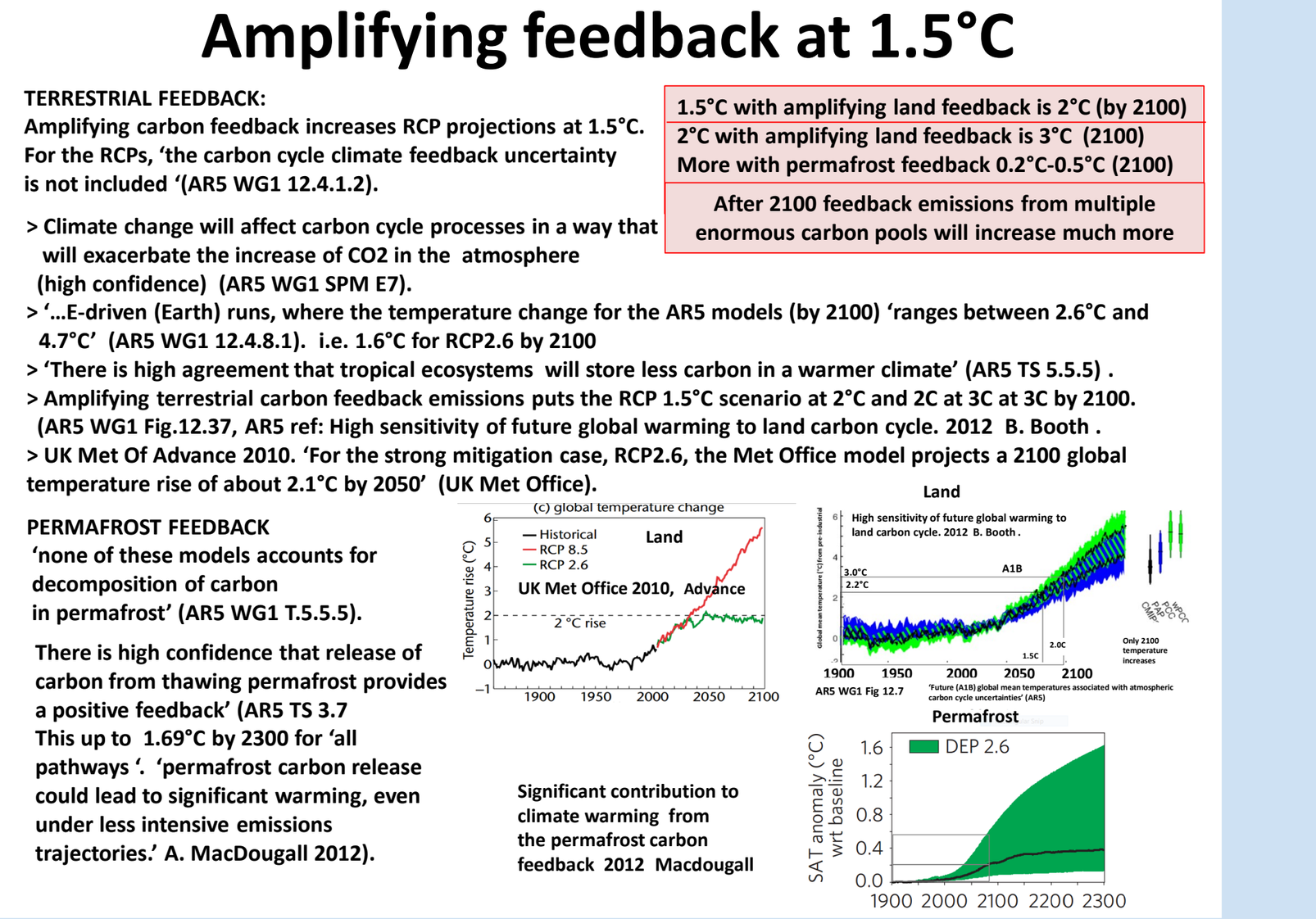
Surface temperature increase at 1.5°C



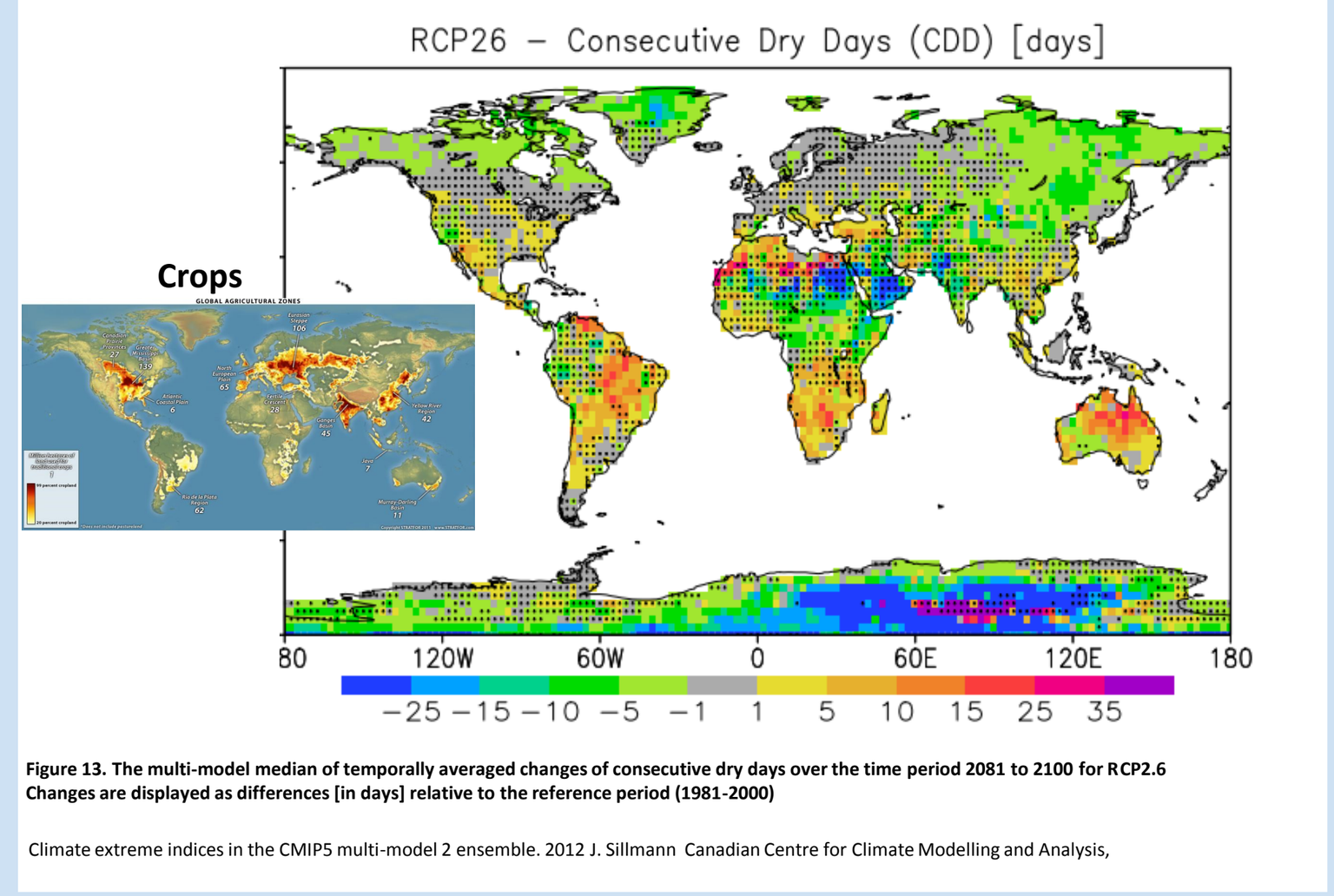
Surface temperature increase at 2.0°C



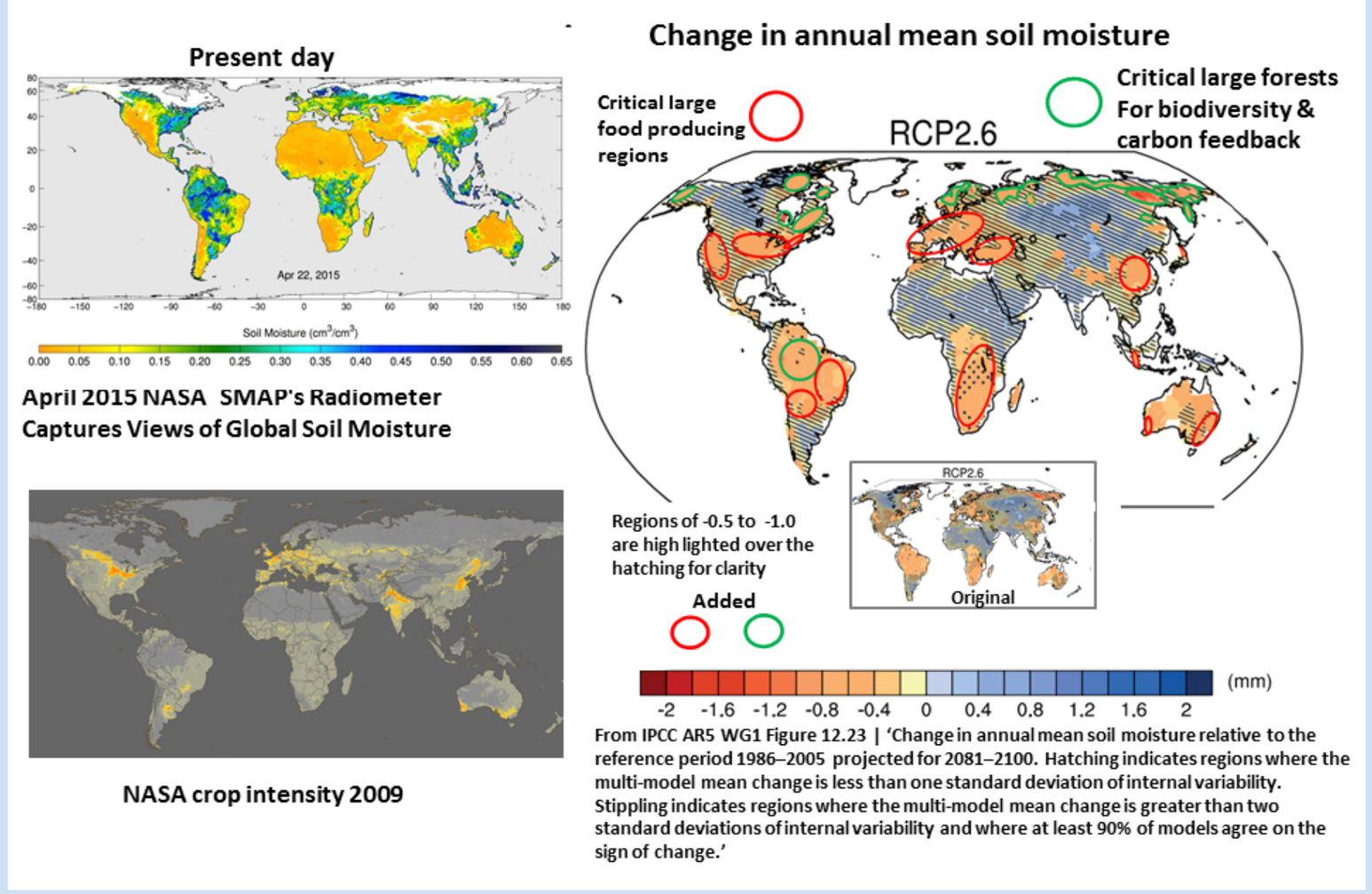
Amplifying feedback at 1.5°C



