CMIP Coupled Model Intercomparison Project
Climate Forcings

University of Exeter

esa

Historical stratospheric aerosol datasets for CMIP7

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on behalf of the CMIP strat. aerosol team including Anja Schmidt, Mahesh Kovilakam, Matthew Toohey, Sujan Khanal, Michael Sigl, Man Mei Chim, Ben Johnson & Simon Carn

With generous support from CMIP IPO and ESA

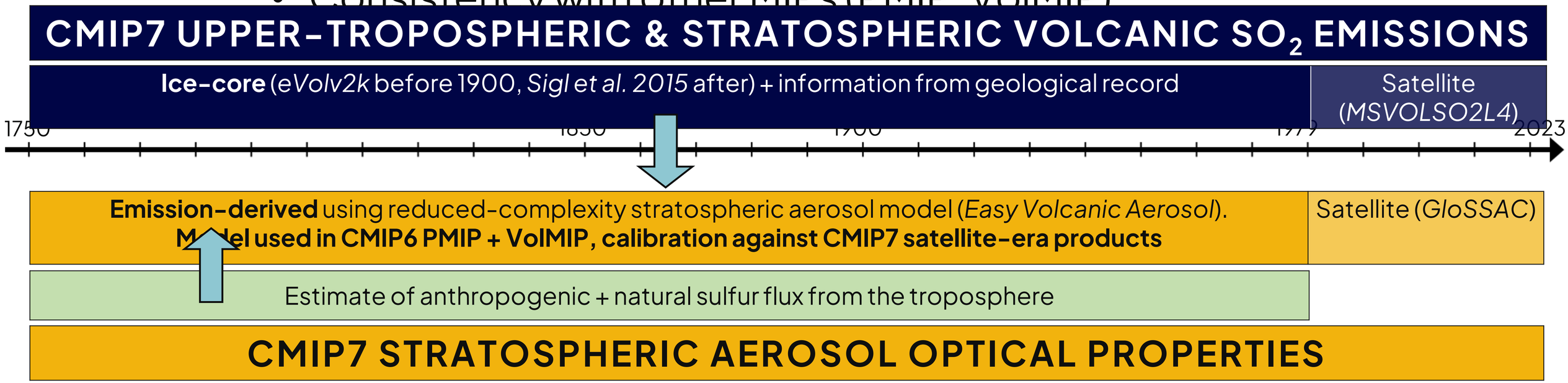
Pathway to regular and sustained delivery of climate forcing datasets workshop: 28-31 October 2024, ECMWF Reading

Chairs: Paul J. Durack, Vaishali Naik

CMIP7 stratospheric aerosol datasets – Design

Top priorities:

- Cater to both emission-driven and aerosol optical properties-driven models
- Consistency between our emission and aerosol optical property datasets
- Consistency with other MIPs (PMIP, VolMIP)



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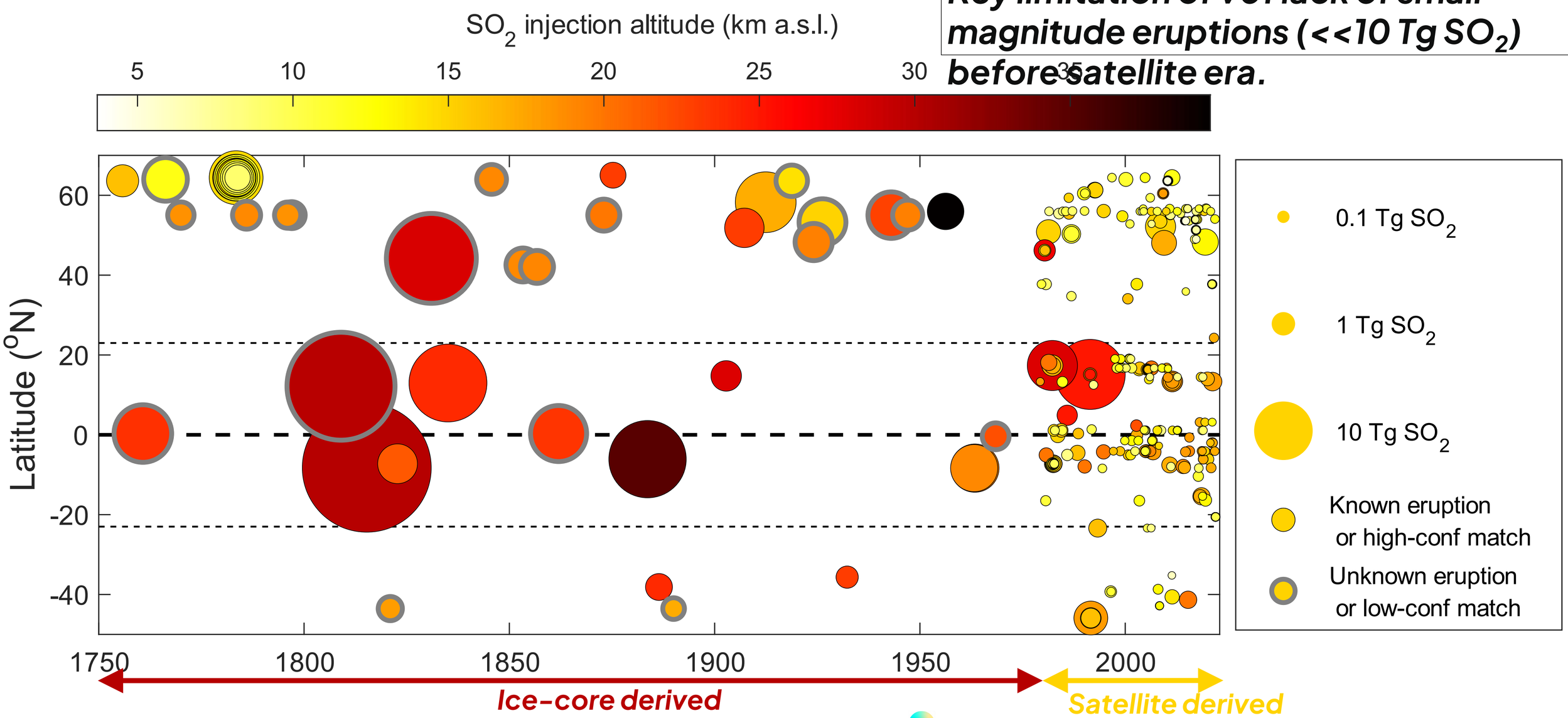
CMIP7 UTS volcanic SO_2 emissions (v0)

