

Ozone and N-deposition forcings

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Ozone and N-deposition forcings: Status and timeline

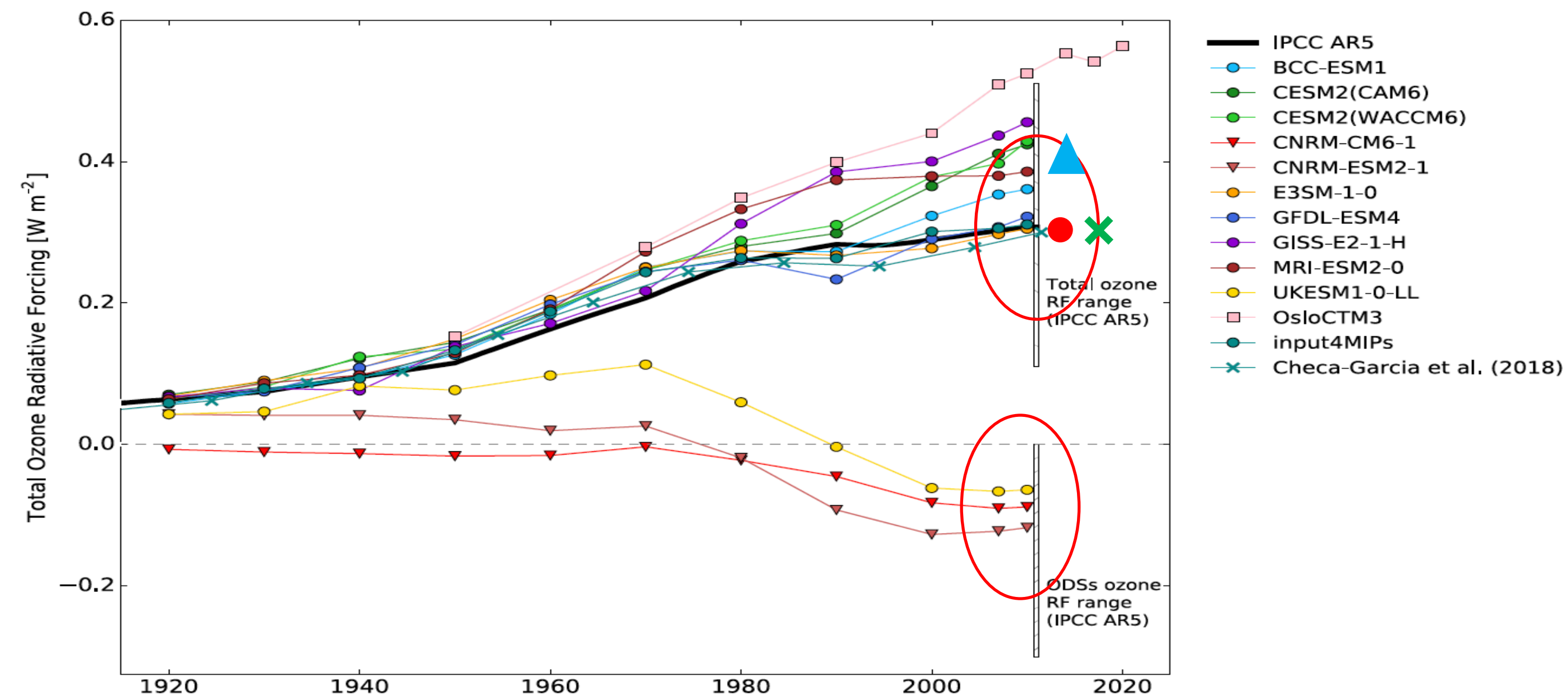
- First preliminary (CMIP6plus) historical datasets will be released end of November 2024.
- CMIP6plus will be a simple extension of CMIP6 database
 - Time period covered 1850-2021.
 - Extension will be based on SSP370 future scenario from CMIP6.
- Current status:
 - Tests, which SSP to be used for extension is finalised.
 - Gathering user needs for data formatting, shortcomings, needed updates, in progress.
- PI dataset (for CMIP7 DECK) to be delivered by January 2025.
- Final historical dataset (for CMIP7 DECK) to be delivered by May 2025
- Future ozone forcings for multiple scenarios (to be finalized by mid 2026)

Ozone and N-deposition forcings: New features

- Consider user requirements.
- Make fully consistent with other forcings (solar, GHGs, SLCF emissions, volcanic aerosol,...)
 - This was not the case for CMIP6, where CMIP5 emissions were used.
 - A new historical QBO forcing will be used to nudge models towards.
- Use three state-of-the-art chemistry-climate models, all of them stratosphere-troposphere resolving, to improve upon identified shortcomings in models.
 - WACCM-CESM (USA)
 - CMAM (Canada)
 - EMAC (Germany)
- Format remains the same as that provided for CMIP6.
 - Similar horizontal resolution: 96x144
 - Similar vertical resolution: 66 levels
 - Time averaging: Monthly. Hourly surface fields will also be provided.
- Harmonise historical (1850-2021) and future simulations (out to 2100, no step changes).
- Make use of observations using latest methods of data science (ML) (including for extensive validation).
- Plans for operationalization.

Ozone Example

- Total ozone forcing (mainly due to tropospheric air pollutant emissions) is **positive**.
- Ozone forcing due to ozone depleting substances (ODSs) is **negative** (stratospheric ozone depletion).
- **CMIP6 (cross)** ozone forcing agrees with **CMIP5 (circle)** multi-model mean (due to emissions used being the same!).
- The **CMIP6 (triangle)** multi-model mean ozone RF is larger w/o outliers (i.e, UKESM and two stratosphere-only models).
- CMIP7 expected to be closer to CMIP6 → **CMIP6plus should only be used for testing purposes!**



Skeie, Myhre, ... Hegglin et al., npj Climate and Atmosphere 2020

Nitrogen Example

- Harmonisation necessary due to different emission scenarios available for historical and future simulations:
 - CMIP5 historical emissions
 - CMIP6 SSP2-45 future scenario
- Scaling approach accounts for seasonality.

