Feedback from input4MIPs meeting and update of forcings

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Purpose of meeting (held prior AGU 2018)

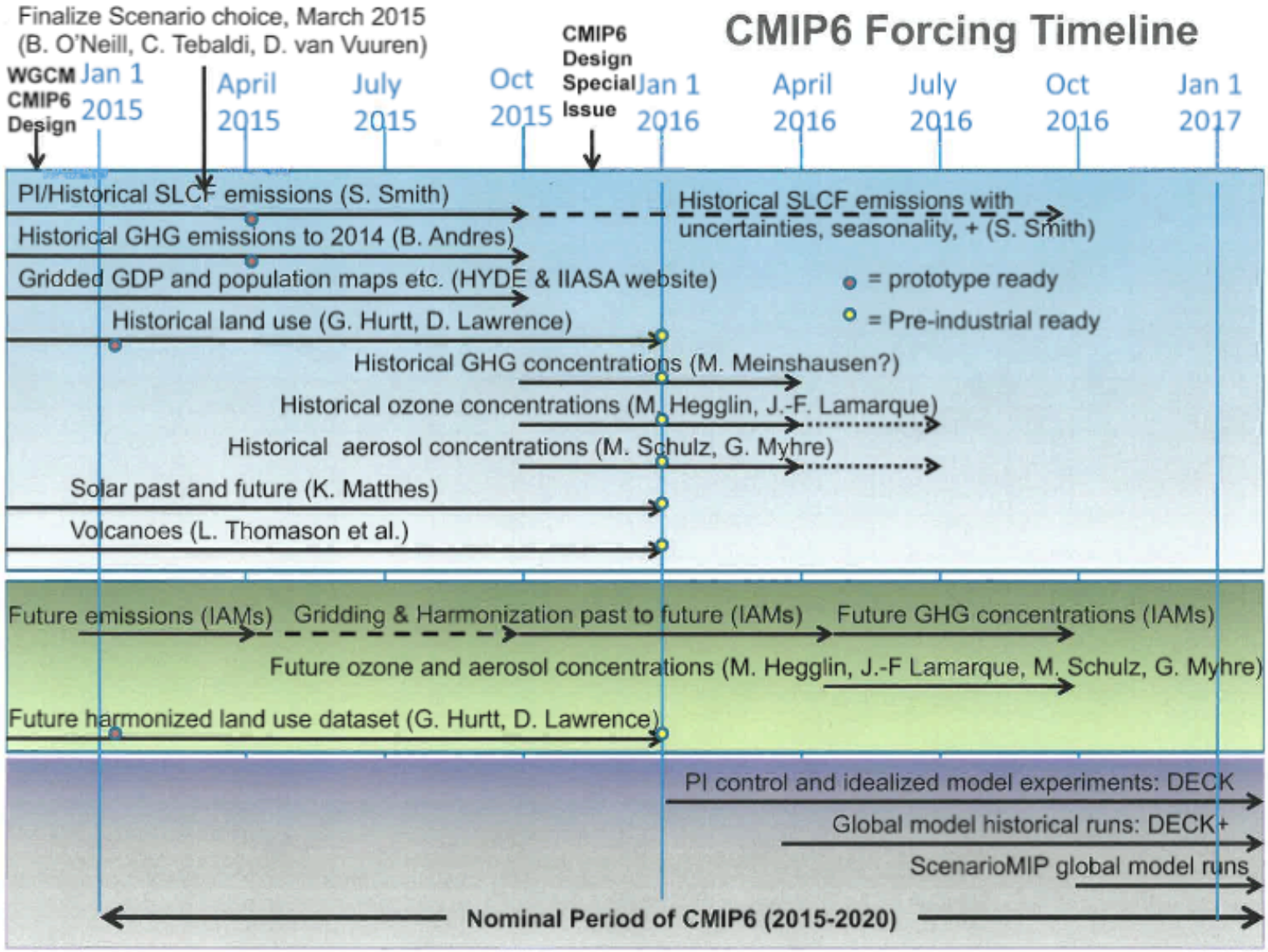
- Combination of dataset developers and users
- Take stock on CMIP6
- What do to for CMIP7?
- Focus on SLCF emissions, land-use, concentrations (including stratospheric aerosols) and deposition datasets

➢ Approximately 20 attendees

Will focus my presentation on forcings, not on the very good support input4MIPs has provided!

