National Aeronautics and Space Administration

SAGE III/ISS

Stratospheric Aerosol and Gas Experiment

An Earth Science Mission on the International Space Station

The SAGE III/ISS Quicklook Website

Kevin R. Leavor
Lead Data Scientist

Jim Farmer
Rick Farmer

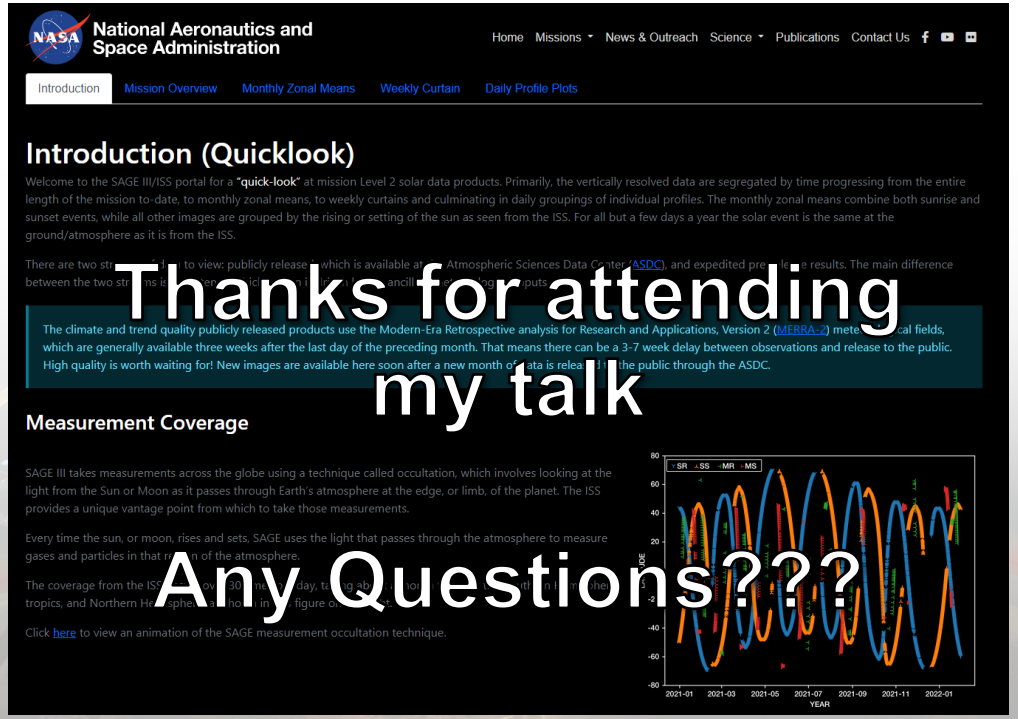
13 September 2023

Overview

- The Quicklook Website
- Where are your quicklook images?
- When are your images available?
- What data are available as images?
- How can I improve your offerings?
- What's next?

