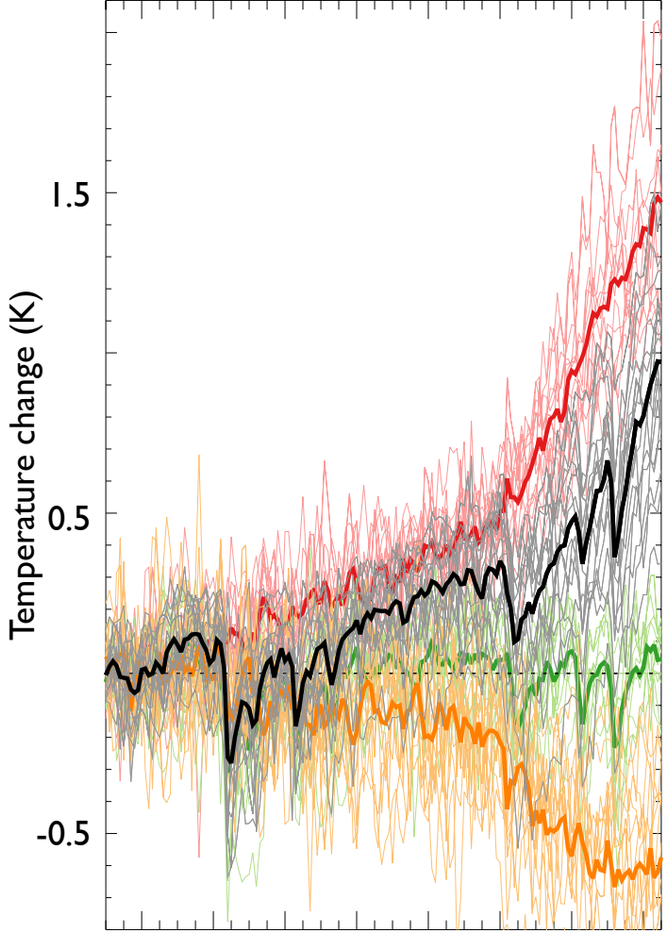
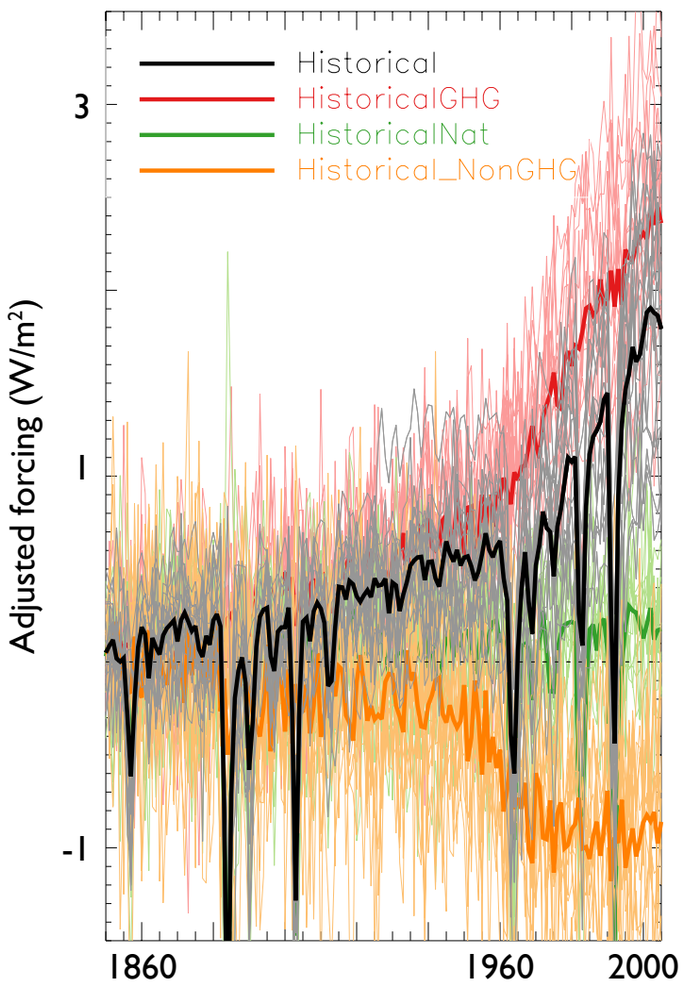




Even in supposedly-controlled experiments each GCM is subject to different radiative forcing forcing. This diversity arises from errors, loose specifications, and specific aspects of the model that modify the theoretical forcing.

Because we require models to reproduce the historical record sensitivity and forcing are inversely related in the CMIP ensemble. Indeed, some amount of the diversity in sensitivity is required just to account for diversity in model-specific forcing over the historical record.