Key points on CMIP6

- It takes a long time to generate and coordinate datasets -> original timeline was overly optimistic


CMIP6 Forcing Timeline
Finalize Scenario choice, March 2015
(B. O'Neill, C. Tebaldi, D. van Vuuren)
WGCM CMIP6 Design
CMIP6 Design Special Issue
Jan 1 2015
April 2015
July 2015
Oct 2015
Jan 1 2016
April 2016
July 2016
Oct 2016
Jan 1 2017
PI/Historical SLCF emissions (S. Smith)
Historical SLCF emissions with uncertainties, seasonality, + (S. Smith)
Historical GHG emissions to 2014 (B. Andres)
Gridded GDP and population maps etc. (HYDE & IIASA website)
= prototype ready
= Pre-industrial ready
Historical land use (G. Hurtt, D. Lawrence)
Historical GHG concentrations (M. Meinshausen?)
Historical ozone concentrations (M. Hegglin, J.-F. Lamarque)
Historical aerosol concentrations (M. Schulz, G. Myhre)
Solar past and future (K. Matthes)
Volcanoes (L. Thomason et al.)
Future emissions (IAMs)
Gridding & Harmonization past to future (IAMs)
Future GHG concentrations (IAMs)
Future ozone and aerosol concentrations (M. Hegglin, J.-F Lamarque, M. Schulz, G. Myhre)
Future harmonized land use dataset (G. Hurtt, D. Lawrence)
PI control and idealized model experiments: DECK
Global model historical runs: DECK+
ScenarioMIP global model runs
Nominal Period of CMIP6 (2015-2020)

Key points on CMIP6

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- Single point-of-failures present in several forcing areas
- Quality control and early testing is essential, and this was not done enough (last minute changes on SO2 emissions or volcanic datasets)

The volc v3 vs v4 differences are also something that will require a number of additional slides, at this stage the AMIP simulations that have been run show that the differences between these are small, and so are unlikely to be a major show-stopper for CMIP6/AR6 assessments