The Quicklook Website

What Website? sage.nasa.gov/sageiii-iss/browse_images/quicklook/

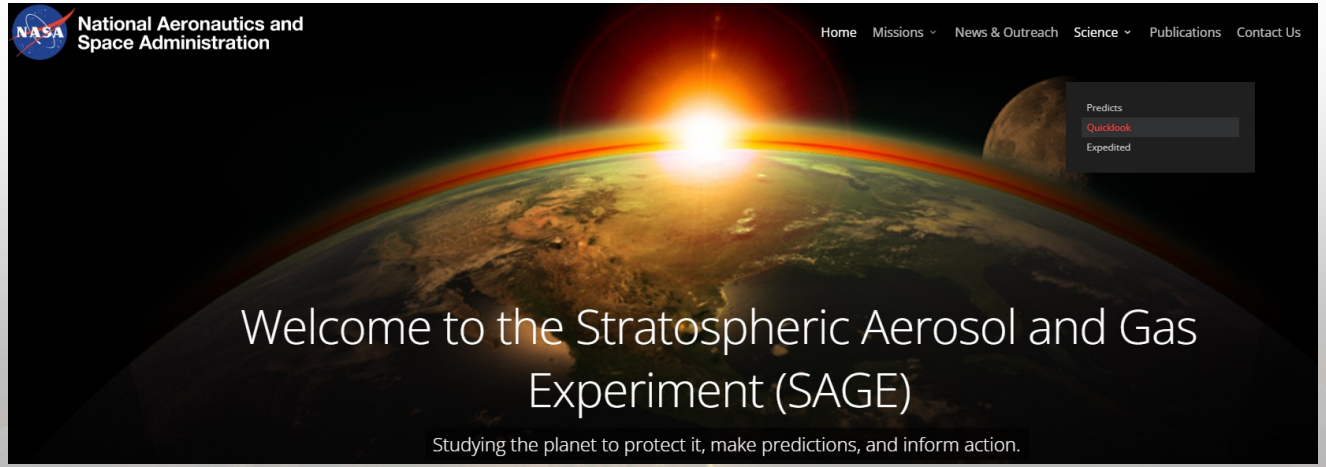


Thanks for attending my talk

Any Questions???

The Quicklook Website

- **Actually two parallel sites**
  - “Quicklook” covers the officially released data product
  - “Expedited” is a special look at more current data before MERRA-2 is available
- **How do I get there?**
  - https://sage.nasa.gov



What Images, and Where are They?

Data products provided

- Ozone
- Water Vapor (Mixing Ratio)
- NO_2
- Aerosol Extinction Coefficient
- Aerosol-to-Molecular Extinction Ratio
  - ***Value Added***

Formats

- “Mission Overview”
  - Mission Start to Current in zonal bands
- Monthly Zonal Means
  - Contours of zonally averaged species
- Weekly Curtains
  - Profile time series as pixel images
- Daily Profiles
  - Individual species line plots

When are Plots Posted?

A Tale of Three Servers

Processing

- 14:00 UTC Quicklook and Expedited generated

Development

- 16:00 UTC images are handled and passed to production

Production

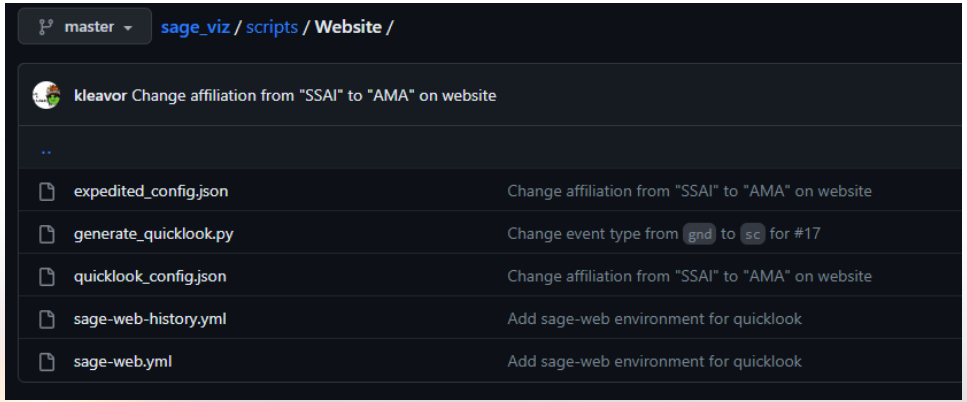
- Images are available upon receipt from dev

In short, new images should be available after Noon (Eastern)

Under the Hood

Processing is performed in Python

- Process is version controlled through NASA Agency GitHub
- Part of a larger python package
- Environment is controlled with code



Images generated from nightly clean checkout

- Never any lingering artifacts

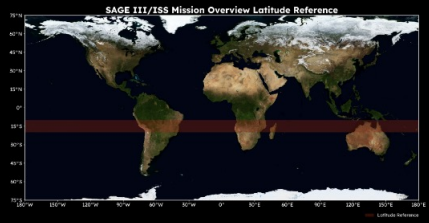
Changes are managed through feature branches and Pull Requests