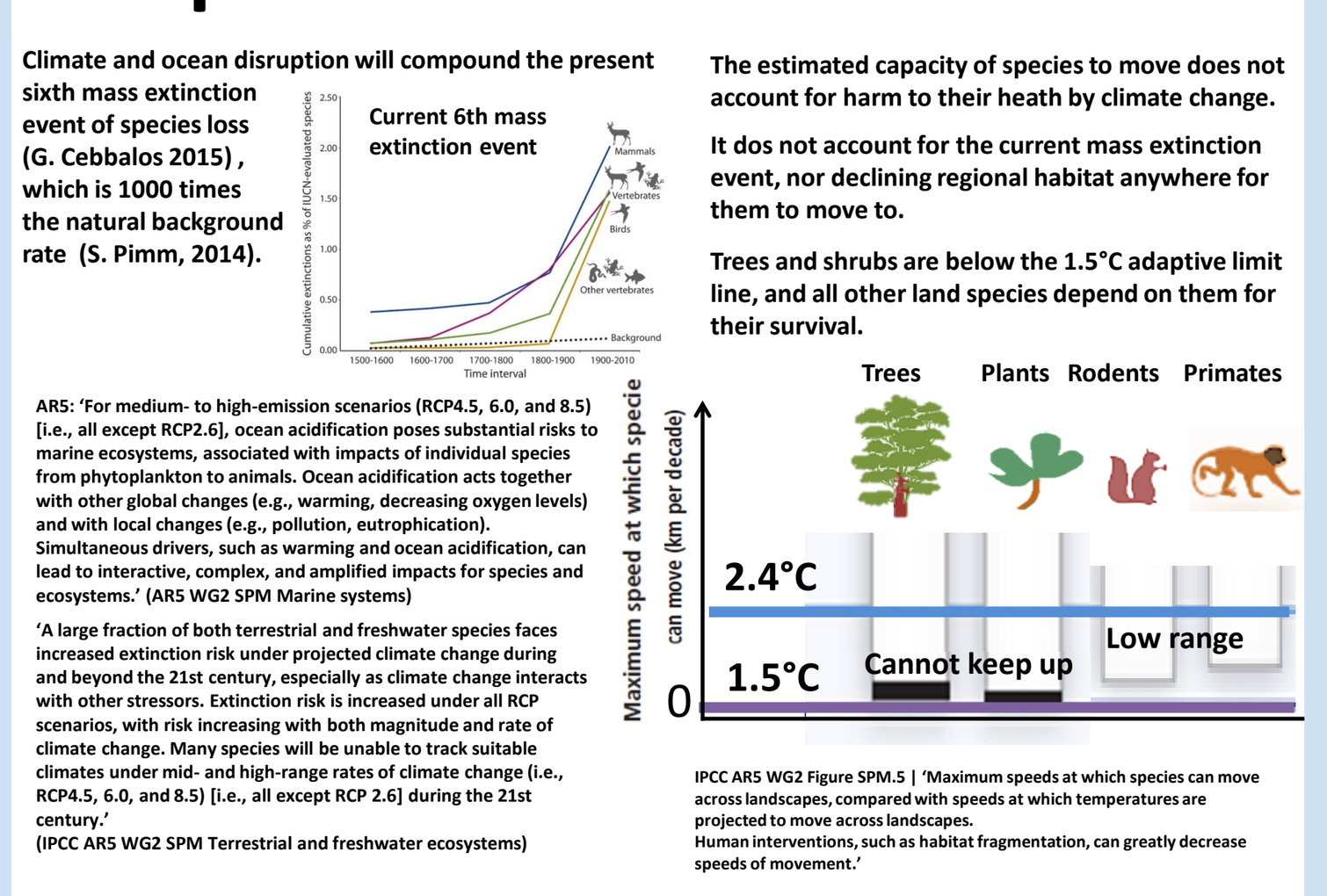
Increased dry days at 1.5°C



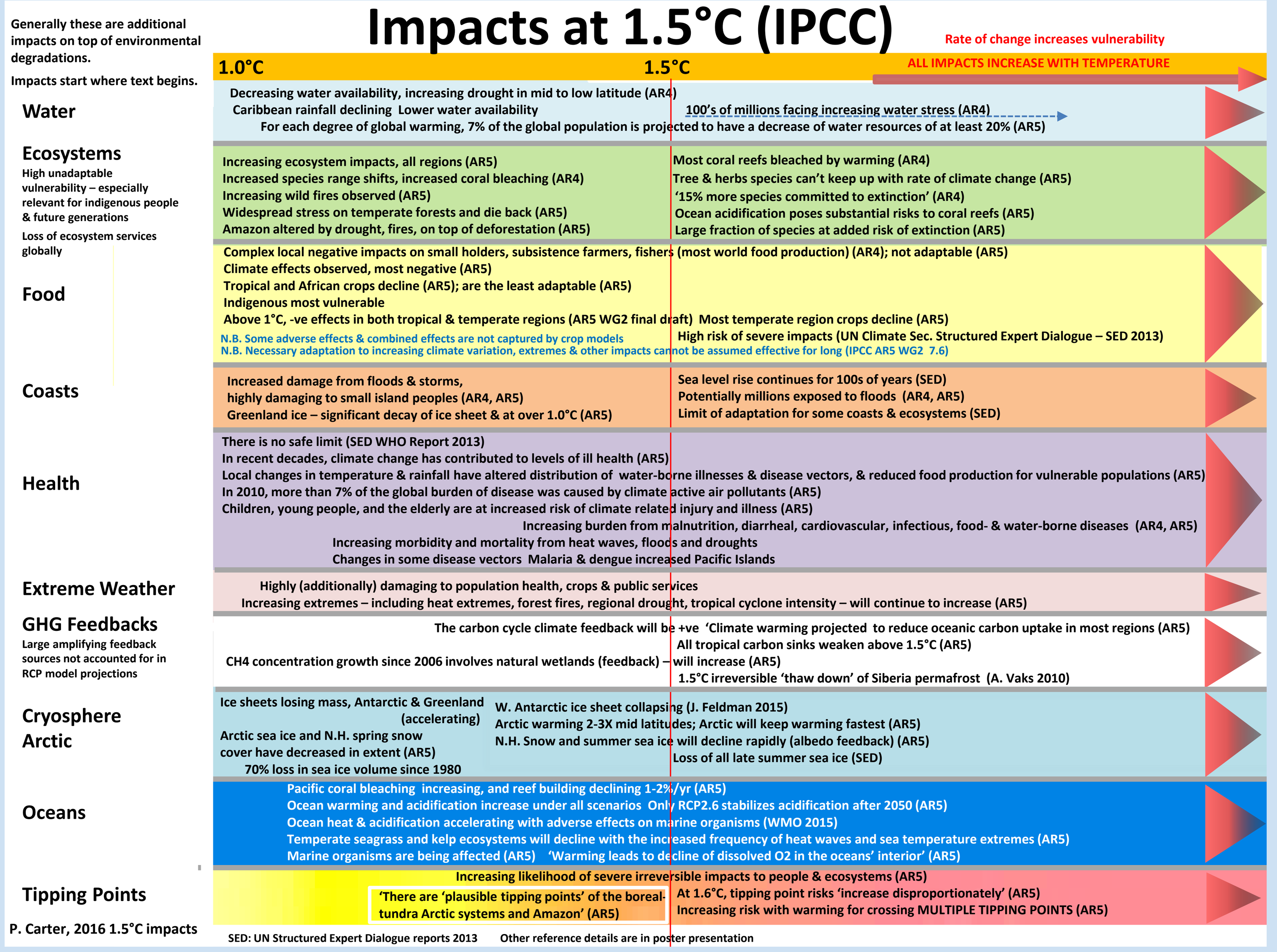
Soil moisture at 1.5°C



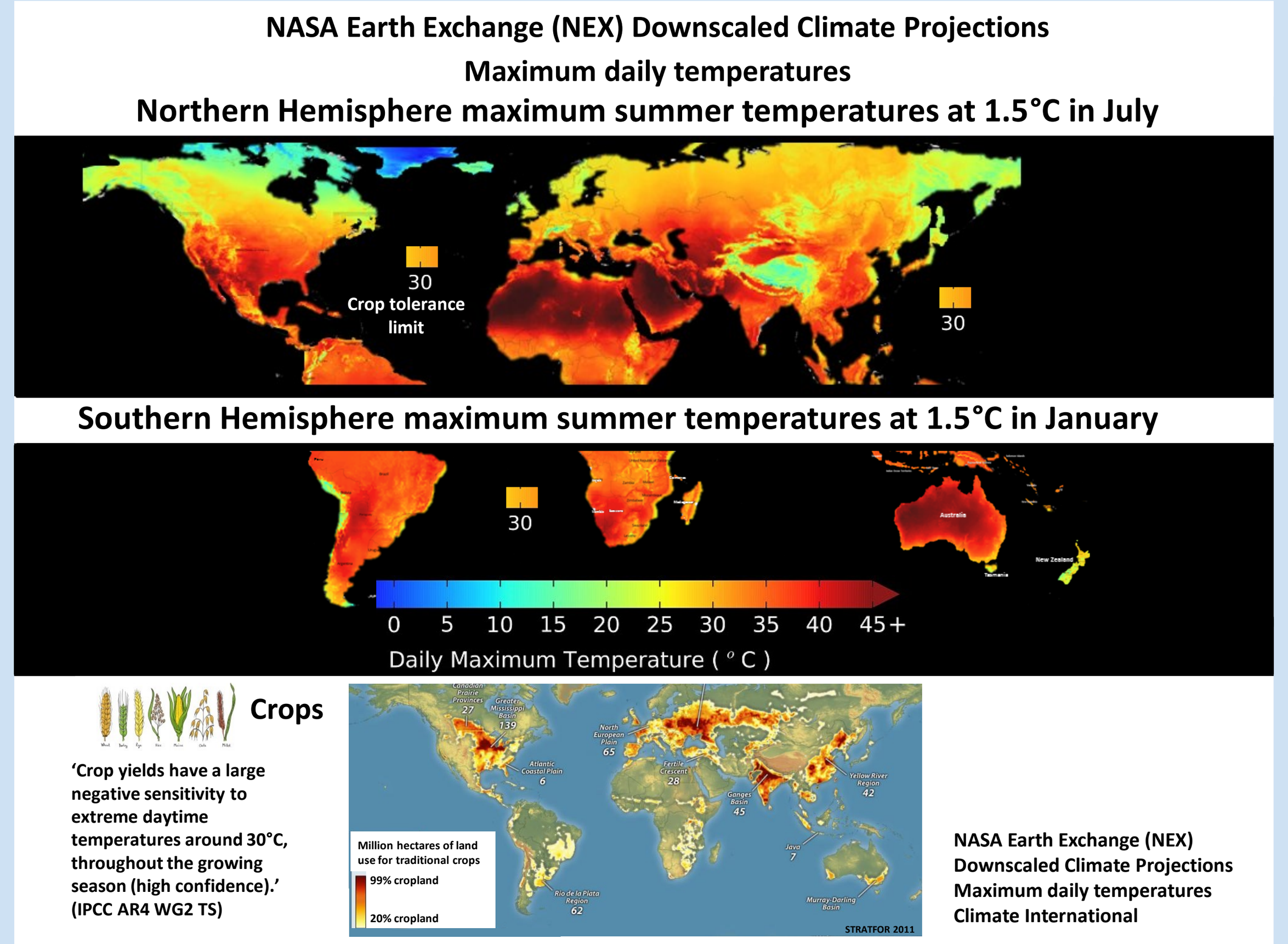
Species extinction at 1.5°C