Forster et al (2013) 10.1002/jgrd.50174

Radiative Forcing (RF) model intercomparison project

Motivation

- Disentangle variability in forcing from variability in response across models

Goals

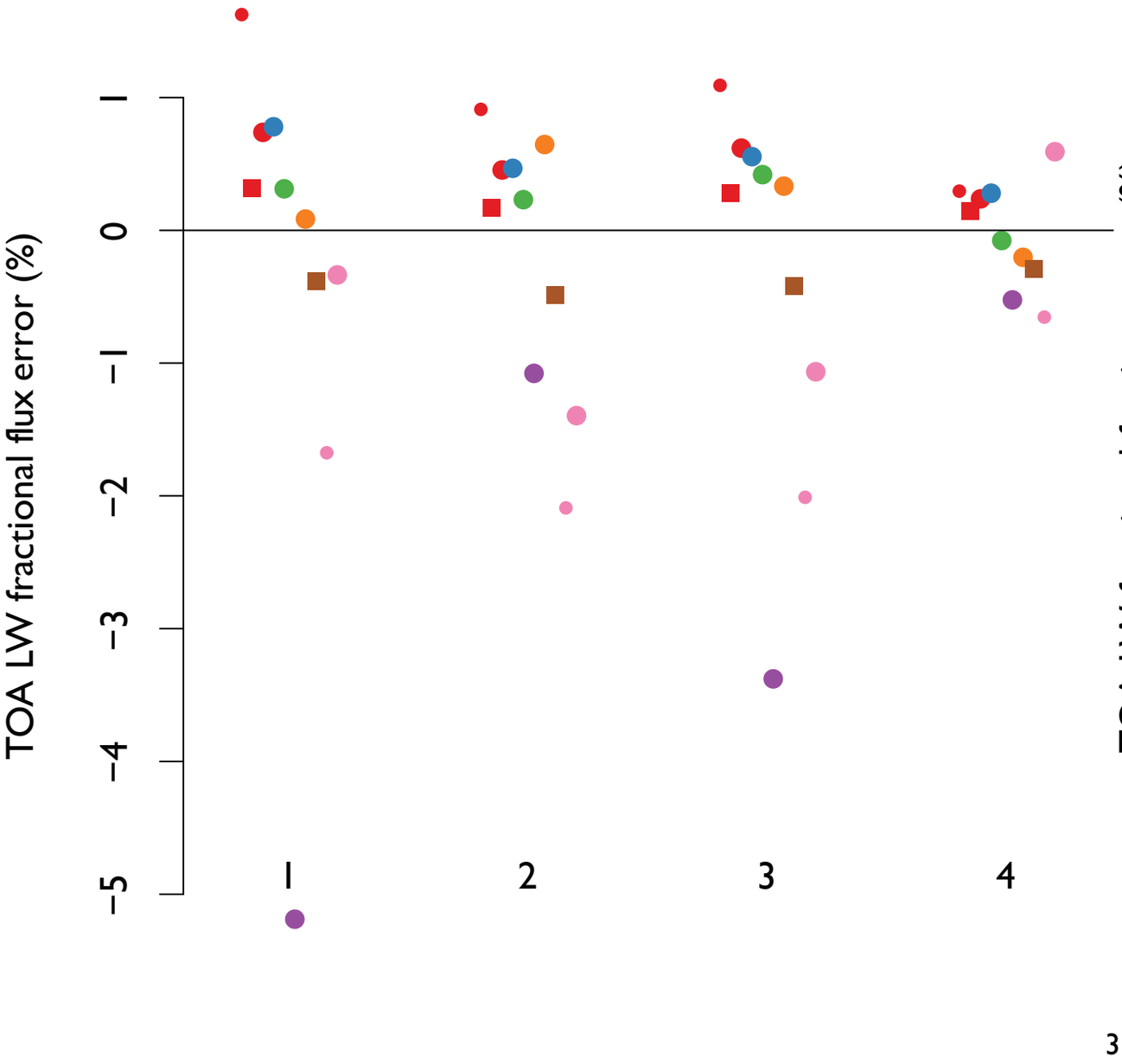
- Characterize and assess radiative forcing for each model
- Coordinate simulations in which RF is tightly specified

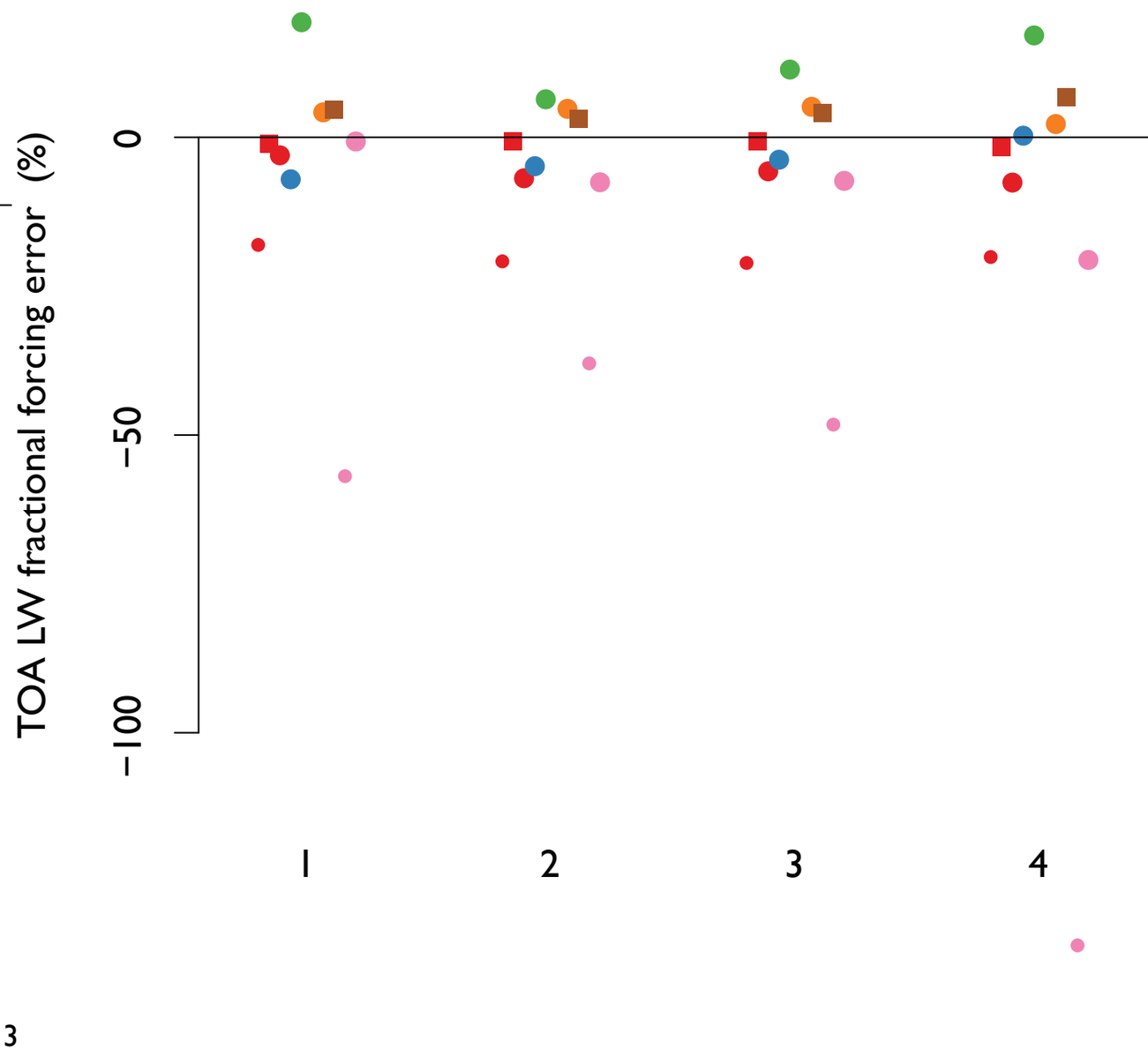
Components

- Offline assessment of flux and forcing calculations by RT parameterizations (gas-only atmospheres)
- Offline diagnosis and assessment of radiative forcing by aerosols
- Online diagnosis of effective radiative forcing including roles of climatology and rapid adjustments
- Integrations with tightly-controlled clear-sky radiative forcing