- Issues are opened and tracked through projects and milestones
- Parallel repository for managing front-end website and related tickets

Mission Overview

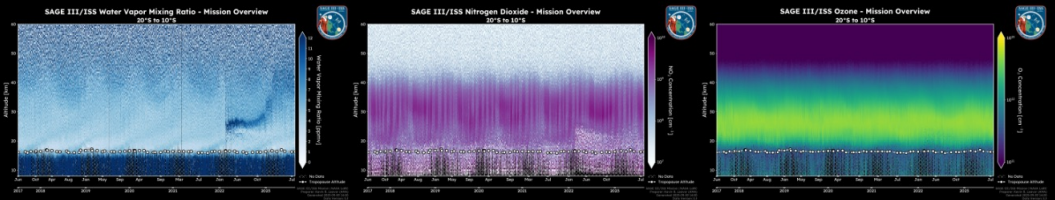
Mission Overview Latitudinal Reference Map (Quicklook)

Select latitude band

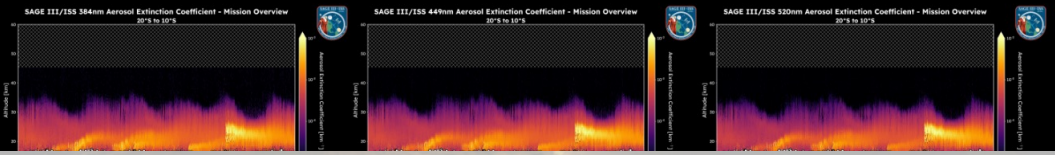


Note: Bands at higher latitudes are likely to contain larger sampling gaps and plots may exhibit discontinuities.