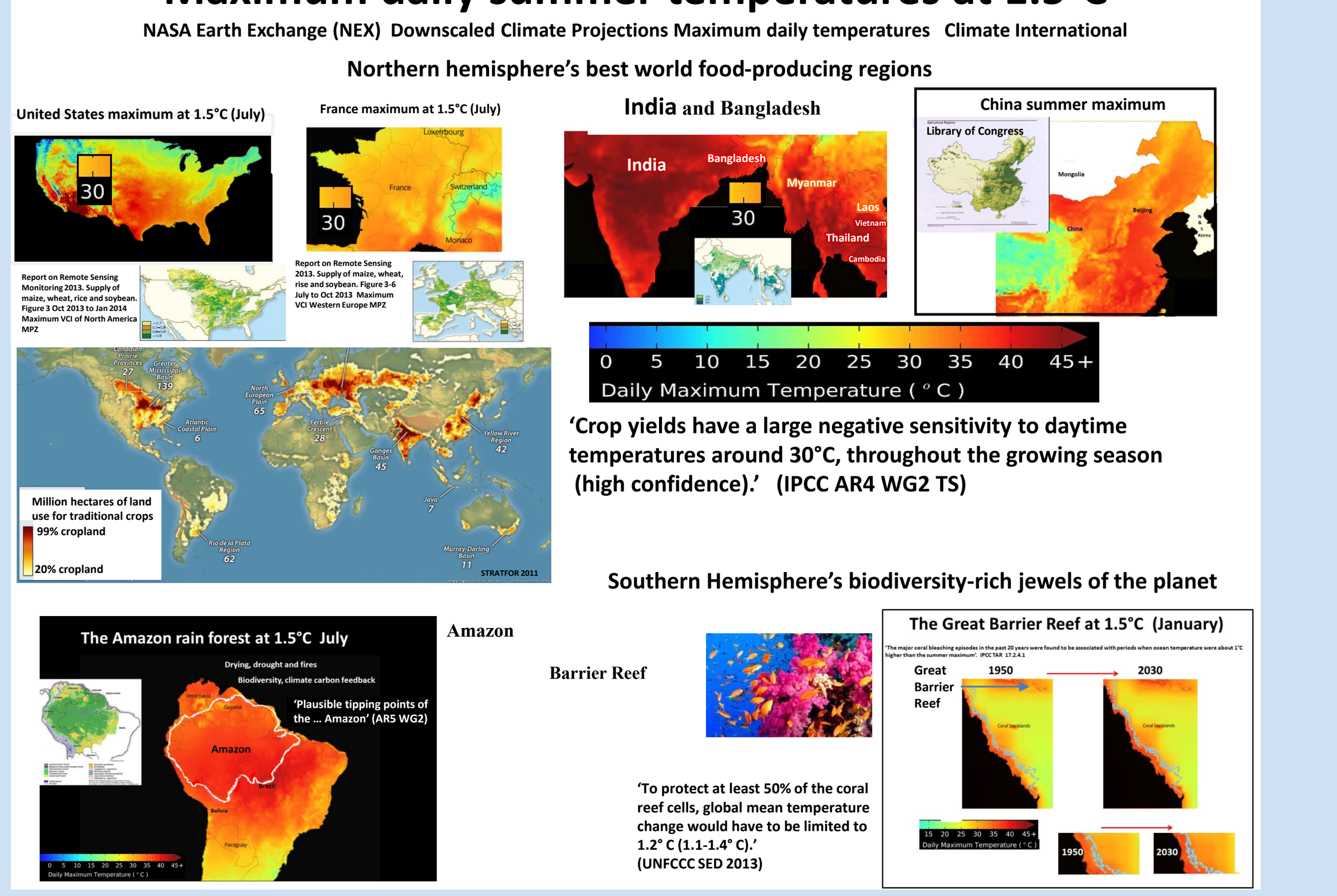
Impacts at 1.5°C (IPCC)



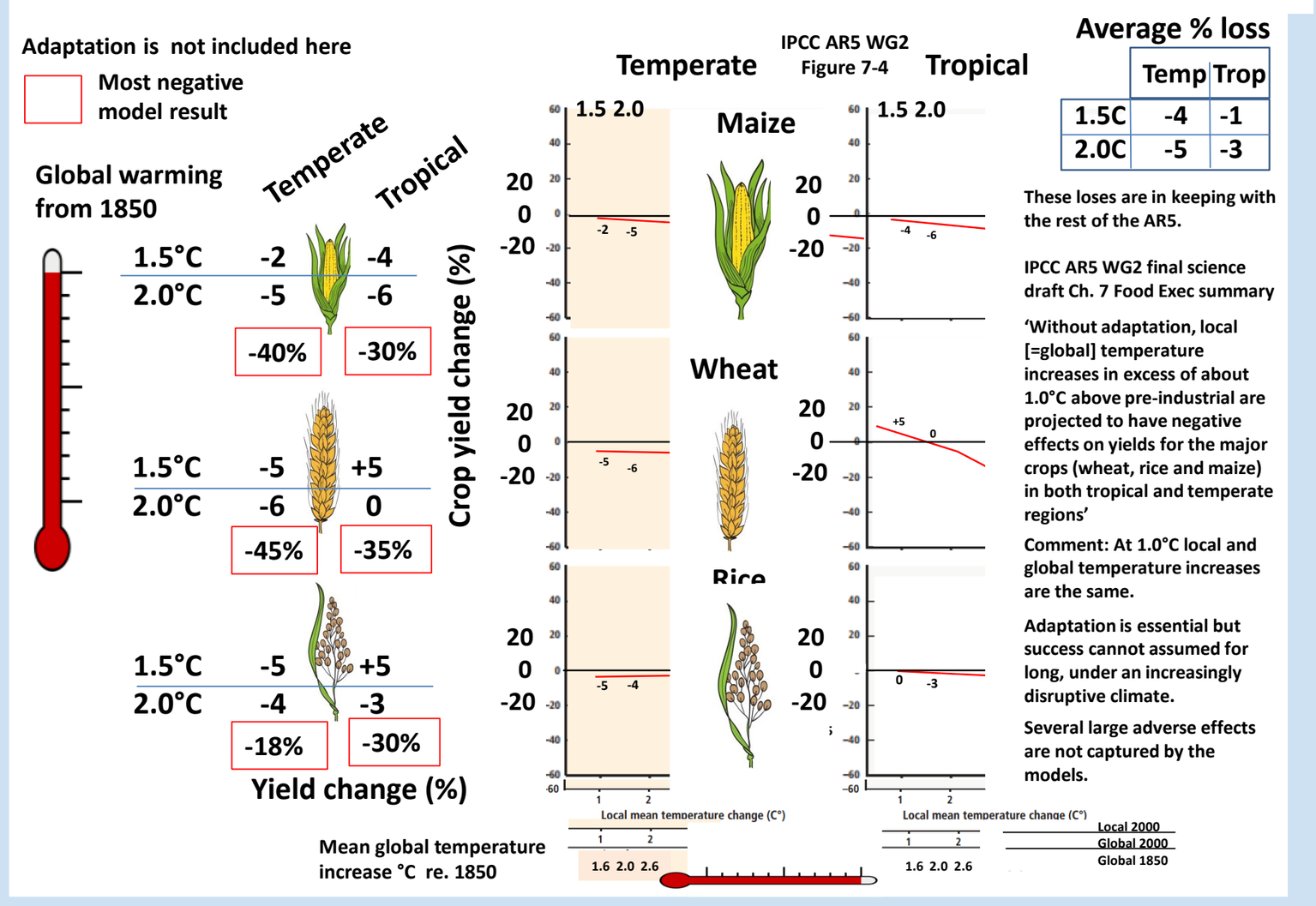
NASA NEX- Maximum daily summer temperatures



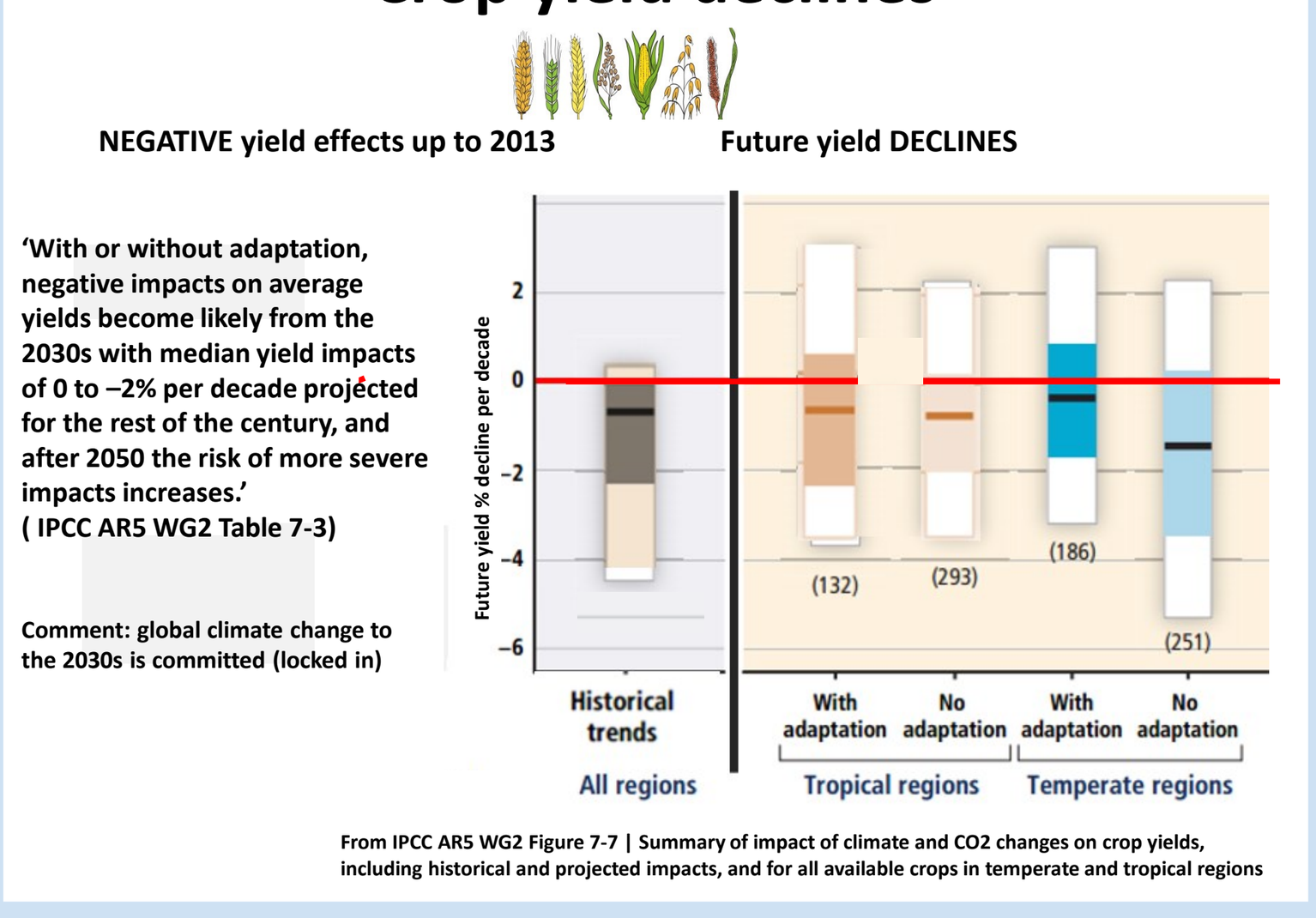
Maximum daily summer temperatures at 1.5°C