Assessment of flux and forcing computed by parameterizations

Radiation is well-understood (reference models reproduce observations to fractions of a percent) but parameterizations show a range of skills, especially in forcing calculations





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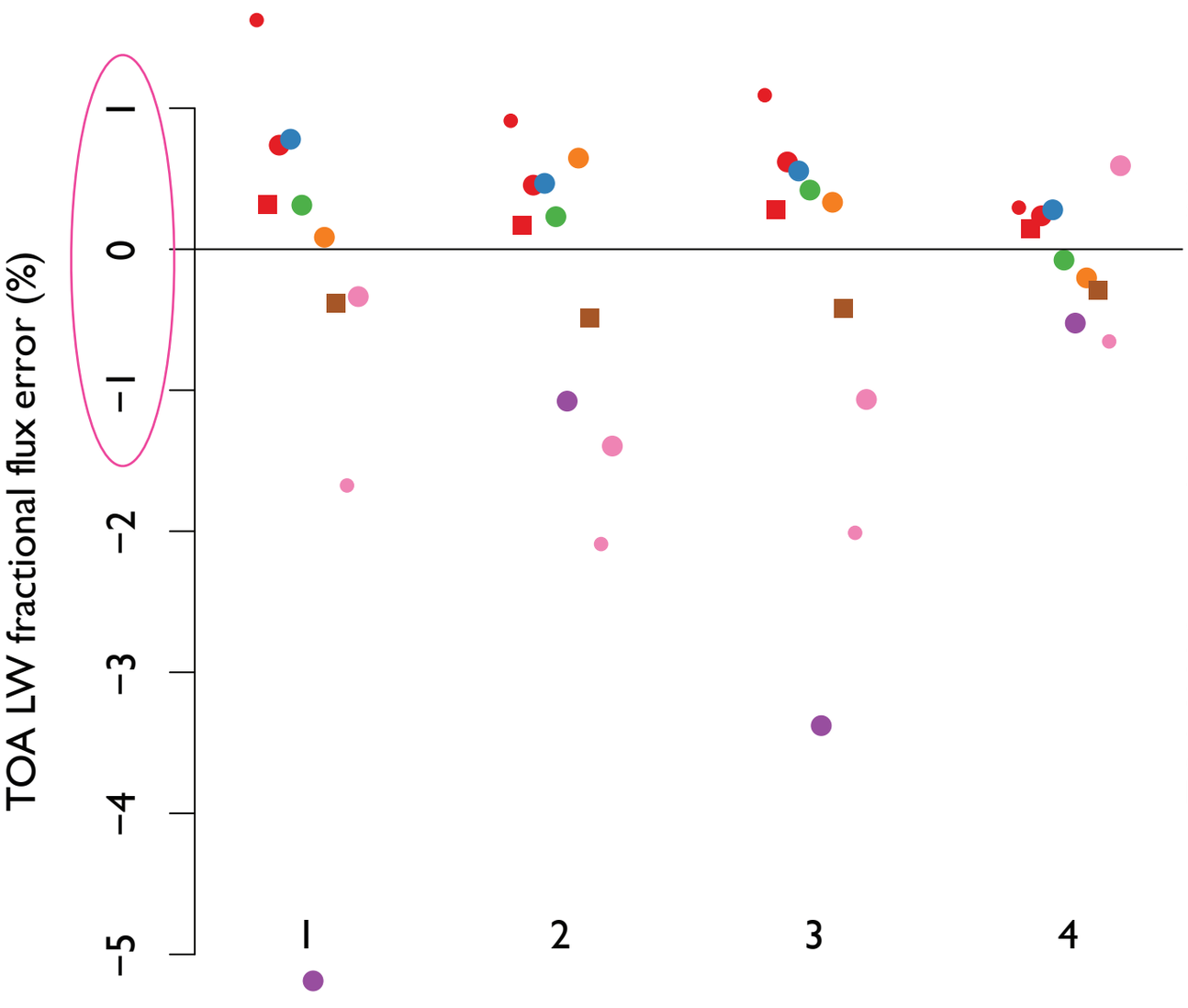