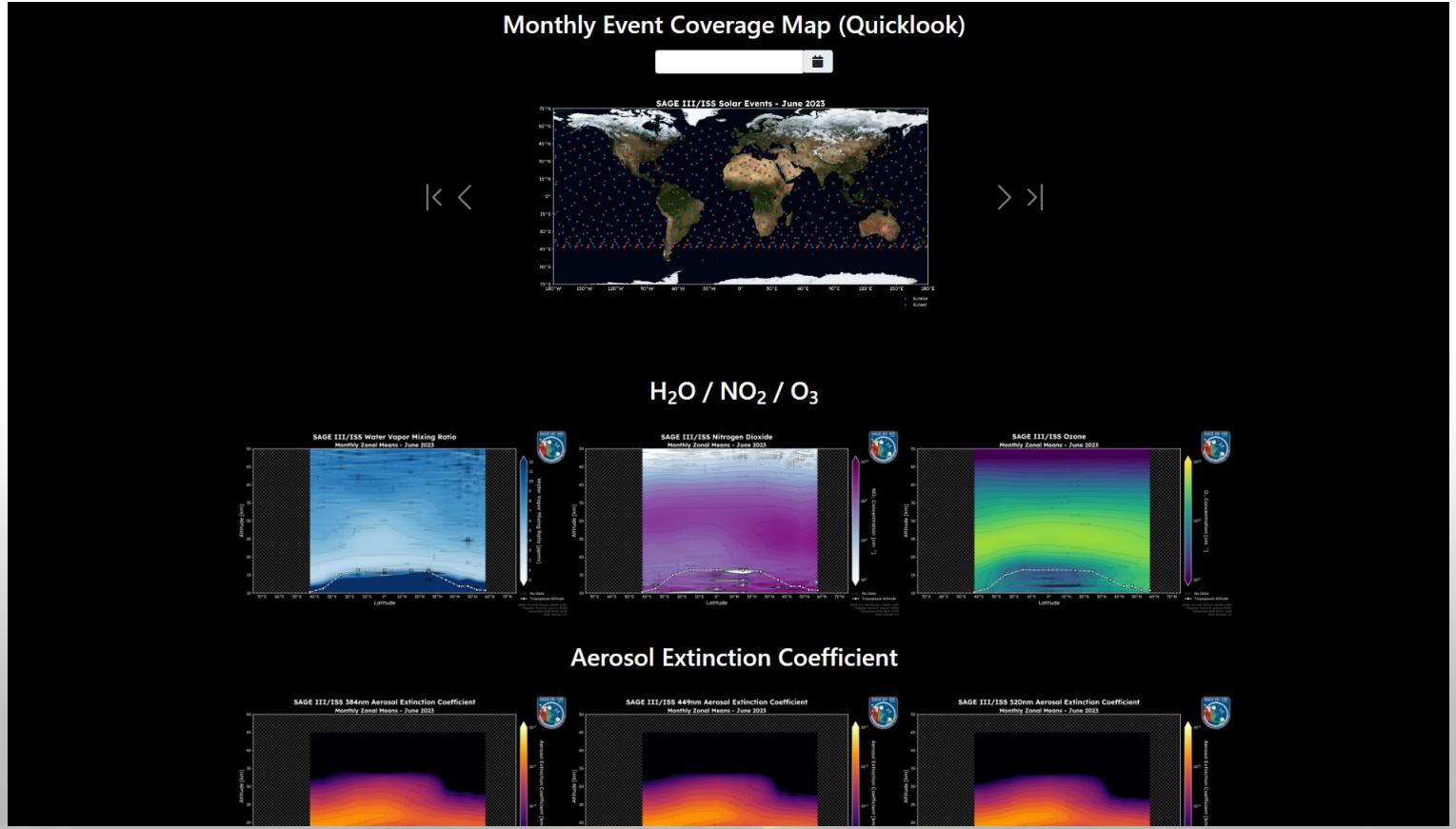
H_2O / NO_2 / O_3



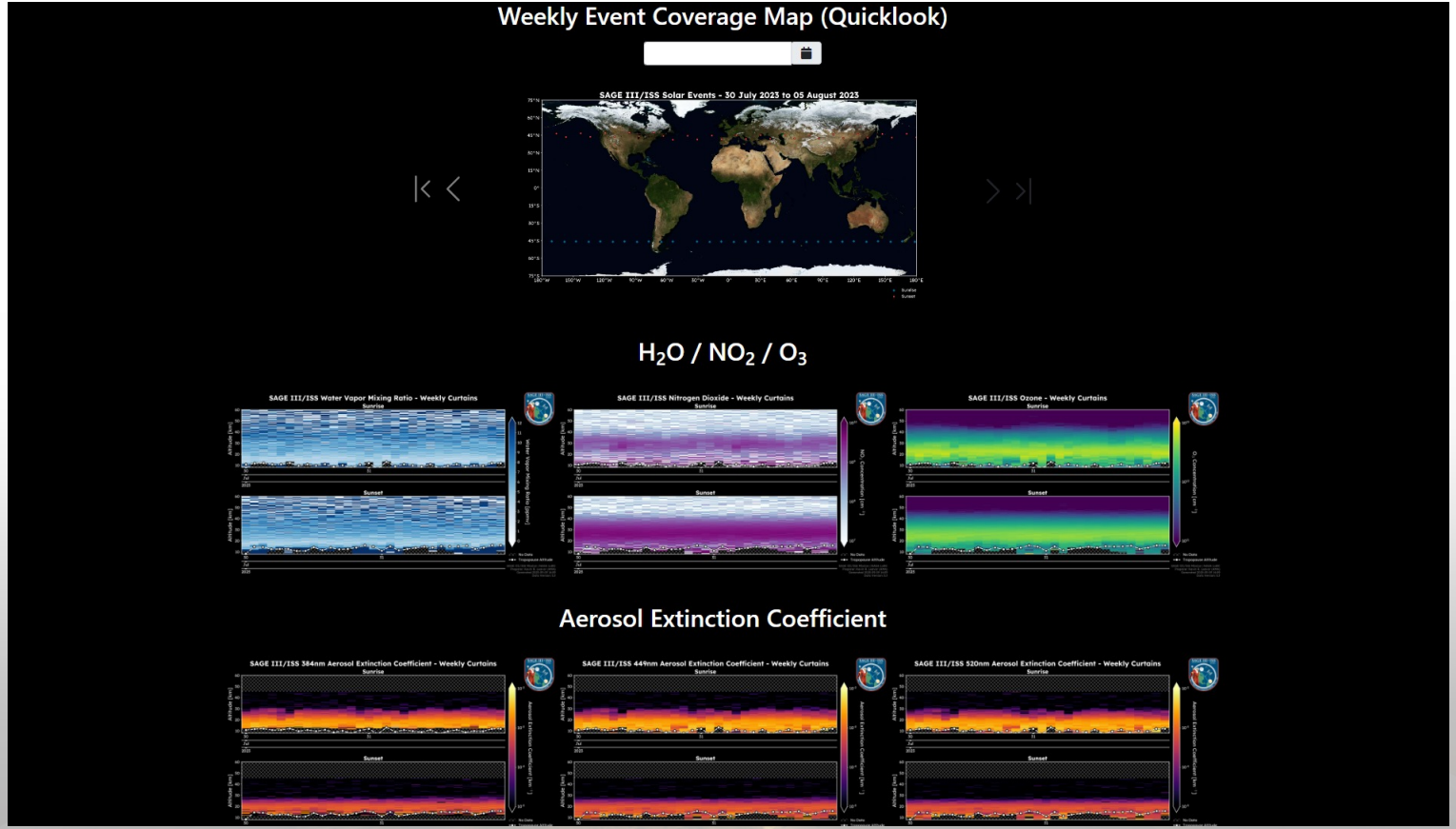
Aerosol Extinction Coefficient



Monthly Zonal Means

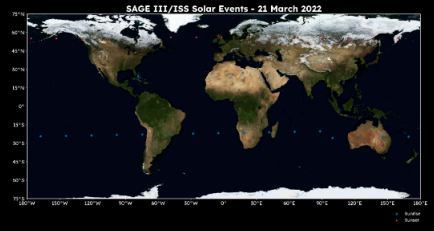