CMIP7 v0 = refer to versions currently available on ESGF labelled v1.1.2

Key limitation of v0: lack of small-magnitude eruptions (<<10 Tg SO_2) before satellite era.



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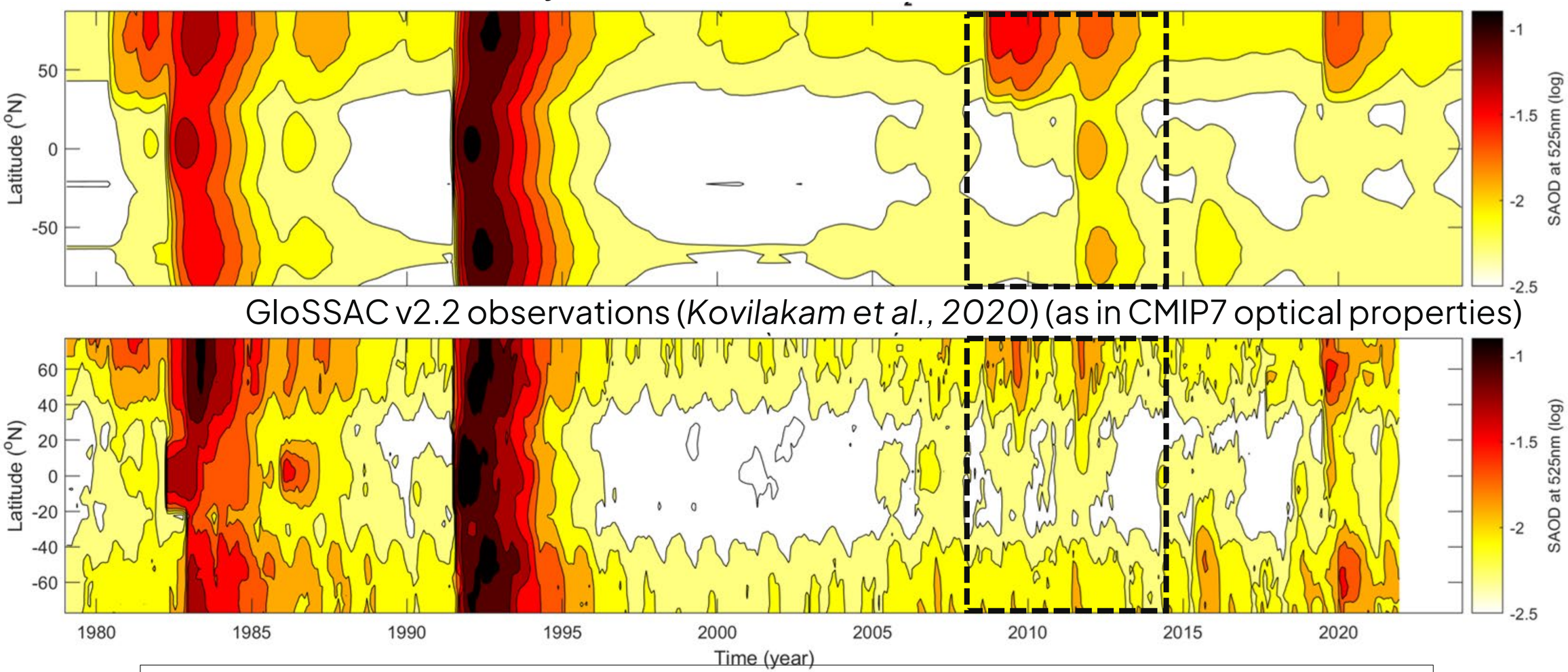
Volcanic aerosol modelling to translate pre-satellite volcanic emission into optical properties