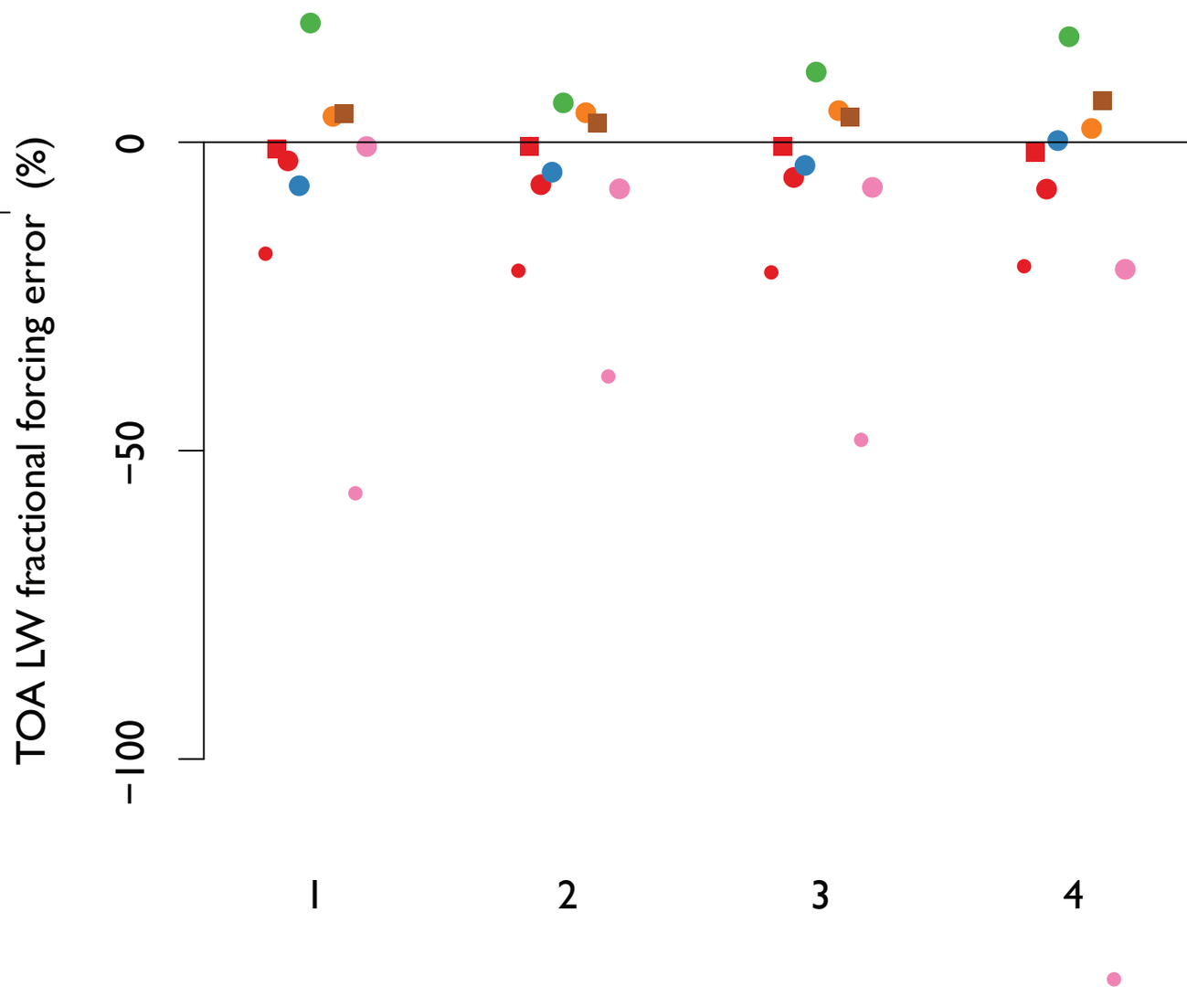

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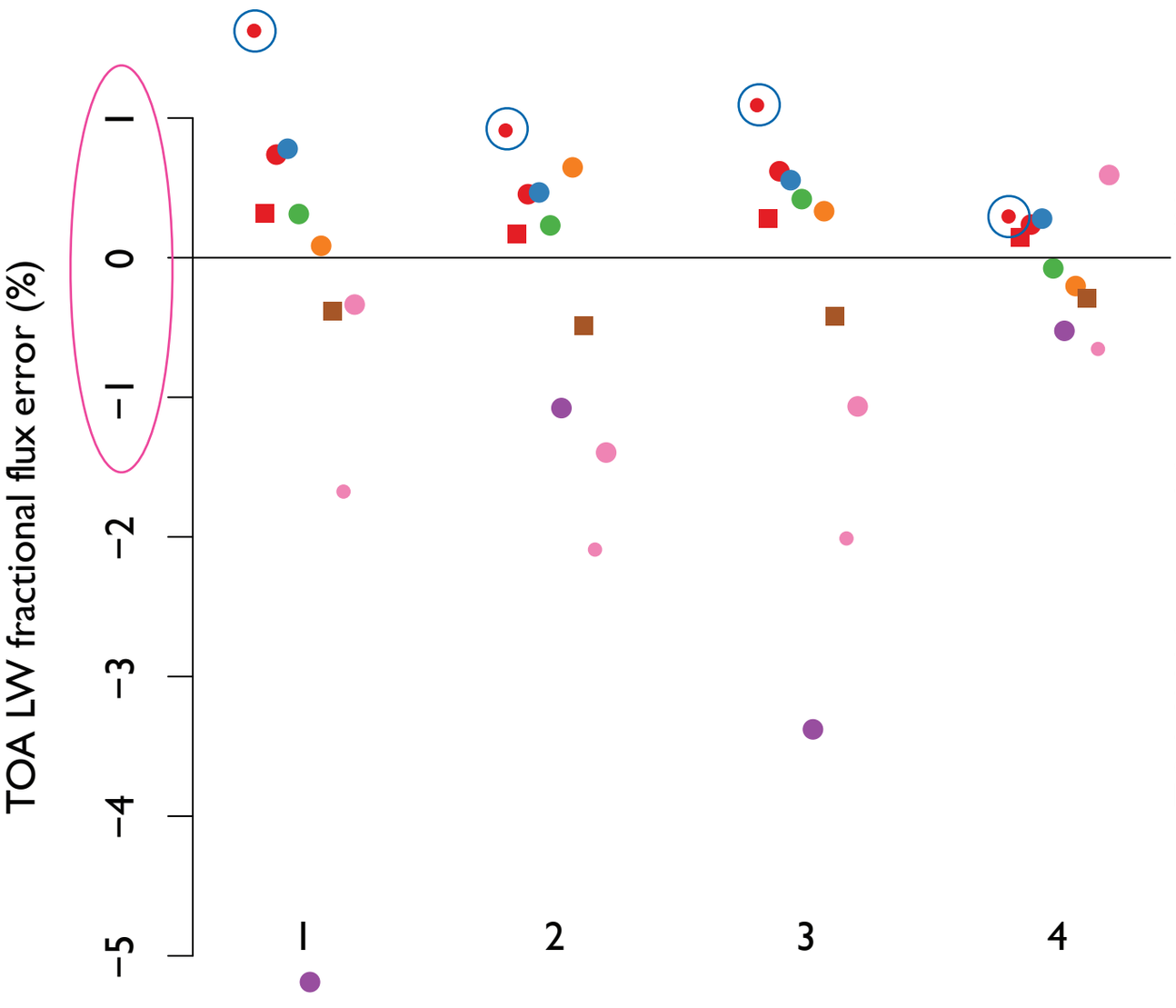