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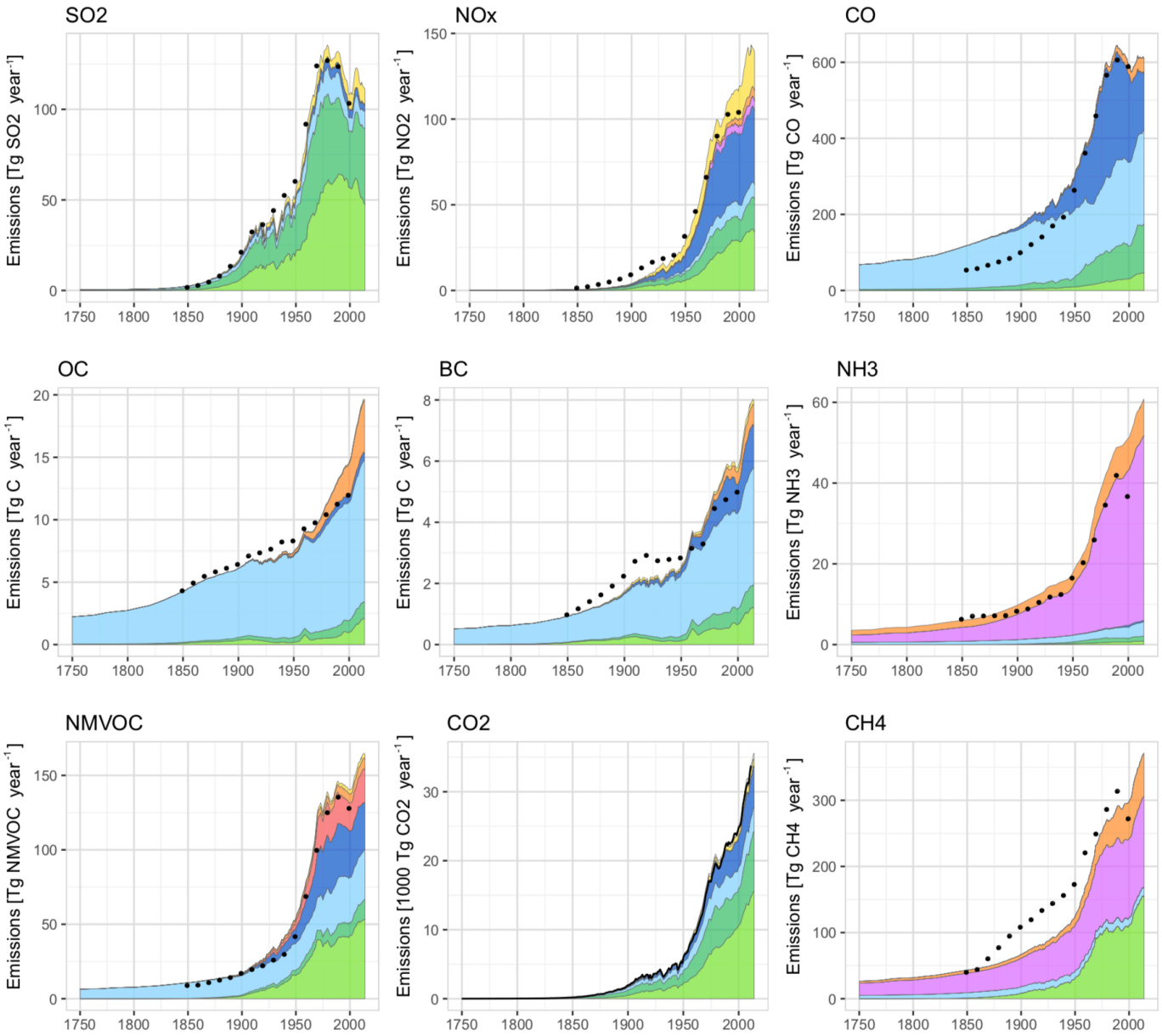
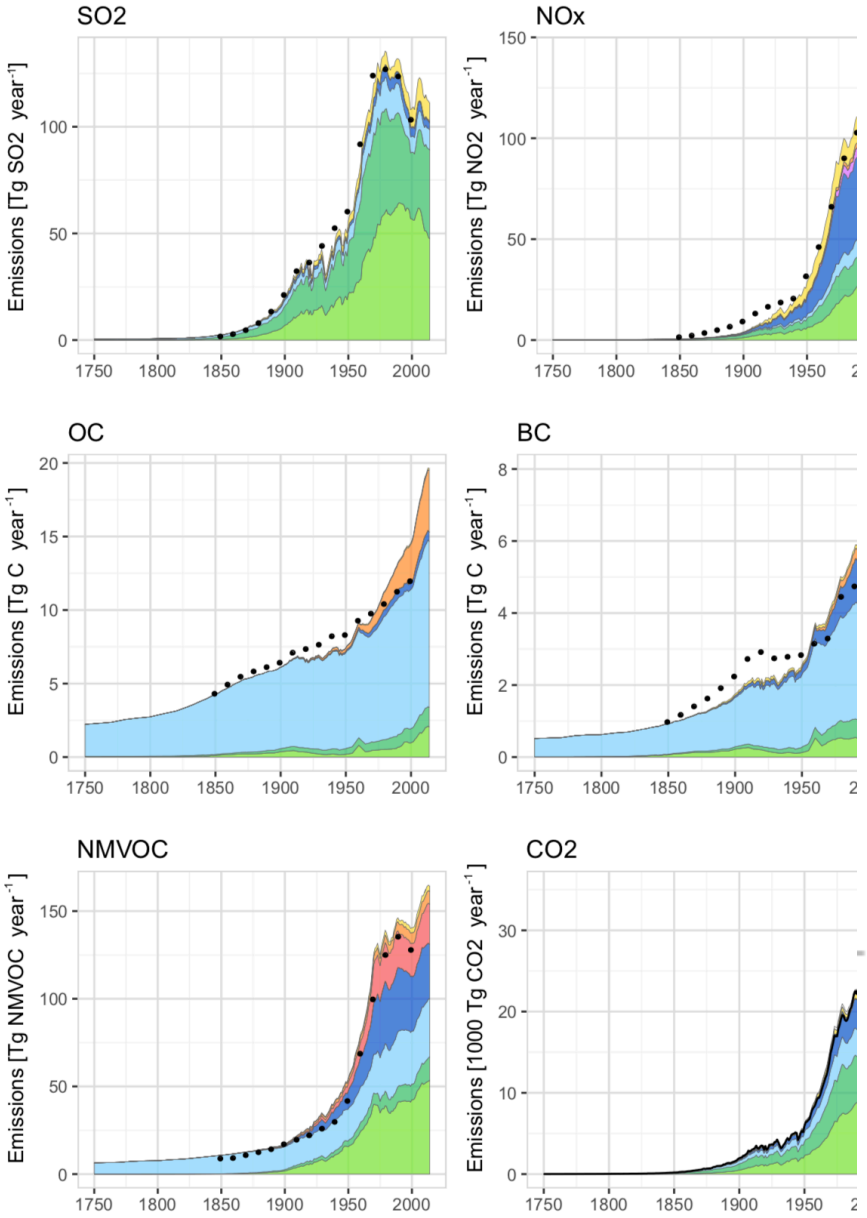
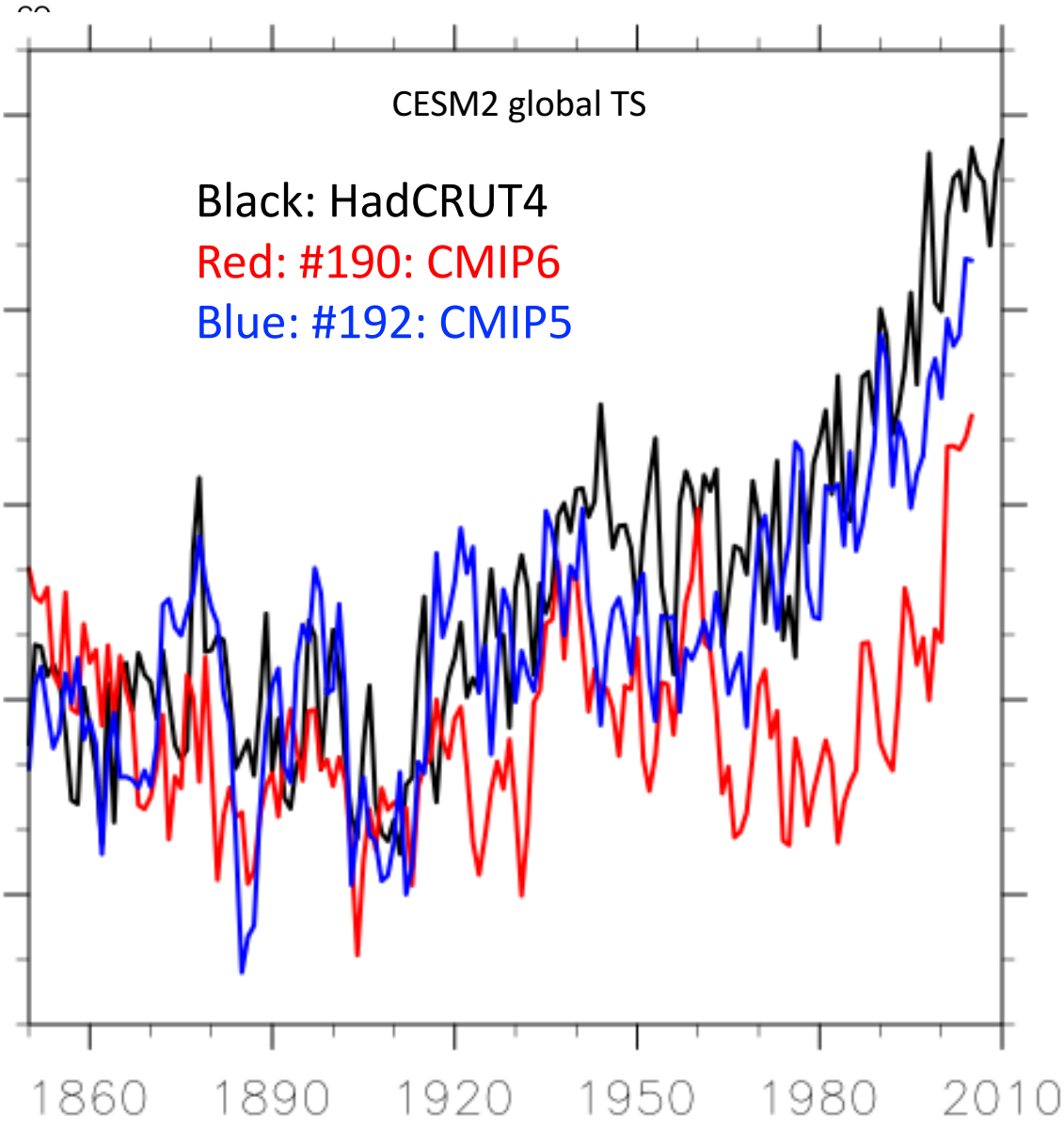
- CMPI6 funding was (slightly) better than for CMIP5, but most efforts still rely on mostly unfunded participation, limiting ability to put pressure on developers
- Some datasets are actually a mix of CMIP5/CMIP6 (ozone and Ndep)
- Globally/annually the SLCF emissions didn't change much from CMIP5 but large differences at regional/seasonal scales