EVA_H model (*Aubry et al., 2020*) ran with MSVOLSO2L4 (as in CMIP7 emissions)

GloSSAC v2.2 observations (*Kovilakam et al., 2020*) (as in CMIP7 optical properties)

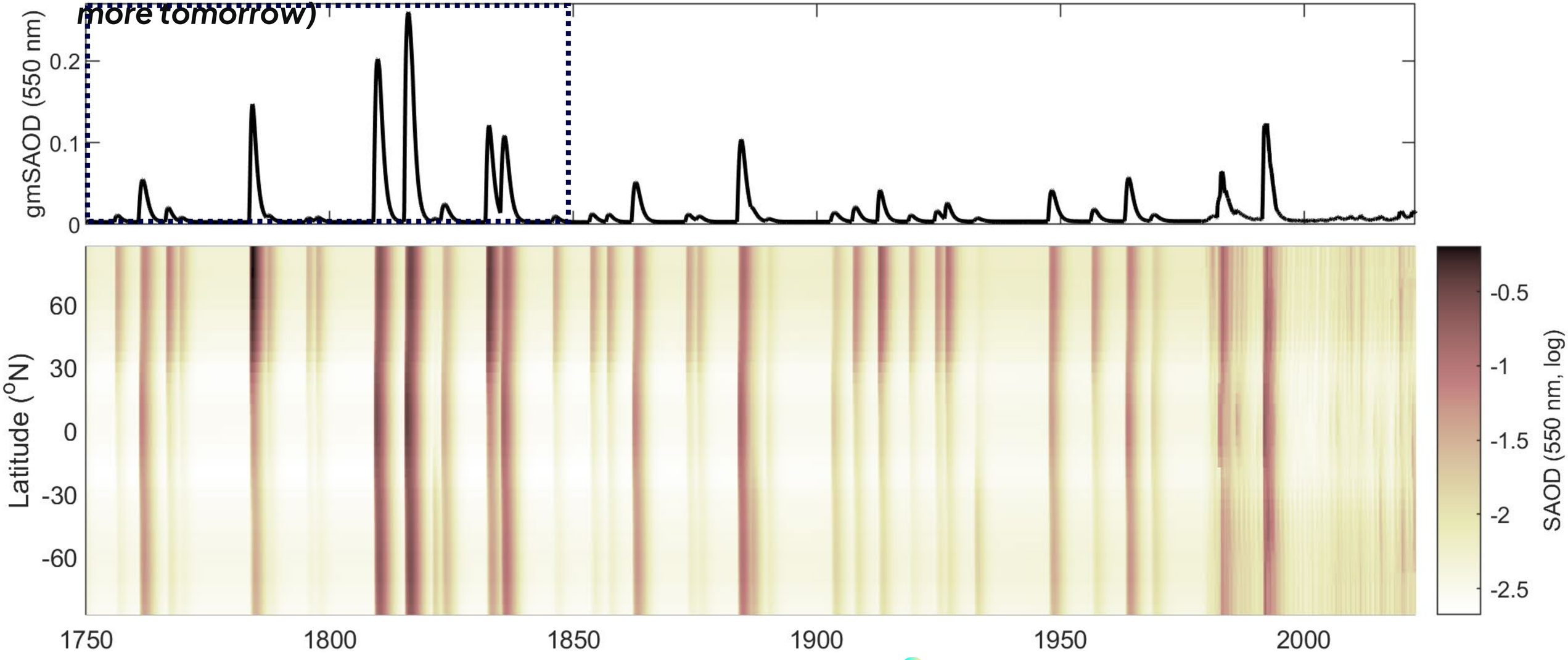


Key area of improvement for EVA_H: aerosol lifetime for small-magnitude eruptions

CMIP7 stratospheric aerosol optical properties (v0)

Lots of big eruptions not baked in 1850 historical run initial conditions (and picontrol baseline? more tomorrow)

Comparison with CMIP6: coming in Fresh Eyes presentation this morning



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From v0 to v1 for FastTrack: Wishlist (please add to it!)

- Fix error in surface area density and volume density provided
- Fix bias in pre-satellite small eruptions (**stay tuned/contribute to discussion tomorrow!**)
- Improve volcanic aerosol model for small vs large eruptions (**ongoing**)
- Provide script for modelling center to convert wavelength provided to arbitrary wavelength (**ongoing**)
- 2006-2017: no multi-wavelength information in GloSSAC
- Implement pre-satellite background climatology
- New eruption identified in 1831

Clock is ticking, we will do our very best! ≣