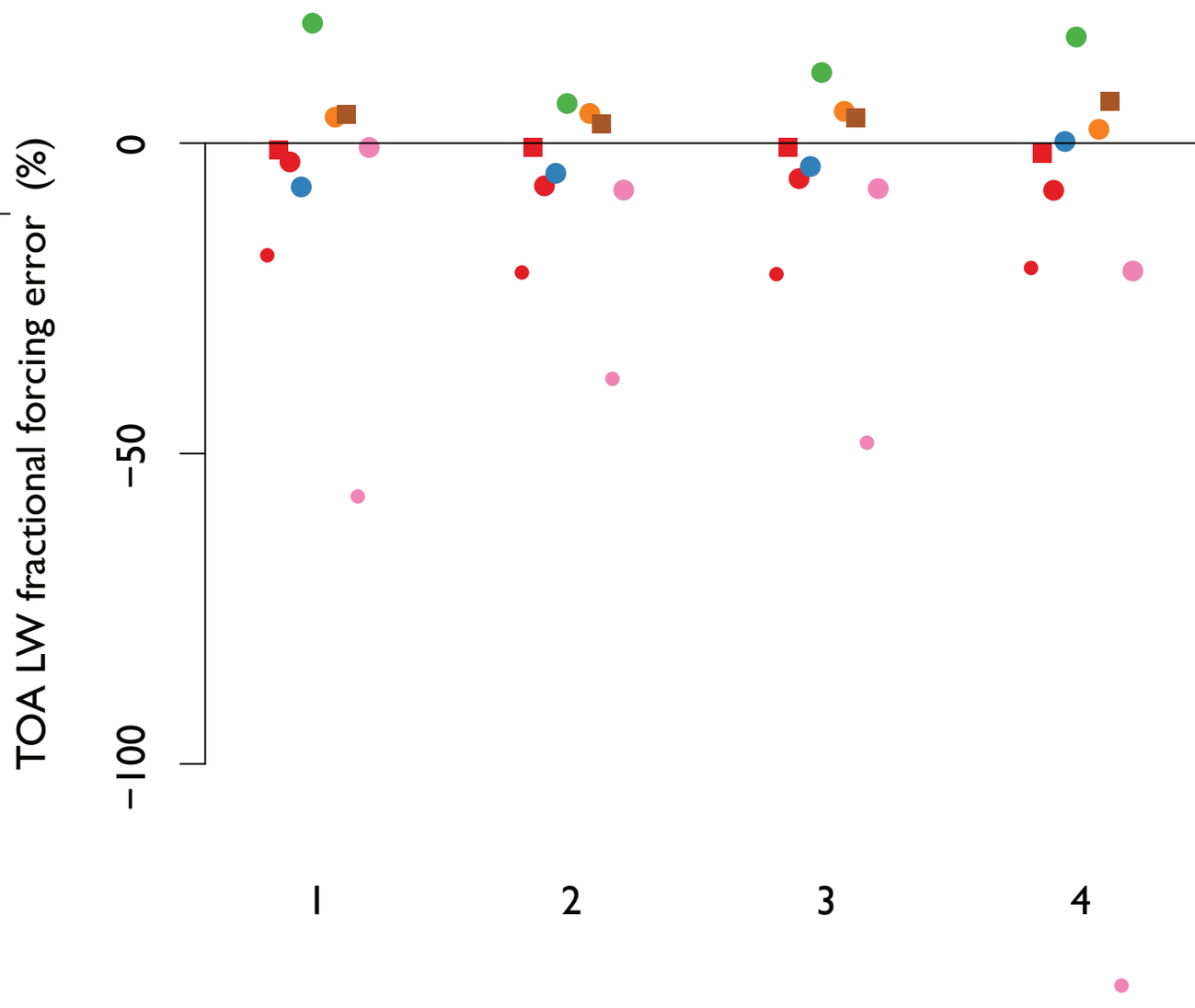

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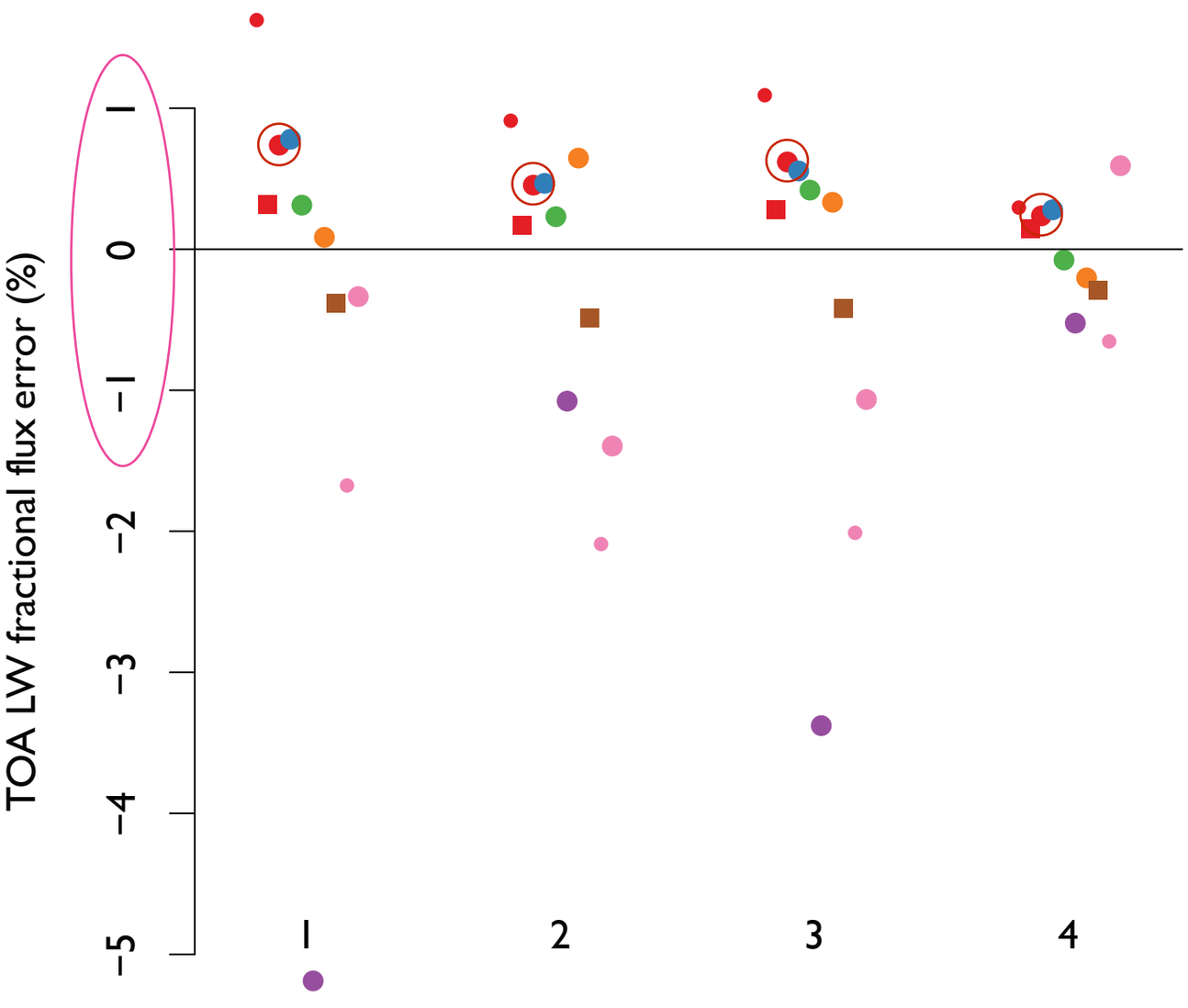