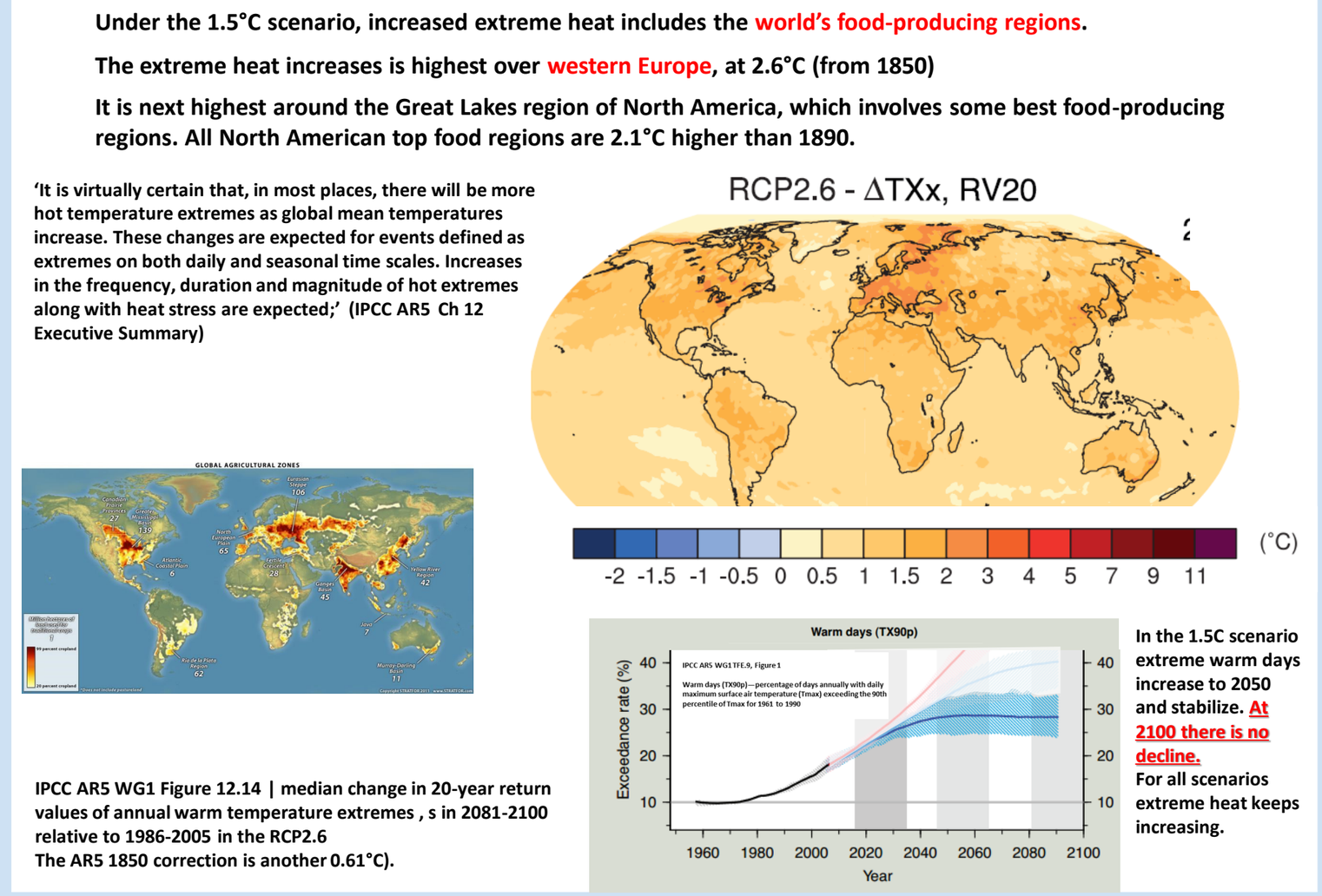
Crop yields decline in ALL regions 1.5°C