Weekly Curtain Plots

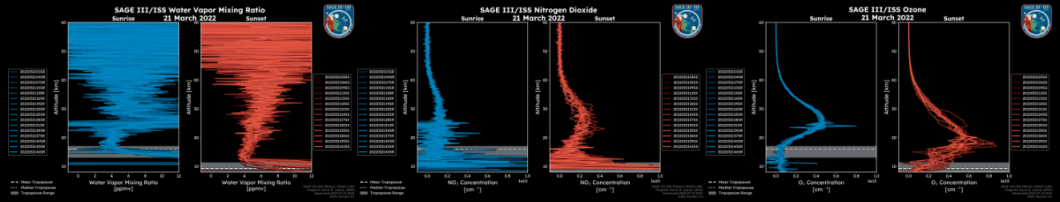


Daily Profile Plots

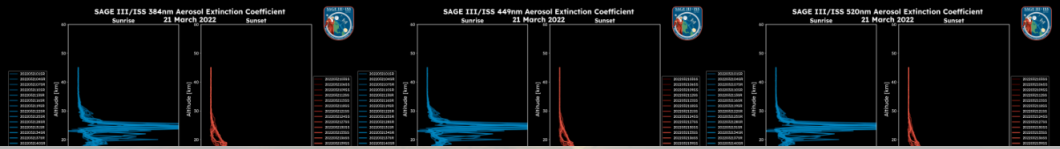
Daily Event Coverage Map (Quicklook)