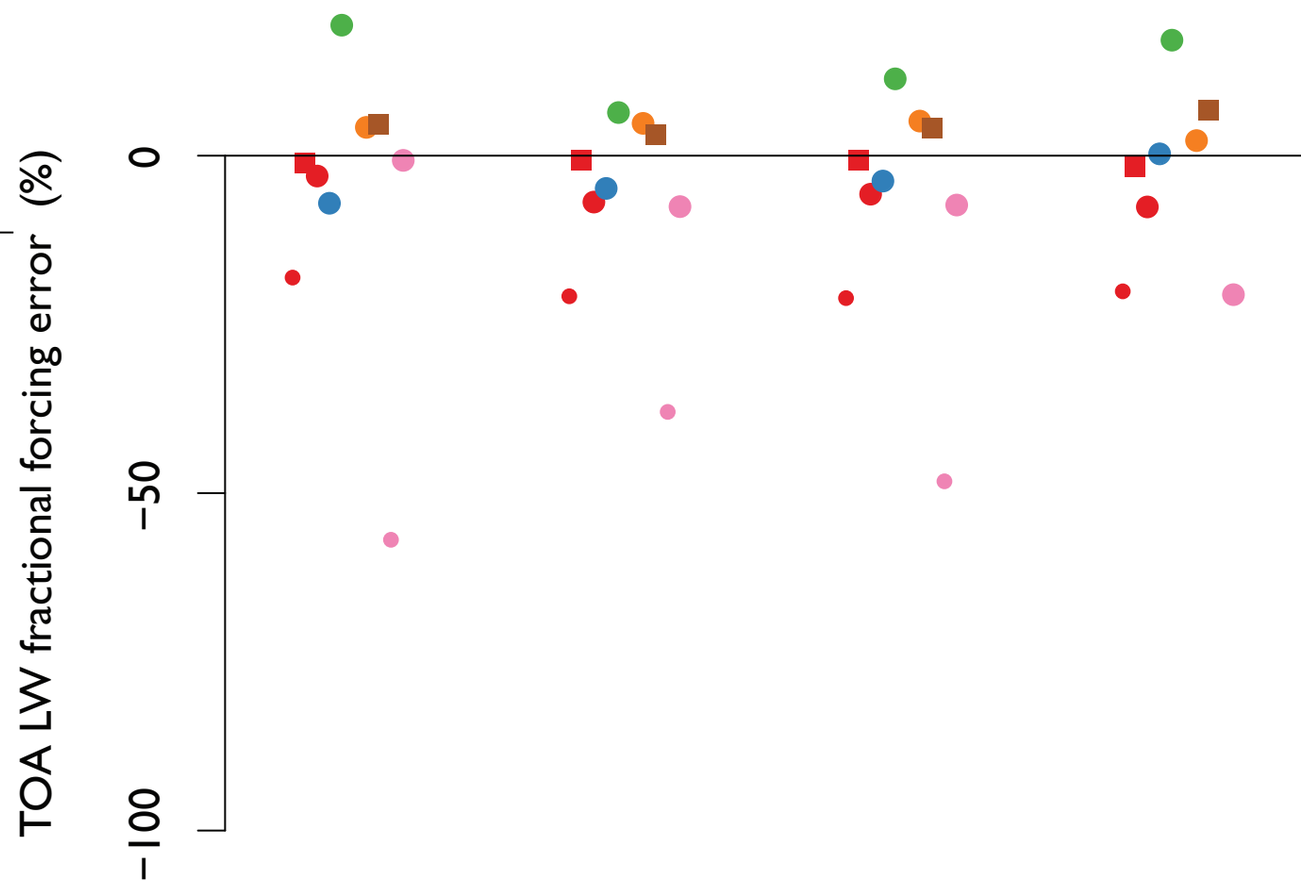

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