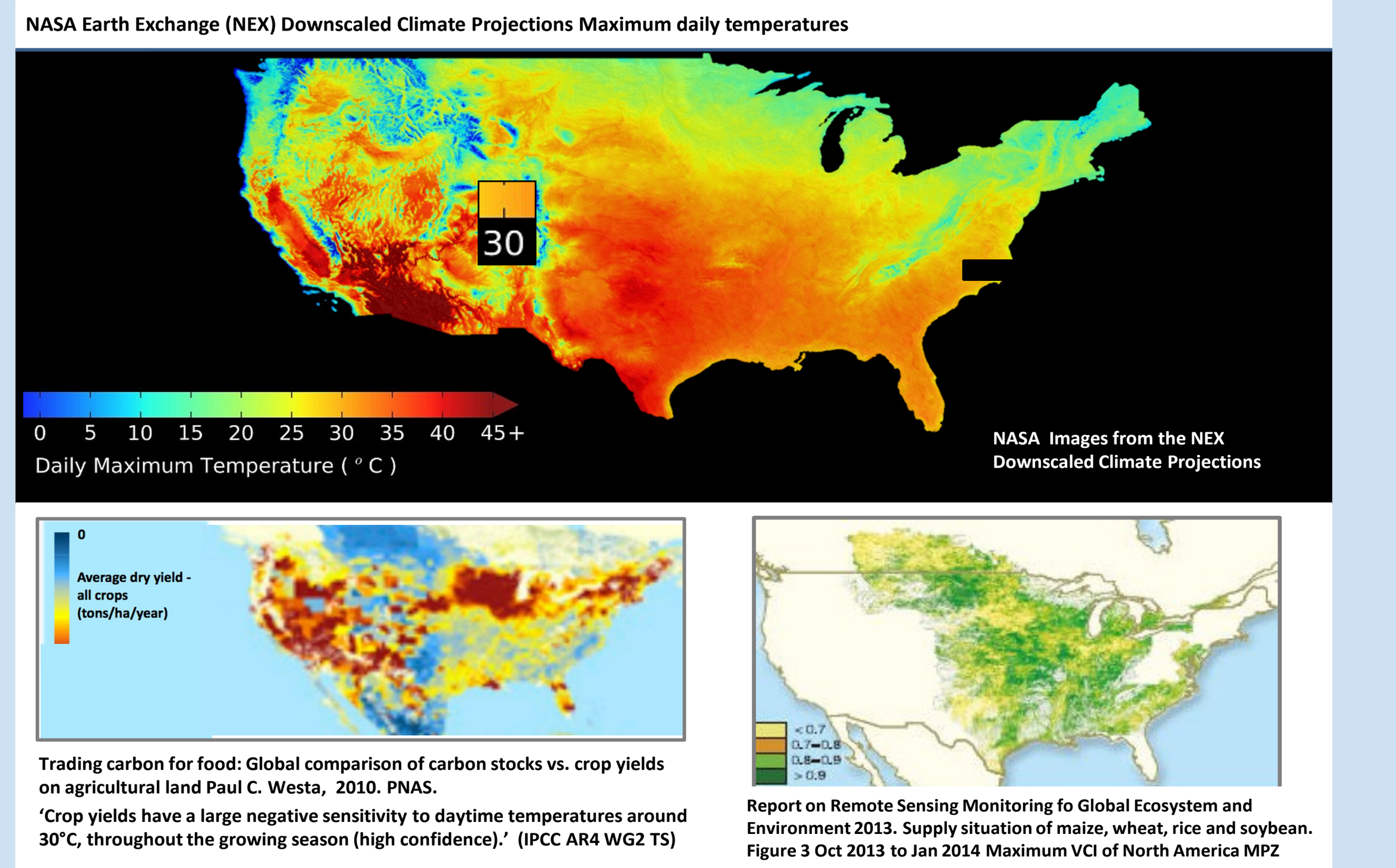
Crop yield declines



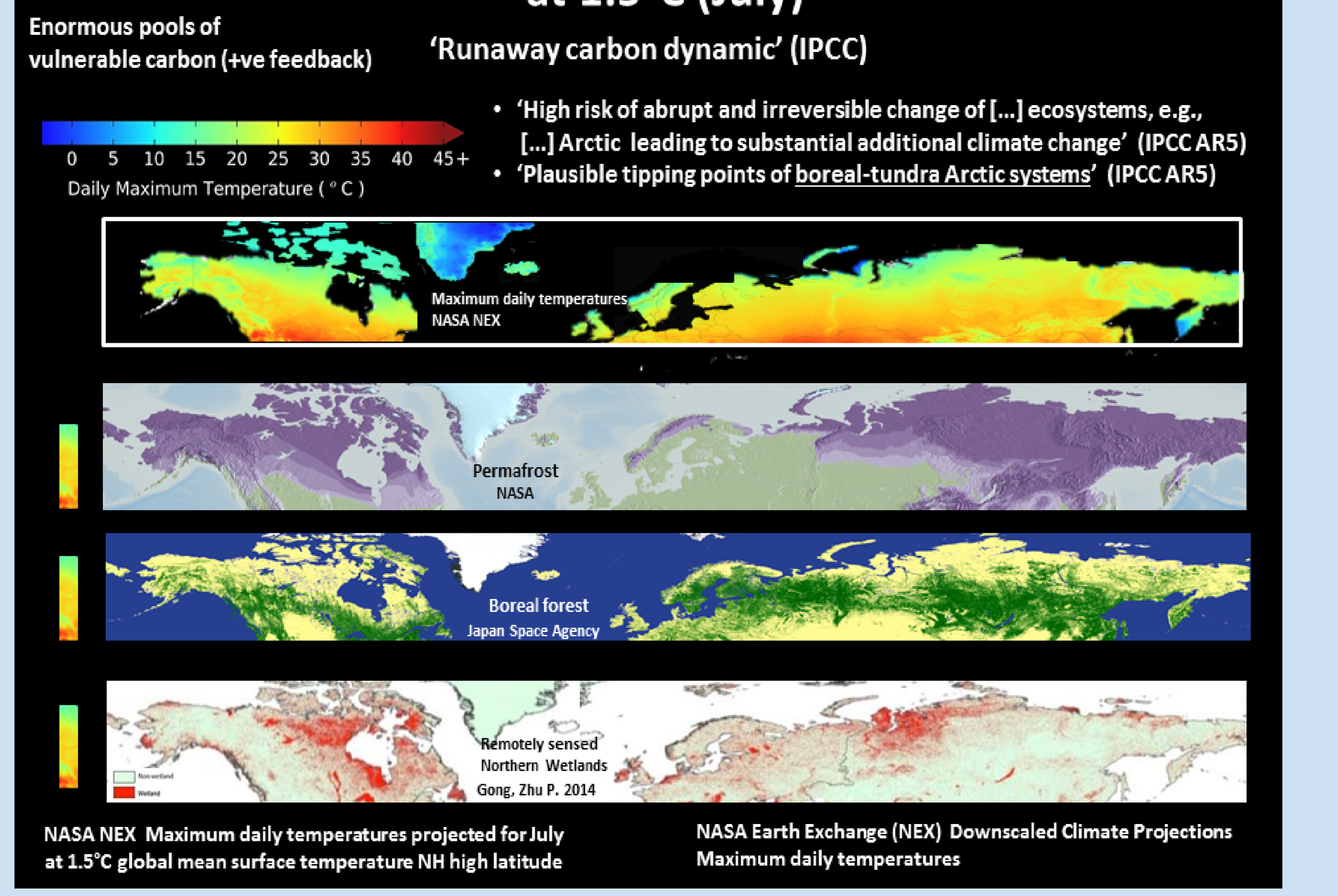
Extreme heat at 1.5°C



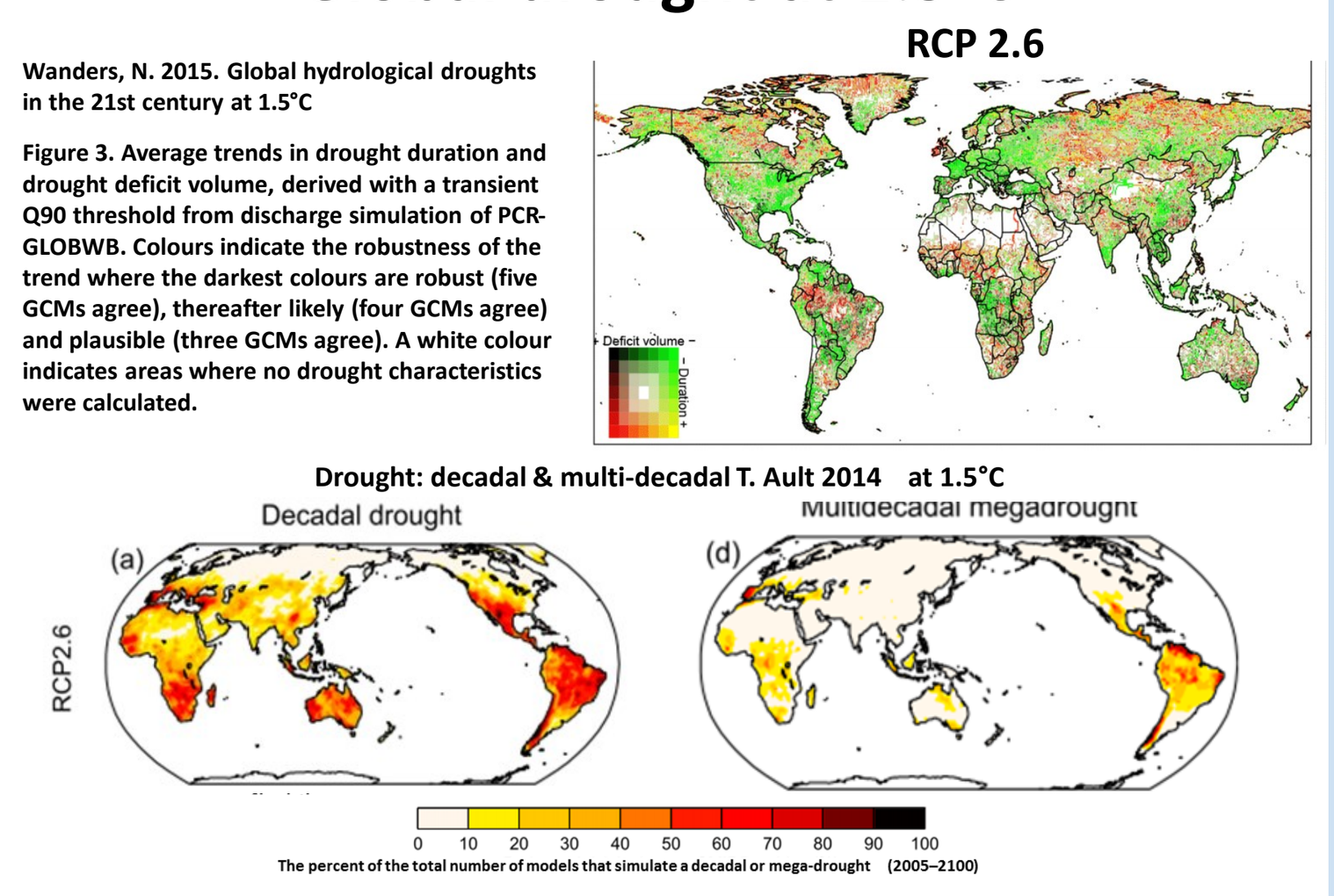
USA at 1.5°C



The Boreal and Arctic maximum temperatures at 1.5°C (July)