SO2
Emissions [Tg SO2 year-1]
0
50
100
1750
1800
1850
1900
1950
2000
NOx
Emissions [Tg NO2 year-1]
0
50
100
150
CO
Emissions [Tg CO year-1]
0
200
400
600
OC
Emissions [Tg C year-1]
0
5
10
15
20
BC
Emissions [Tg C year-1]
0
2
4
6
8
NH3
Emissions [Tg NH3 year-1]
0
20
40
60
NMVOC
Emissions [Tg NMVOC year-1]
0
50
100
150
CO2
Emissions [1000 Tg CO2 year-1]
0
10
20
30
CH4
Emissions [Tg CH4 year-1]
0
100
200
300


SO2
Emissions [Tg SO2 year-1]
NOx
Emissions [Tg NO2 year-1]
OC
Emissions [Tg C year-1]
BC
Emissions [Tg C year-1]
NMVOC
Emissions [Tg NMVOC year-1]
CO2
Emissions [1000 Tg CO2 year-1]
1750
1800
1850
1900
1950
2000


CESM2 global TS
Black: HadCRUT4
Red: #190: CMIP6
Blue: #192: CMIP5
0.9
0.6
0.3
0.0
-0.3
1860
1890
1920
1950
1980
2010

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- Some datasets are actually a mix of CMIP5/CMIP6 (ozone and Ndep)
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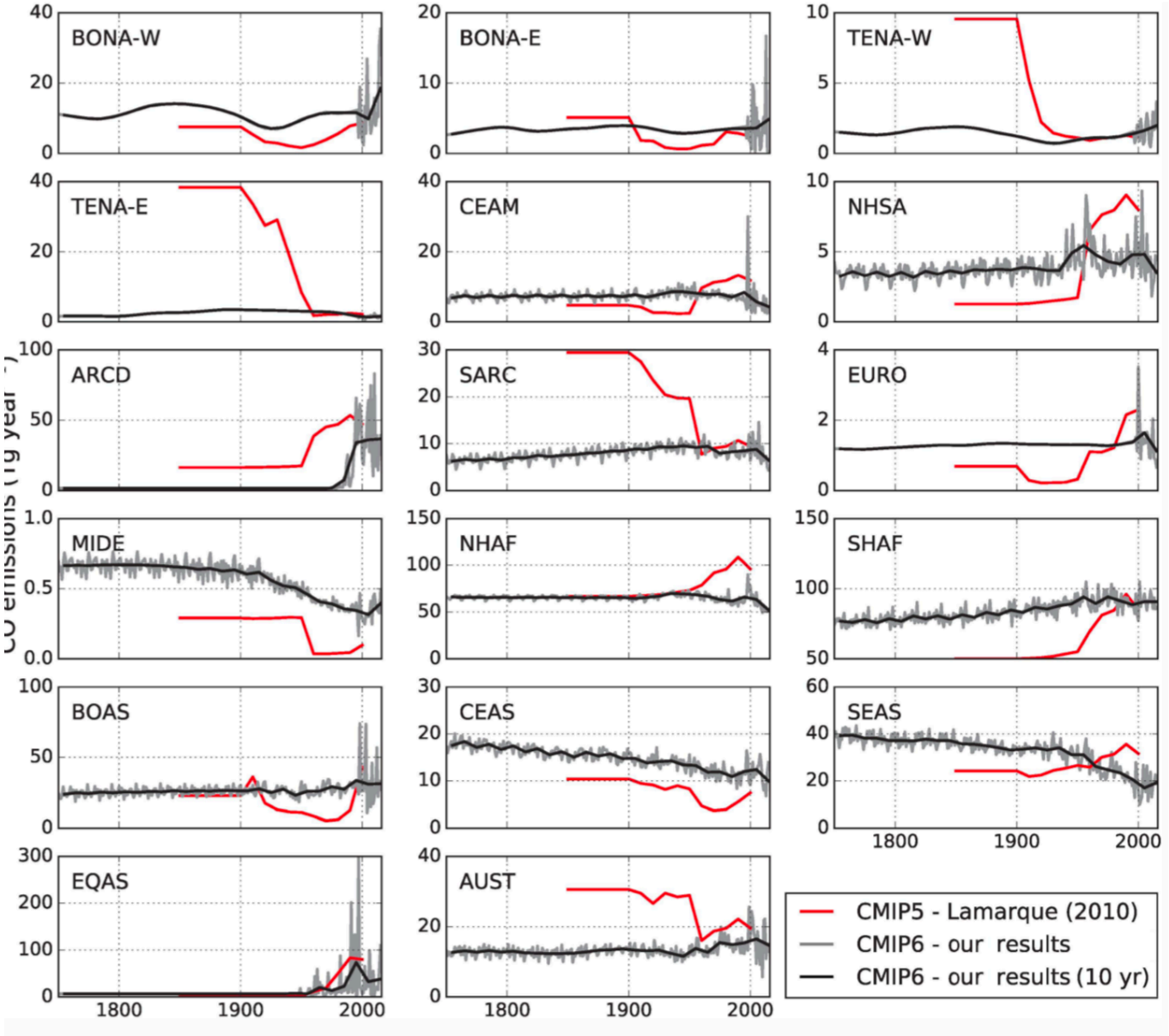
- Biomass burning changed drastically between Lamarque et al (2010) and van Marle (2017)


BONA-W
BONA-E
TENA-W
TENA-E
CEAM
NHSA
ARCD
SARC
EURO
MIDE
NHAF
SHAF
BOAS
CEAS
SEAS
EQAS
AUST
1800
1900
2000
CMIP5 - Lamarque (2010)
CMIP6 - our results
CMIP6 - our results (10 yr)

Moving forward

- Communication is critical: should we create a private forum to discuss identified issues within a trusted group? Early automated tests should help!
- Is continual update/evolution of forcing necessary?
- We need to remove bottlenecks -> funding/TSU-like group?
- How do we move away from a single/central estimate forcing -> should that be another MIP/community activity?
- What constitutes an experiment, i.e. can forcings change/get updated?
- Does it really matter that we have “consistency” between forcings?
- Needs and capabilities of modeling groups are changing: are we addressing the new ones? Are we doing un-necessary ones?
  - should ozone be set at PI in a 4xCO2 run?
  - volcanic emissions
  - fire/biogenic emissions/deposition are becoming online calculations in many ESMs