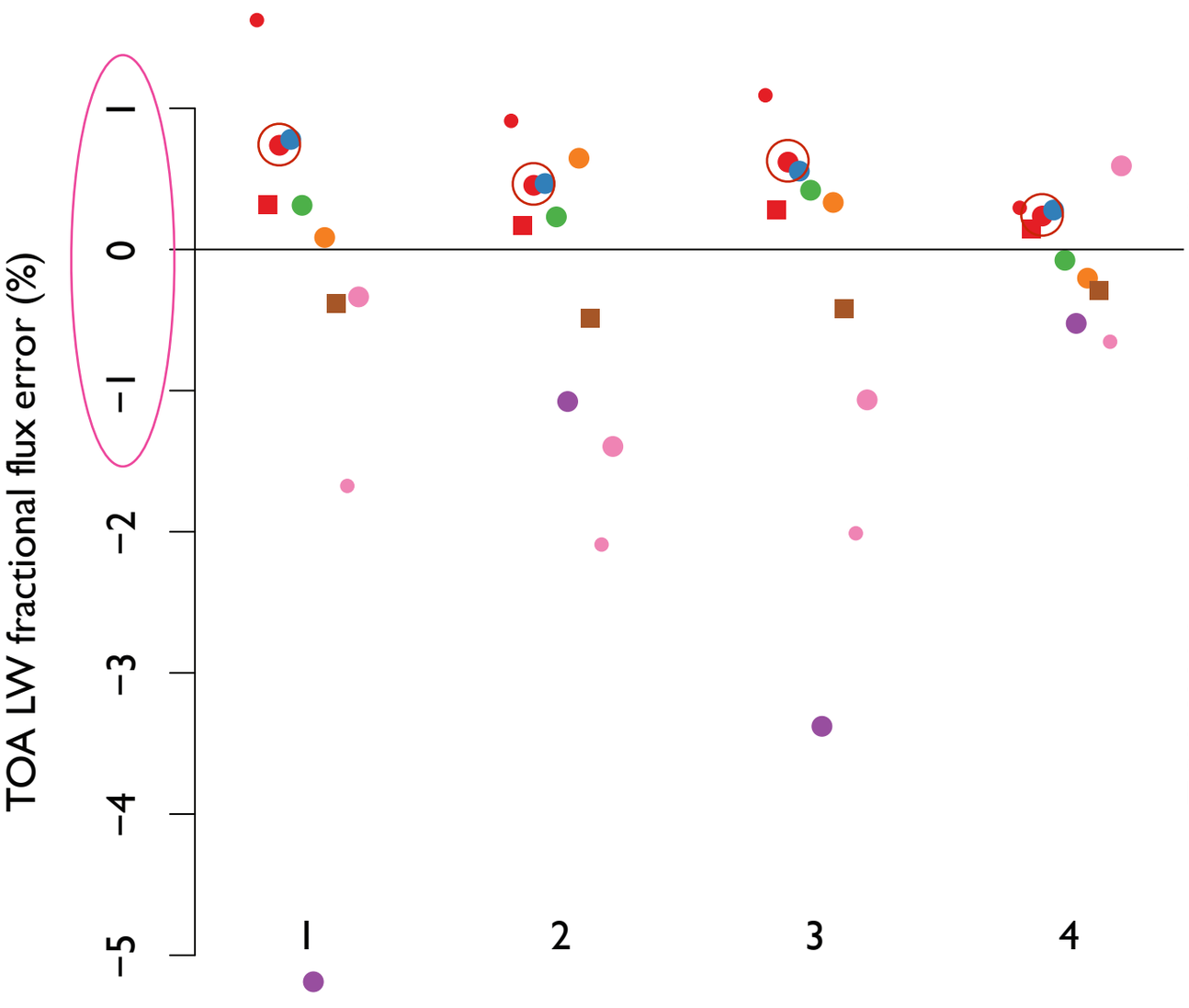
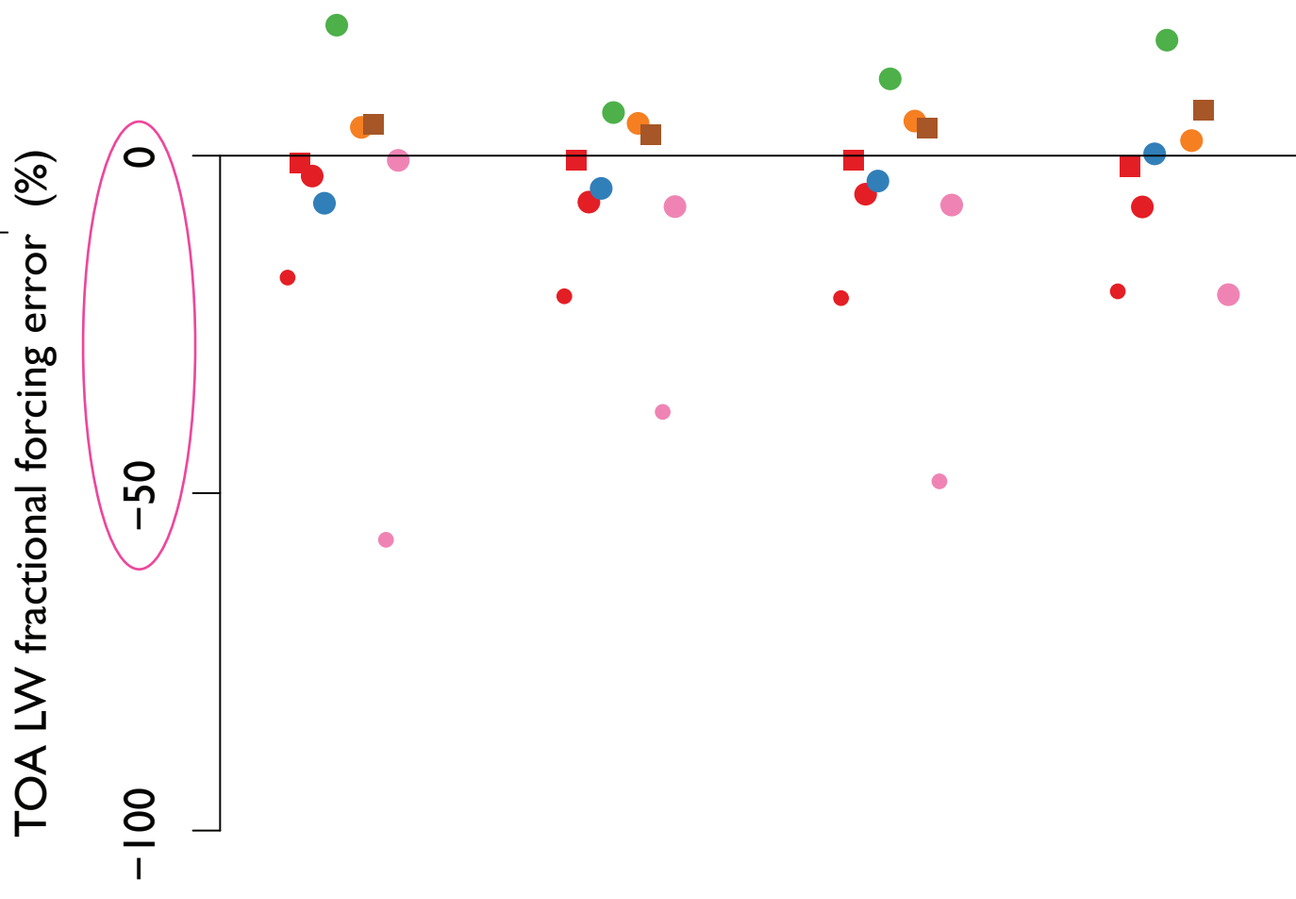