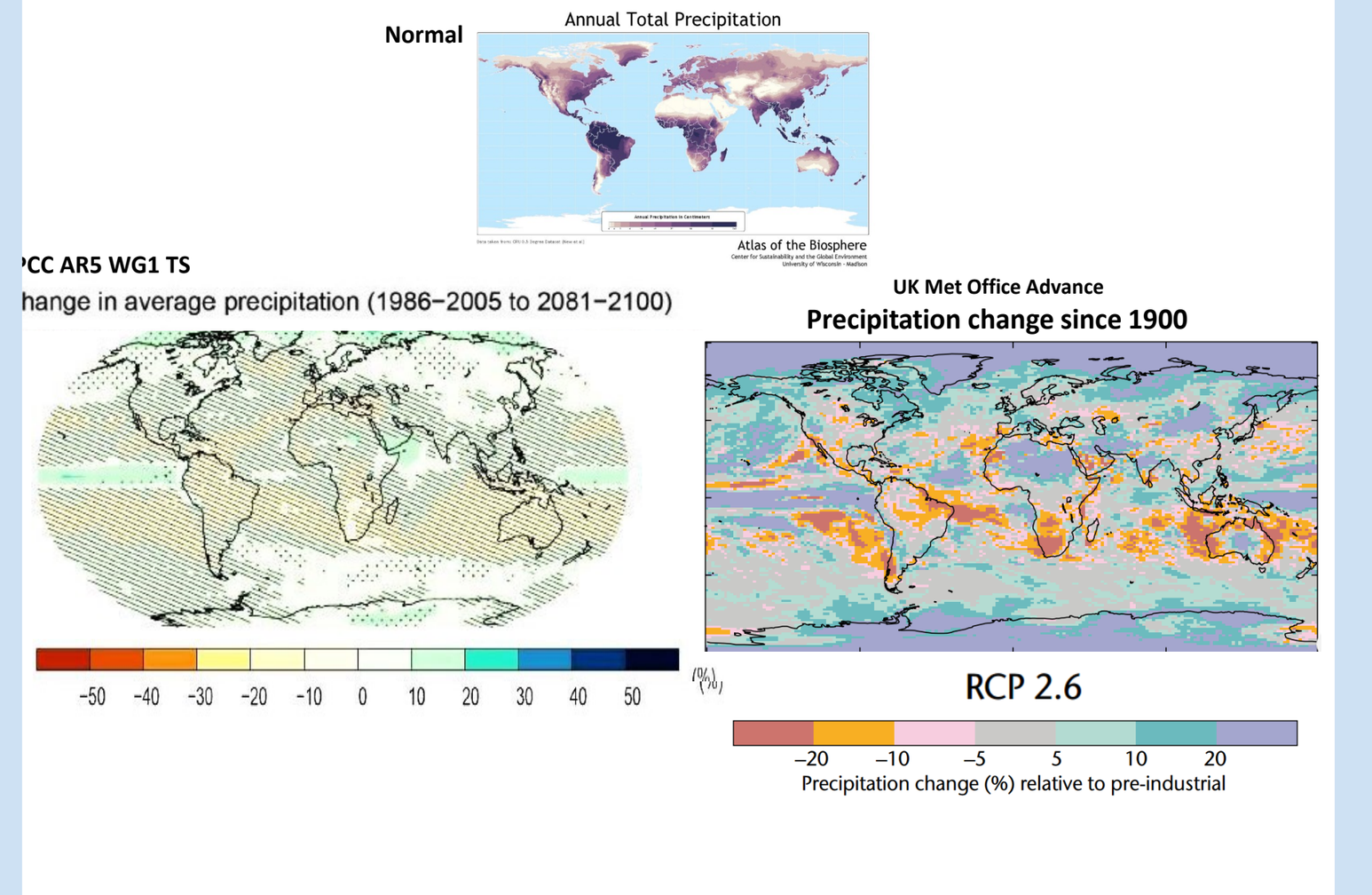


Global drought at 1.5°C

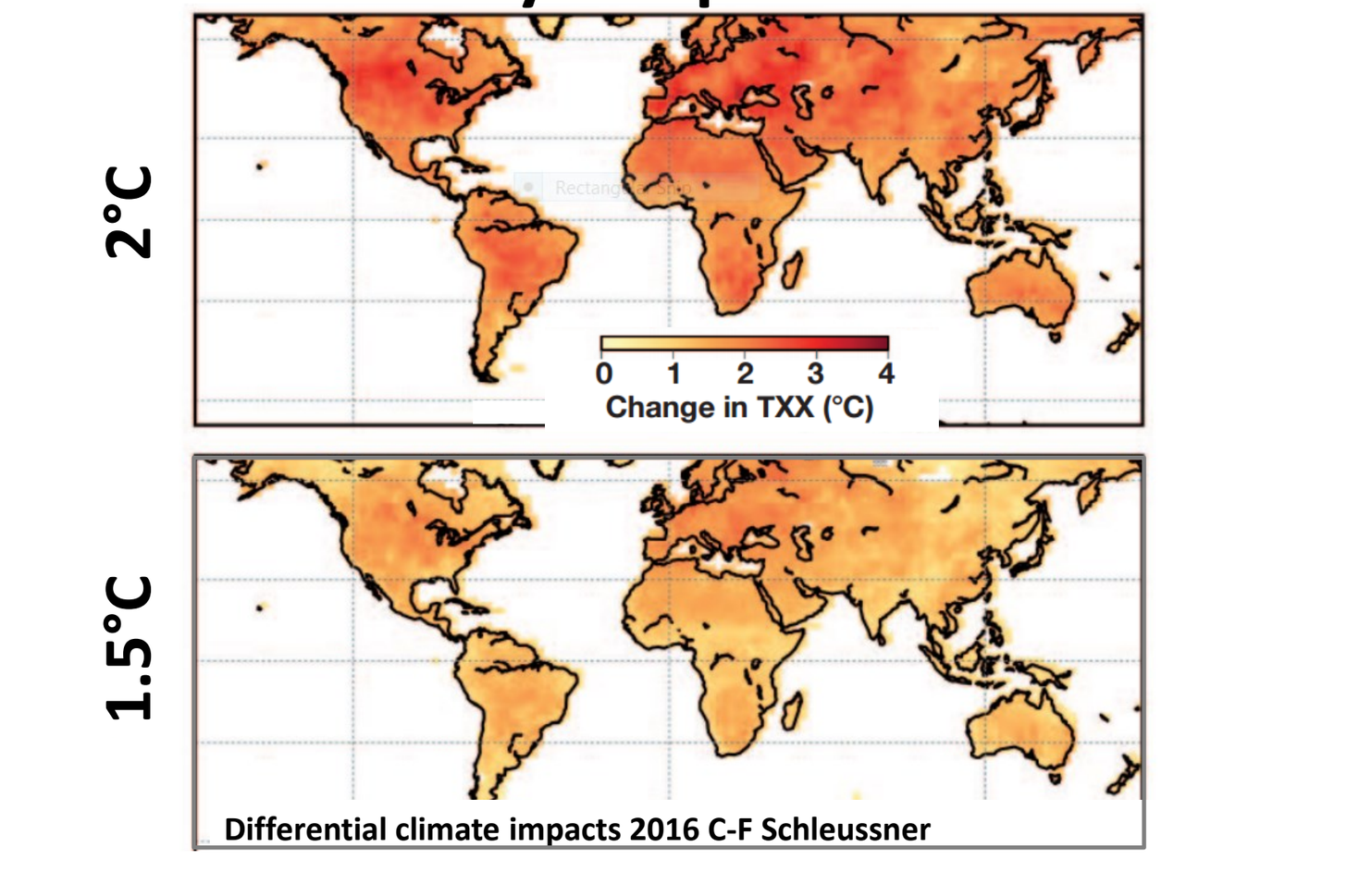


T.R. Ault 2014 Assessing the risk of persistent drought using climate model simulations and paleoclimate data

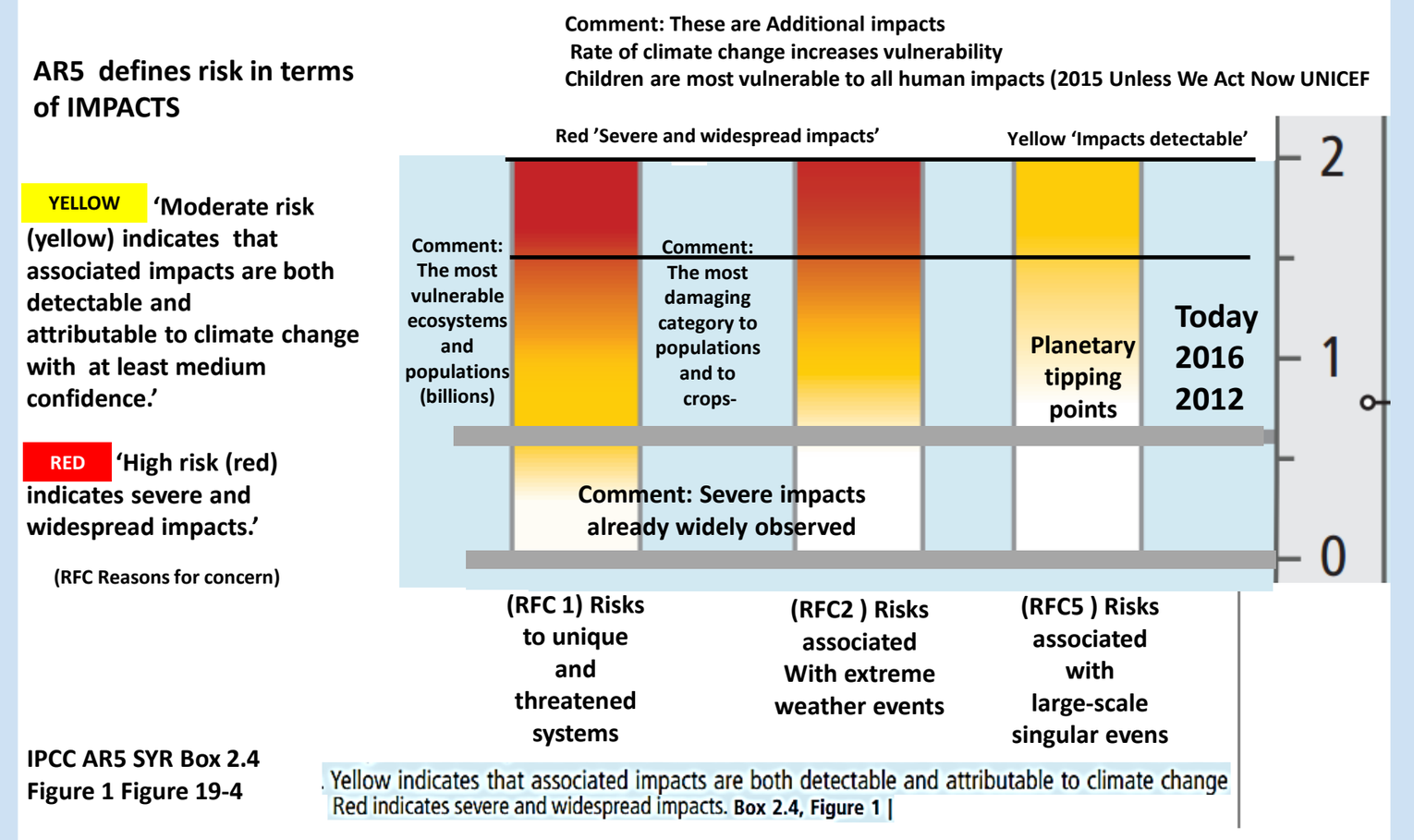
Precipitation change at 1.5°C



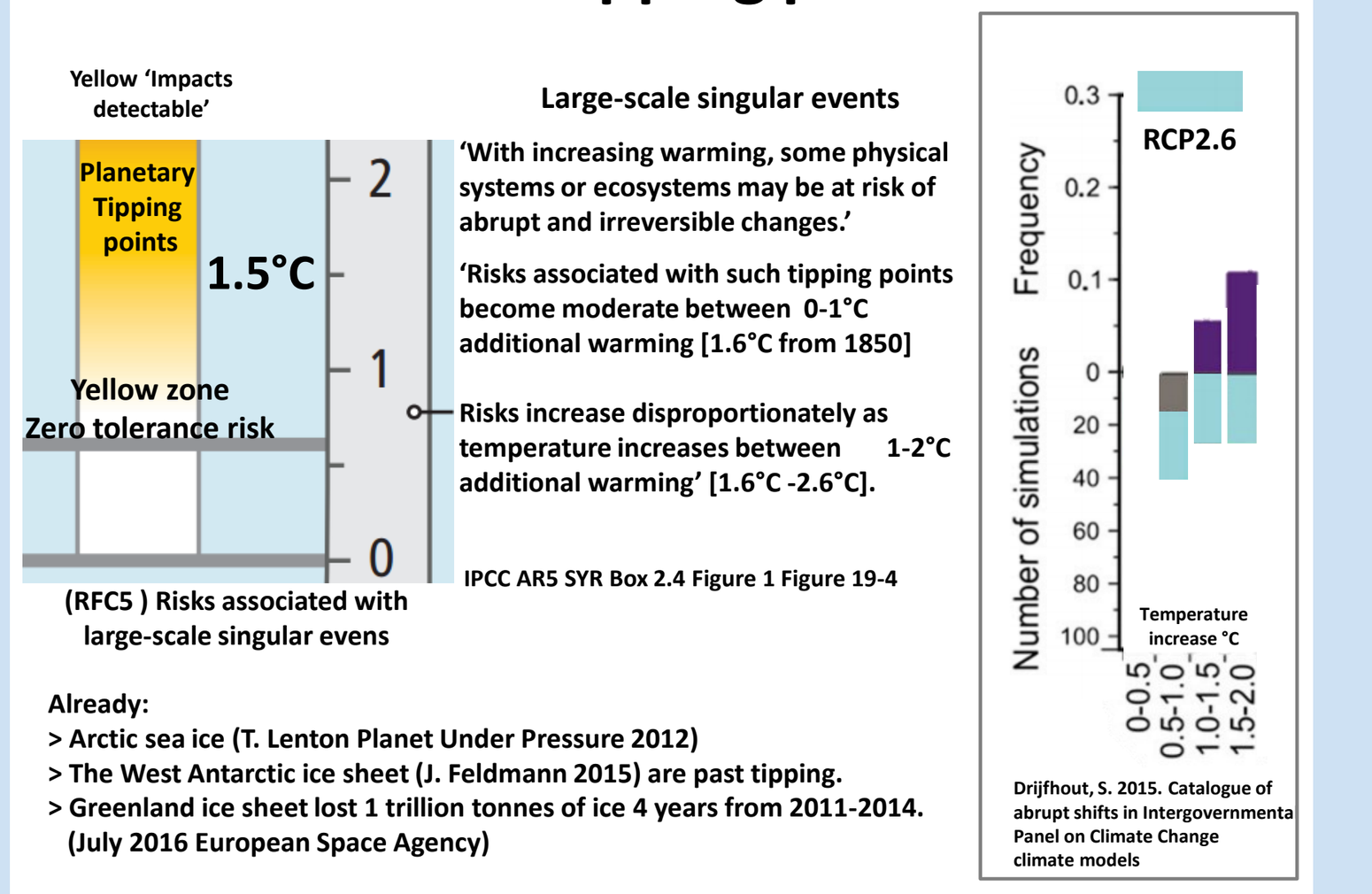
Change of annual maximum daily temperature



Severe widespread IMPACTS at 1.5°C + zero tolerance risks



Zero tolerance tipping points at 1.5°C



Method

Sources are IPCC 2007 AR4, IPCC 2014 AR5, the 2013 UN Structured Expert Dialogue, the NASA NEX Earth Exchange Downscaled Climate Projections of maximum daily temperatures (°C), and Climate International.

As used by the 2013 Climate Secretariat's Structured Expert Dialogue (SED), the 1.5°C scenario is taken as the IPCC AR5 scenario RCP2.6 at 2100 (mean 1.6°C).

The IPCC Impacts at 1.5°C chart design uses the IPCC AR4 Figure SPM.7. design. Specific IPCC AR5 references are provided by AR5 the illustrated graphics with text.

The 1.5°C surface temperature increase was applied to the NASA NEX downscaled projections. NASA NEX uses RCP4.5 as its 'low emissions' scenario. RCP4.5 is at 1.5°C at 2031. The NASA NEX map is downloaded using the low emissions scenario at 2030.

A regional focus for crop tolerance at maximum daily summer temperatures is shown.

This does not include extreme heat events.

There are many other adverse impacts that will combine adversely with daily maximum temperature on crops and human populations.

Comments signifies text added by the author.

