Chemistry-Climate Model Initiative: Where we are and where we are going

Co-chairs: Tatsuya Nagashima, David Plummer

Scientific Steering Committee

Alex Archibald, Gabriel Chiodo, Suvarna Fadnavis, Hella Garny,

Béatrice Josse, Joowan Kim, Jean-François Lamarque,

Olaf Morgenstern, Lee Murray, Clara Orbe, Amos Tai

CCMI-1

- experiments / data request defined in Eyring et al. (2013)
  - three reference simulations, 14 sensitivity simulations
  - 18 diagnostic tracers, chemical flux terms, deposition fluxes, species concentrations
  - model output submitted to archive through 2016
  - 19 models submitted the baseline projection scenario

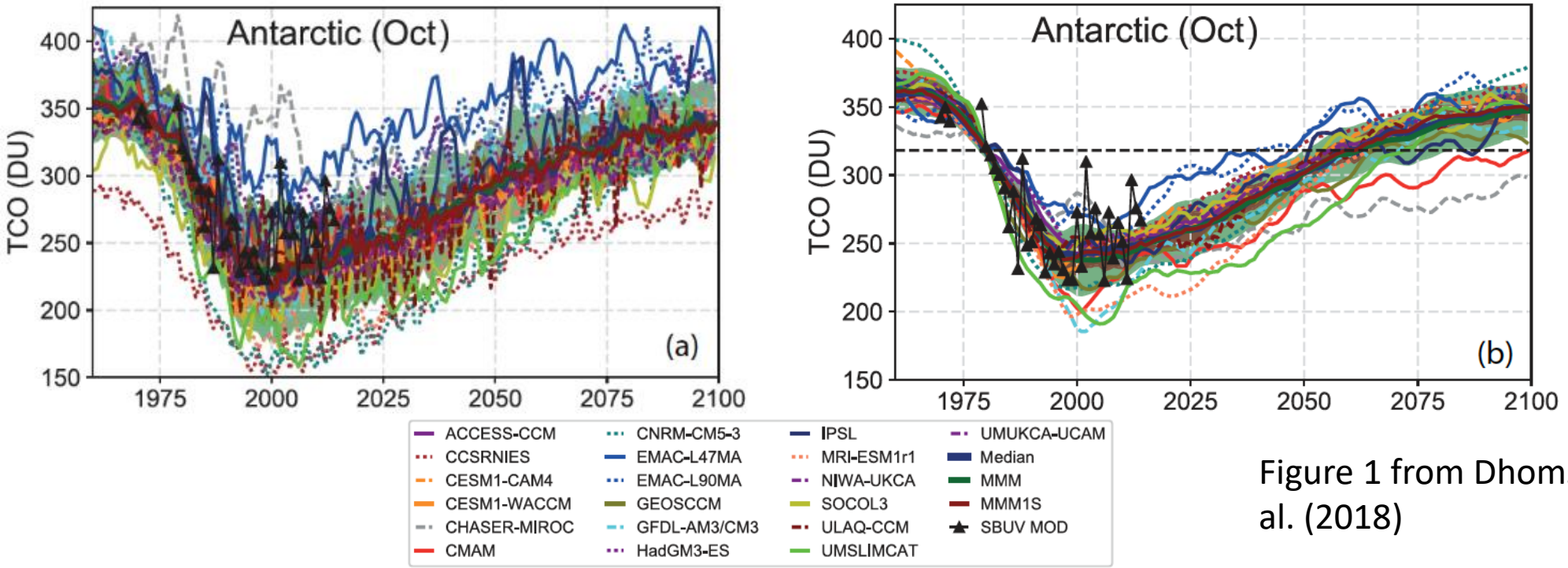


Figure 1 from Dhomse et al. (2018)

CCMI-2022

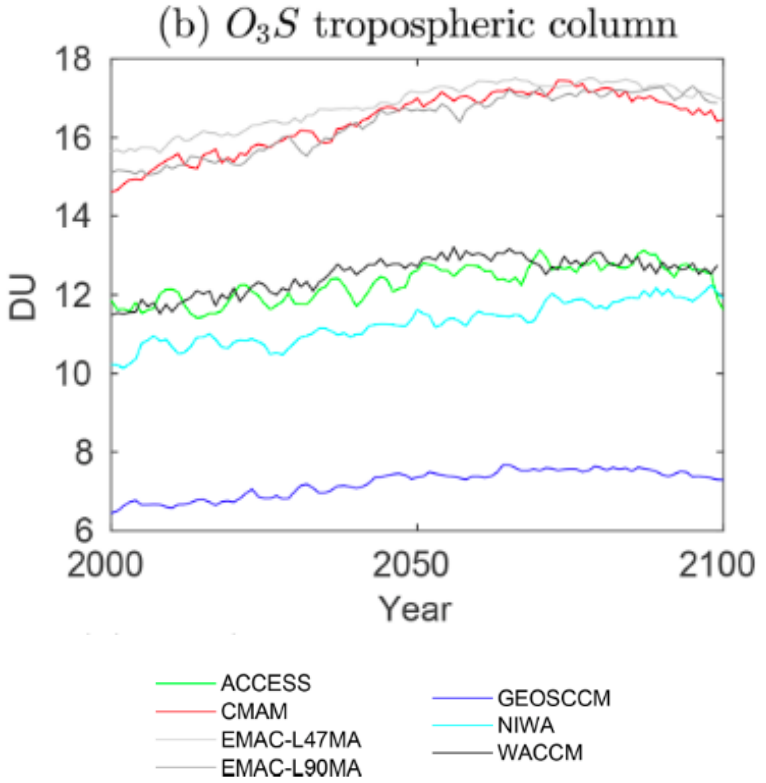
- tightly focused on providing guidance for 2022 Ozone Assessment
  - CCMI-1 used WMO(2010) scenario for ozone depleting substances
  - new CMIP6 scenarios and forcing datasets (e.g. extTerrestrial solar flux)
- tried to address some of the difficulties working with CCMI-1 data
  - many models submitted only a single simulation
    - difficult to separate internal variability from inter-model variability
  - greatly reduced number of models that submitted scenarios
    - heterogeneous multi-model ensemble when analyzing effects (fCH4, fODS, …)
- provide results on a quicker timeline
- hindcast, baseline projection (SSP2-4.5), geoengineering plus two scenarios (SSP1-2.6, SSP3-7.0)
- two diagnostic tracers
- experiments / data request published in July 2021

CCMI-2022

- even a ‘light’ set of experiments is still a tremendous amount of work
  - increasing model complexity / cost
  - increasingly stringent standards for model output formatting / metadata
  - different model groups are at different points in development cycle
  - model groups have existing commitments / resource constraints
- currently have output for
  - 1960 – 2018 hindcast (refD1) from 10 (soon 11) models
  - 1960 - 2100 baseline projection (refD2) from five models
  - small numbers of additional simulations for the geoengineering (senD2-sai) and SSP1-26 and SSP3-70 scenarios
- still very much an on-going activity

CCMI-2022 and TOAR-2

- one promising point of collaboration is analysis of ‘stratospheric ozone’ tracer specified for the CCMI-2022 simulations
  - feeds in to analysis for the ‘Role of STE in the Earth System (ROSTEES) TOAR-2 activity
  - builds on similar tracer from CCMI-1 but with attempt to simplify / harmonize calculation of tropospheric loss
- not in a position to push for new simulations on the timeline for TOAR-II, it could be possible to ask groups for additional outputs from the current set of simulations
- longer term: restart ‘bottom-up’ process to design new experiments / diagnostics
  - methane lifetime, chemical budgets, ….



From Abalos et al. (2020)