Assessment of flux and forcing computed by parameterizations

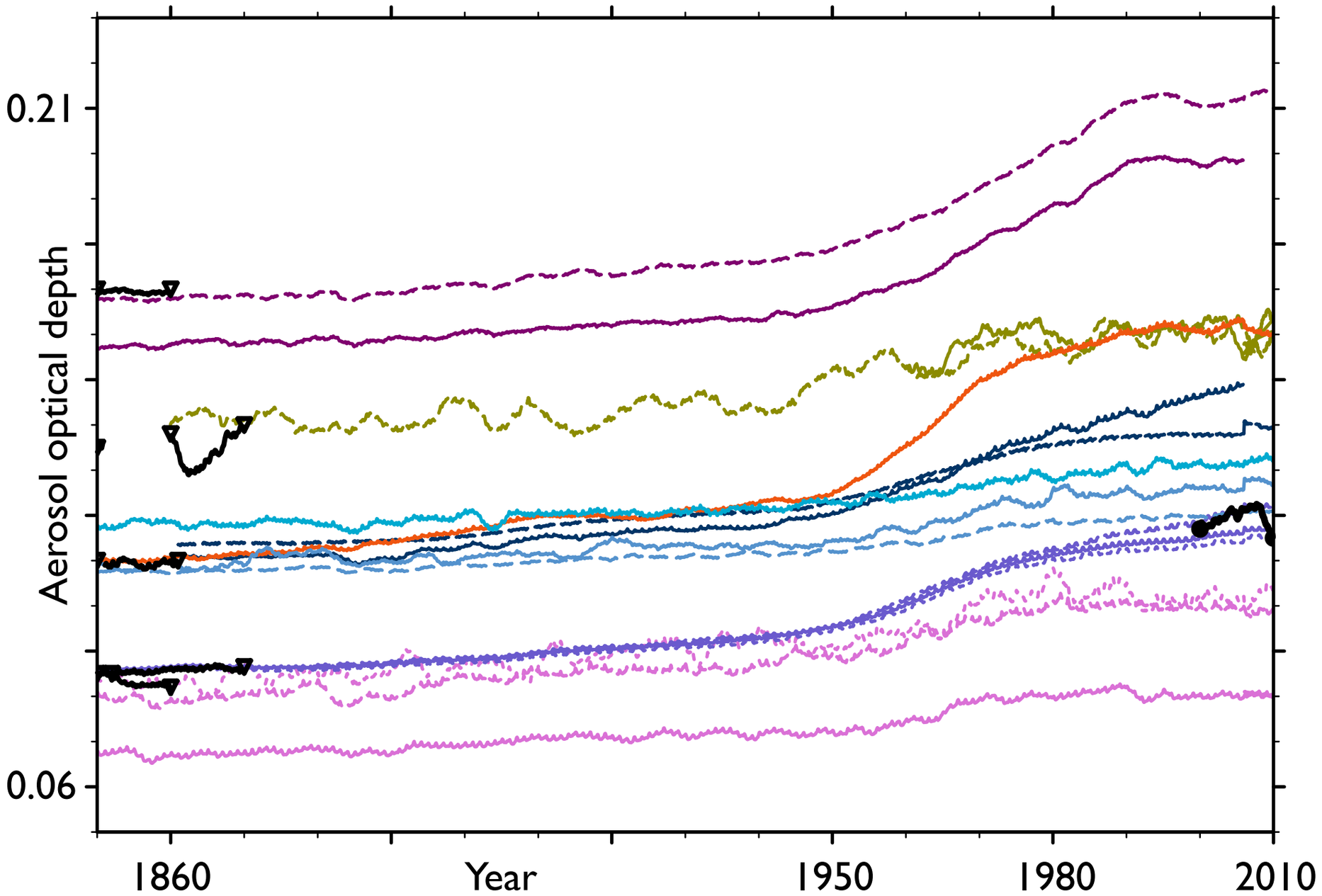
RFMIP extends previous assessments of aerosol-free, clear-sky flux and forcing as computed by GCM parameterizations to global scales

We will request off-line radiation calculations for specified atmospheres (present-day and perturbed) and compare these to reference models

This activity is led by Robert Pincus and Eli Mlawer (Atmospheric Environment Research)

Characterization and assessment of historical aerosol forcing

Aerosol optical thickness appears to differ among CMIP models by a factor of 4, including different baselines and different forcings since pre-industrial



Shindell et al (2013) 10.5194/acp-13-2939-2013

Characterization and assessment of historical aerosol forcing

RFMIP will carefully diagnose and assess historical radiative forcing by aerosols

We will request snapshots with enough diagnostic information (aerosol burdens, spectrally-resolved optical properties) to compute aerosol radiative forcing and compare these to calculations from GCMs and to reference models

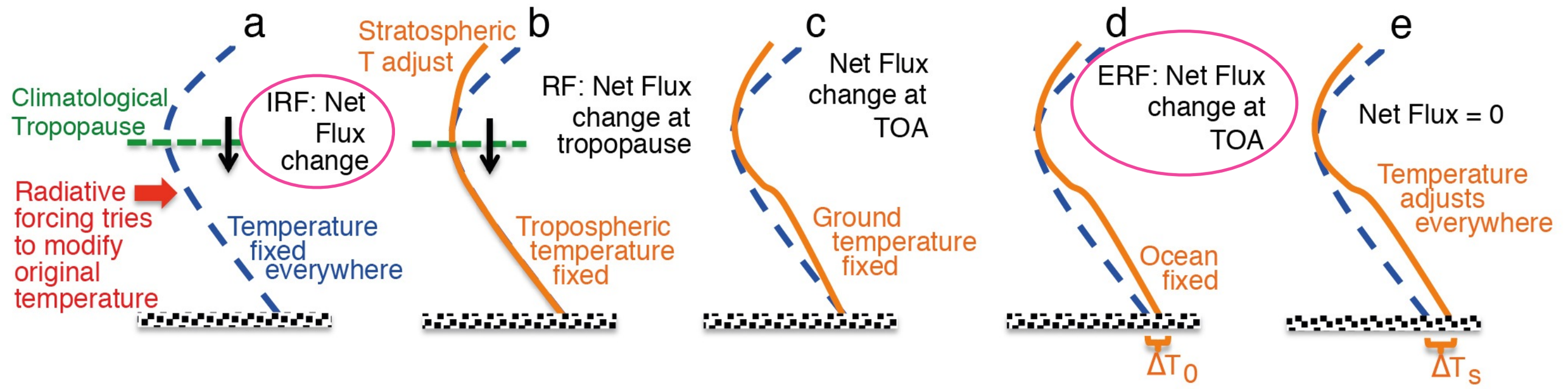
This activity is led by Bill Collins (Lawrence Berkeley Lab) and Ramaswamy (GFDL)

Precise characterization of model-specific effective RF

The effective radiative forcing relevant for feedbacks may vary among models due to

aspects of model climatology

aspects of model physics ("rapid adjustments")



IPCC AR 5, Figure 8.1

Precise characterization of model-specific effective RF

We will

diagnose the components of model-specific effective radiative forcing including the impact of model climatology

request specific GCM integrations that will enable precise determination of effective radiative forcing

compare model-specific rapid adjustments with those determined from observations

This activity is led by Piers Forster (Leeds)

Say a few words, Bjorn…

Opportunities

Experimental designs and data requests will be developed this summer

We solicit input especially about what output would be useful

Coordination with other communities/MIPs (especially atmospheric chemistry, land use, scenarios, detection & attribution) will be hashed out in a workshop 3-5 September in Hamburg