Conclusion from IPCC AR5 evidence

The evidence from the IPCC AR5 is overwhelming that *the only option is the IPCC AR5 best case scenario RCP 2.6, which is the only scenario not exceeding 2°C and potentially the only 1.5°C scenario (*also quoted by T. Stocker Dec 6, 2013 Grantham Institute lecture 'Anthropocene: The closing doors of climate targets'.

Furthermore, for an equilibrium limit of 2°C, warming by 2100 has to be limited to 1.5°C due to ocean thermal inertia.
Negative emissions are unproven and at scale research does not show this can be counted on as feasible.

However the evidence indicates that climate and ocean disruptions from a warming above 1.5°C (and associated atmospheric CO2 increase) will be disastrous to huge human populations, world food production, all species, all major ecosystems and all future generations.

With radiative forcing still accelerating at an unprecedented rate (atmospheric CO2 concentration) adaptation, though essential, cannot be assumed to mitigate impacts for most populations and most ecosystems for long (AR54 WG2 7.4) Applies to large ecosystems, the Arctic and the ocean

Warming of 2.0°C by 2100 (as being used by UN agencies) is 3.5°C equilibrium (ocean thermal inertia) long after 2100 and higher again due to amplifying feedback emissions (not included in the AR5 RCP scenario projections). Such a progressively rising temperature increase would eventually render Earth unlivable, if not uninhabitable, for humanity.

The evidence indicates that an equilibrium warming of 2.0°C will cause

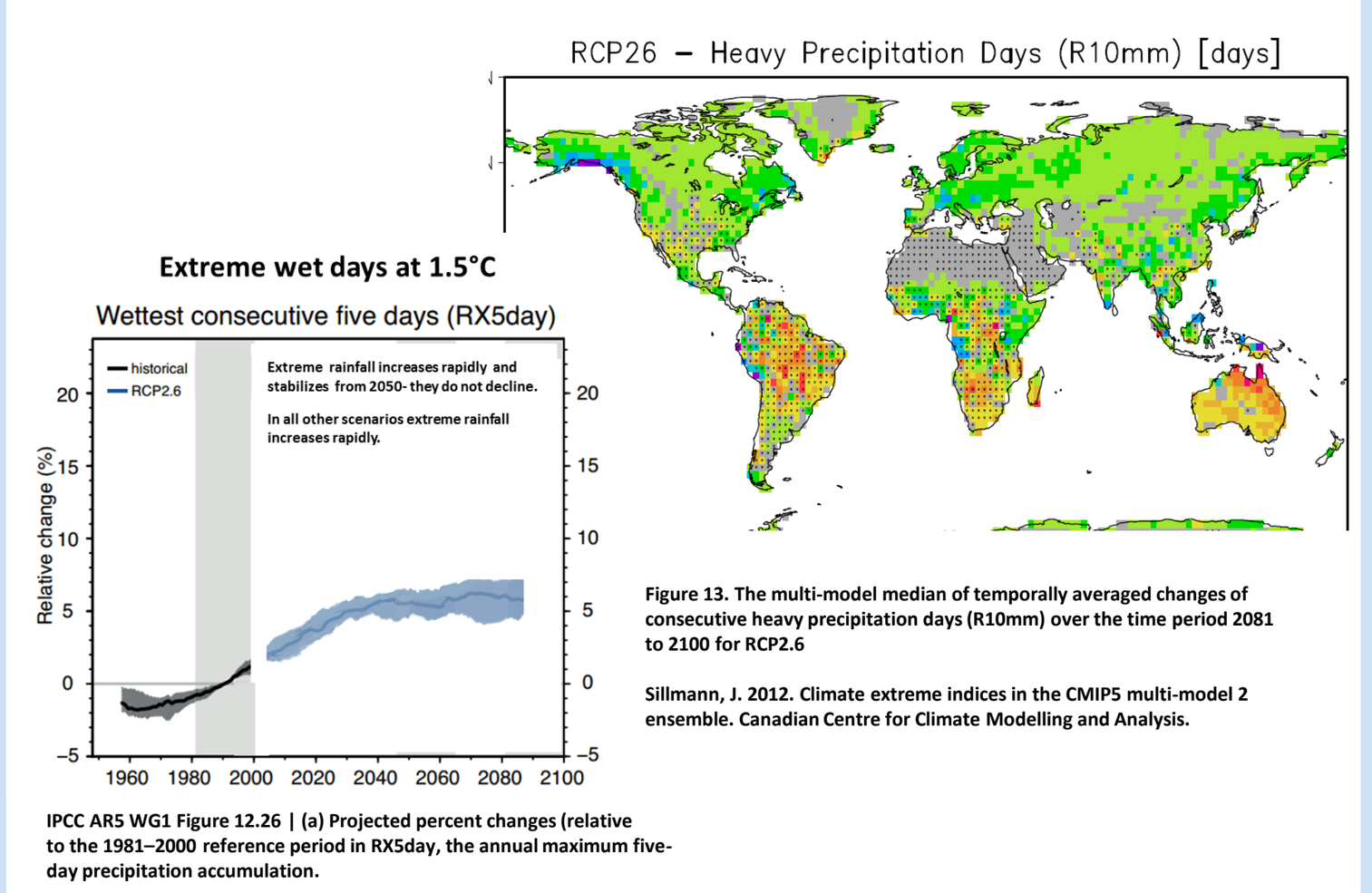
- 2°C sustained surface warming leads to an enormous increase in today's mass extinction rate of land and ocean species, increased further by die offs of the Amazon, the Boreal and other large forests.
- 2°C leads to a large decline in world crop production with substantial reductions in all major food producing regions.
- Ocean heating, acidification and deoxygenation will rise past ocean collapse levels.
- 2°C (or less) can be expected to trigger the total planetary calamity of 'runaway' rapid global heating and climate chaos i.e. multiple Arcrtic amplifying feedback runaway carbon dynamics (IPCC TAR, O'Connor Arctic feedbacks 2010).

- The evidence indicates that warming of 1.5°C will cause:
  - Severe, pervasive, widespread disastrous and catastrophic impacts to huge human populations and the planet, continuous over generations.
  - A decline in world food output and declines from all major food producing regions.
  - Ocean heating, acidification and deoxygenation at ocean collapse levels.
  - An enormous risk of passing multiple planetary tipping points
  - An enormous risk of 'runaway carbon dynamics' (IPCC 2001 TAR) due to inter-reinforcing amplifying carbon feedback emissions from multiple enormous planetary pools of vulnerable carbon mainly from the Arctic Boreal tundra system, such as Arctic permafrost, subarctic and tropical wetlands, Boreal forest die back, permafrost, and also die-back of the Amazon forest.

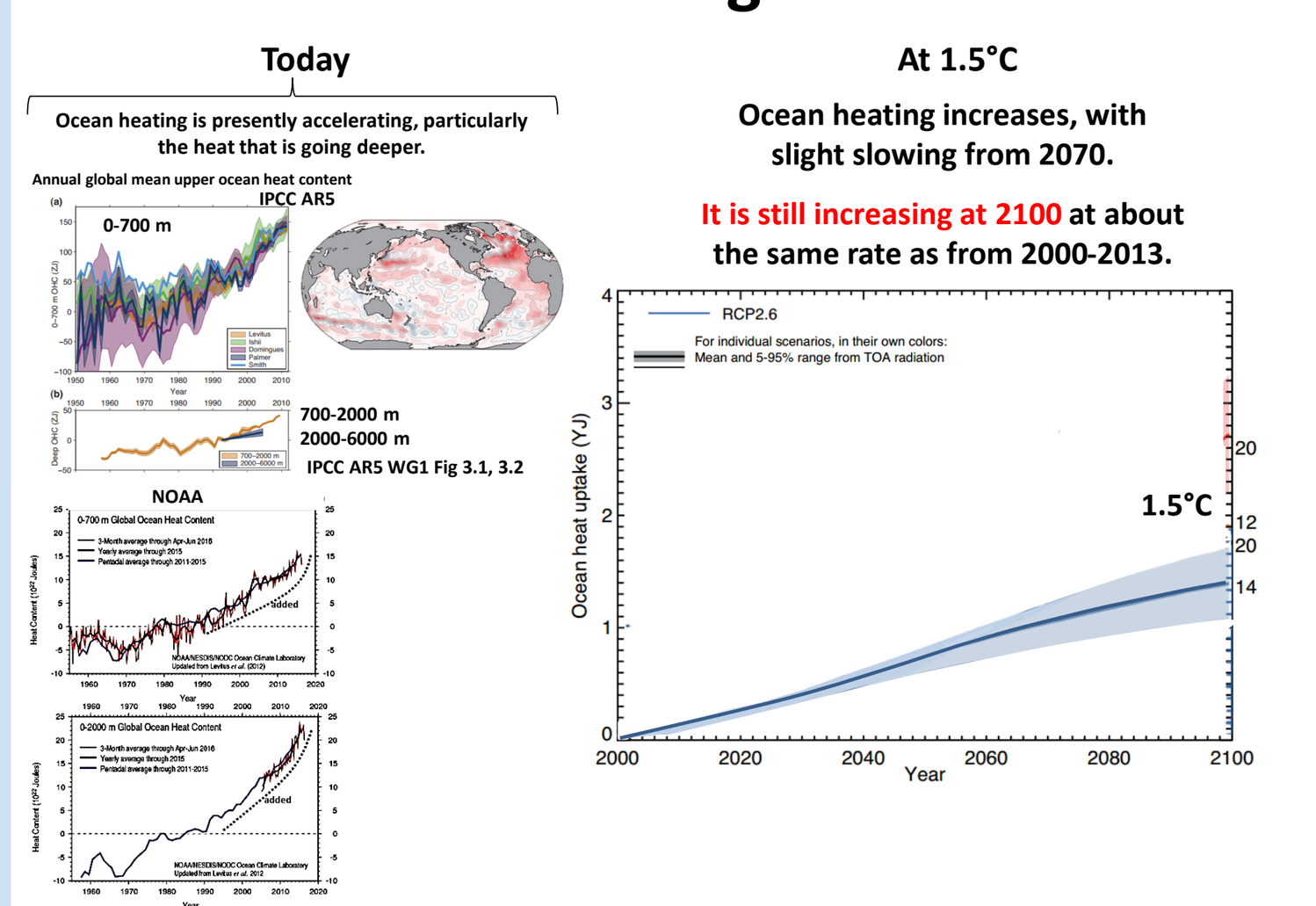
To mitigate the above (from IPCC AR5), science may still may just have time for the following to be effective, if formally urged by climate scientists and science organizations.

- Emissions of all long lived GHGs from OECD nations have to peak immediately, for a 2°C limit.
- Emissions of all long lived GHGs from all large polluters (countries and central source corporations) have to peak immediately, and decline substantially by 2030 , for a 2°C and 1.5°C limit

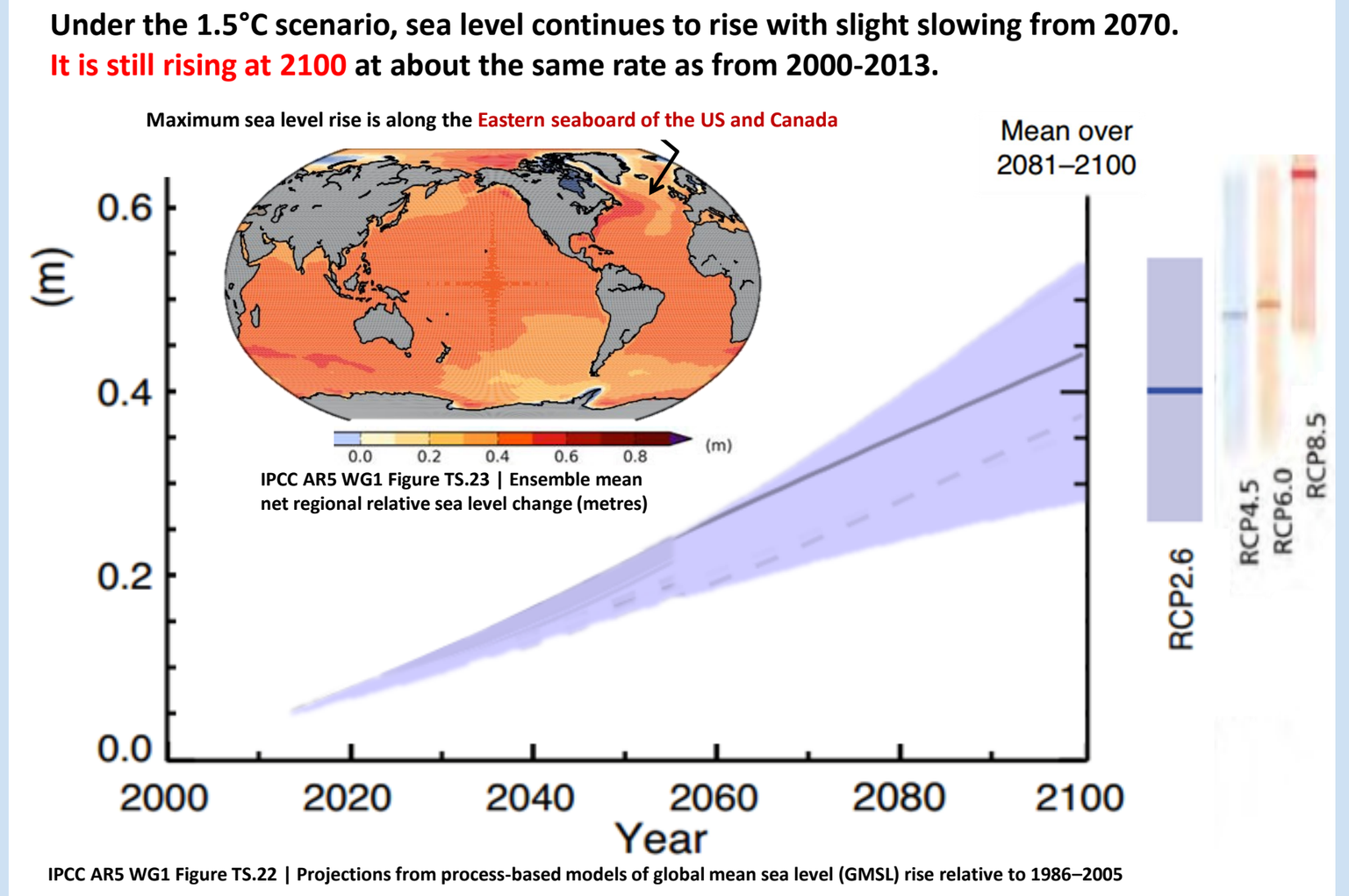
Extreme wet at 1.5°C



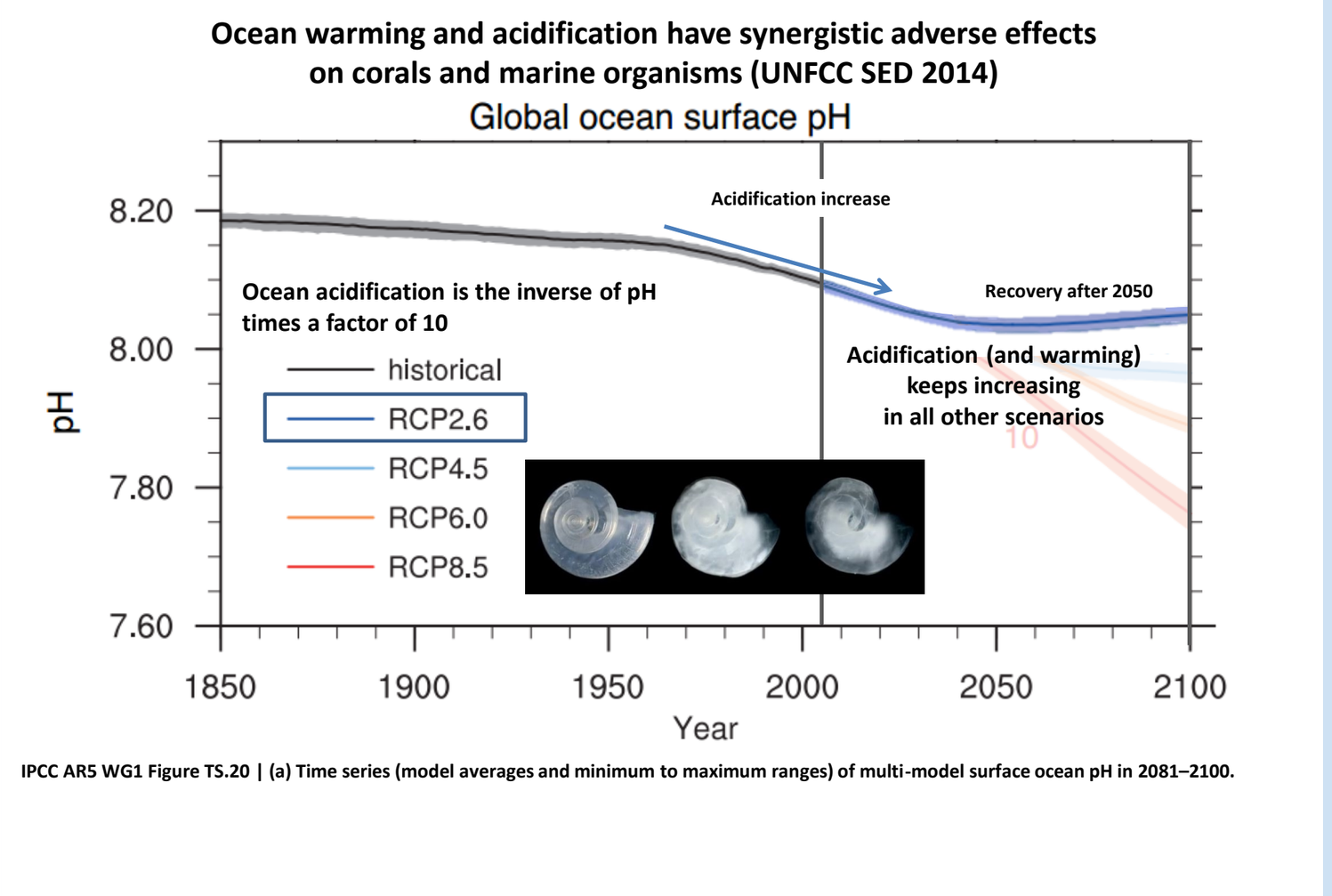
Ocean heating at 1.5°C



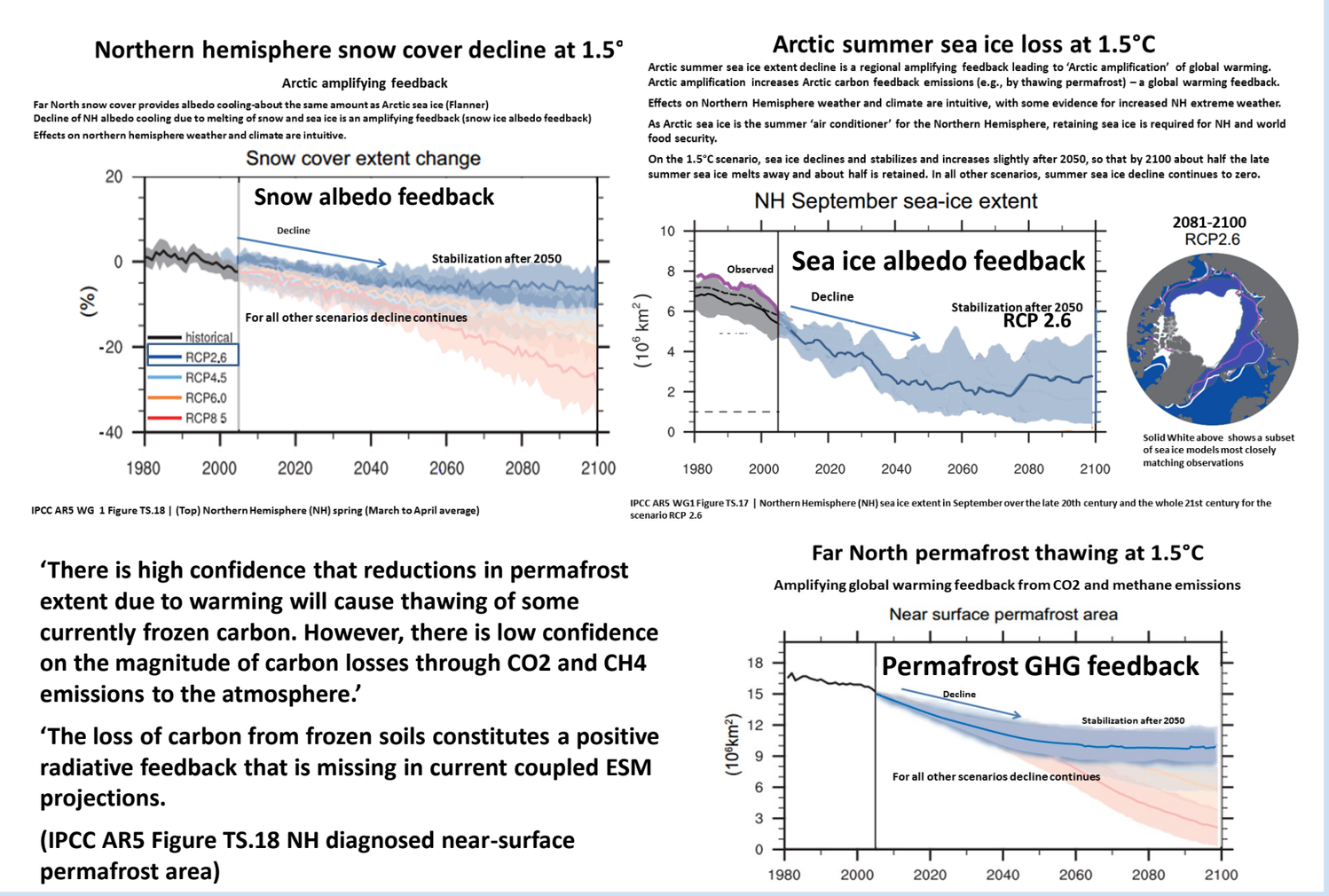
Sea level rise at 1.5°C



Ocean acidification at 1.5°C



Arctic feedbacks at 1.5°C



Permafrost 'thaw-down' at 1.5°C