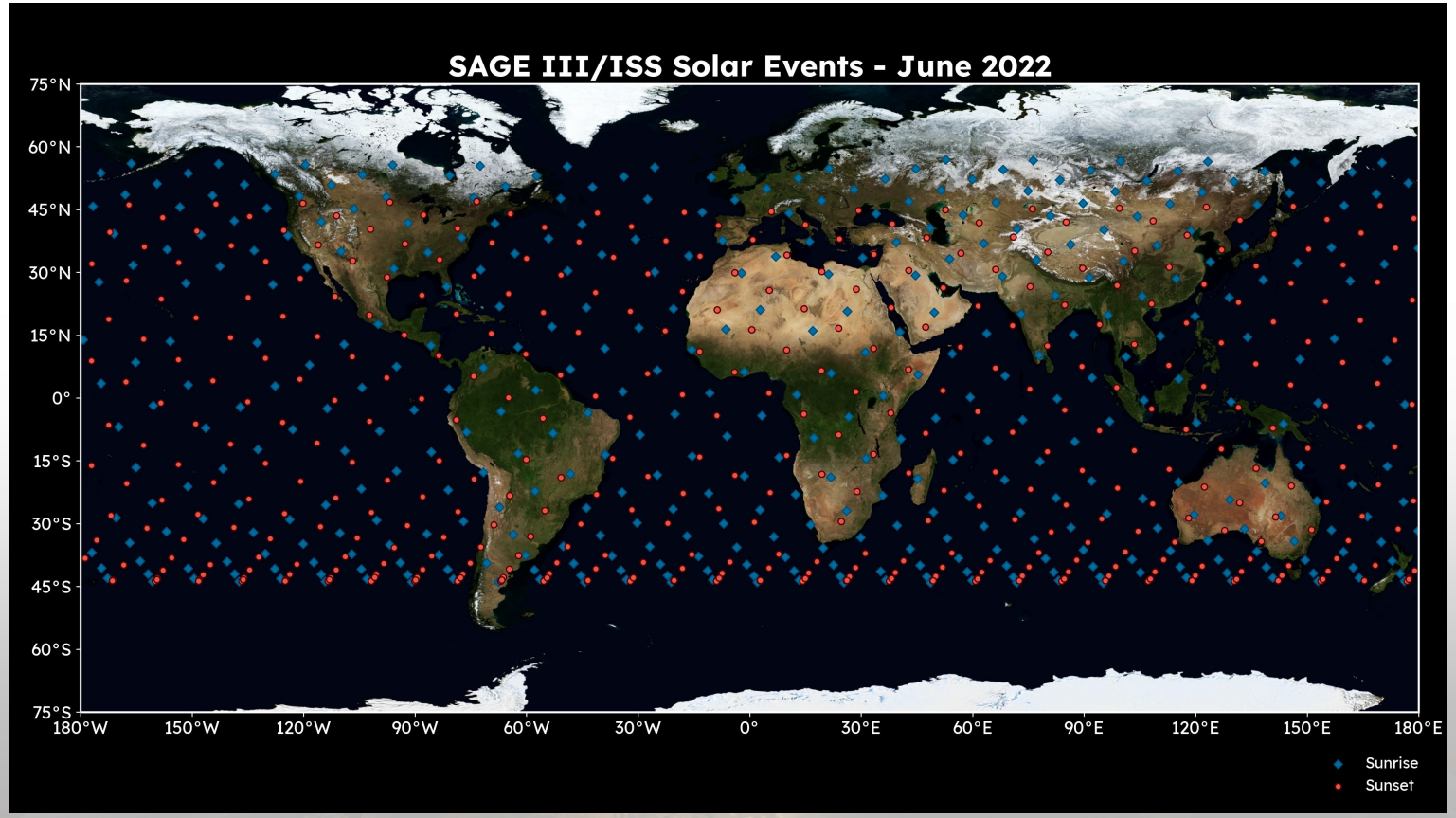
H_2O / NO_2 / O_3



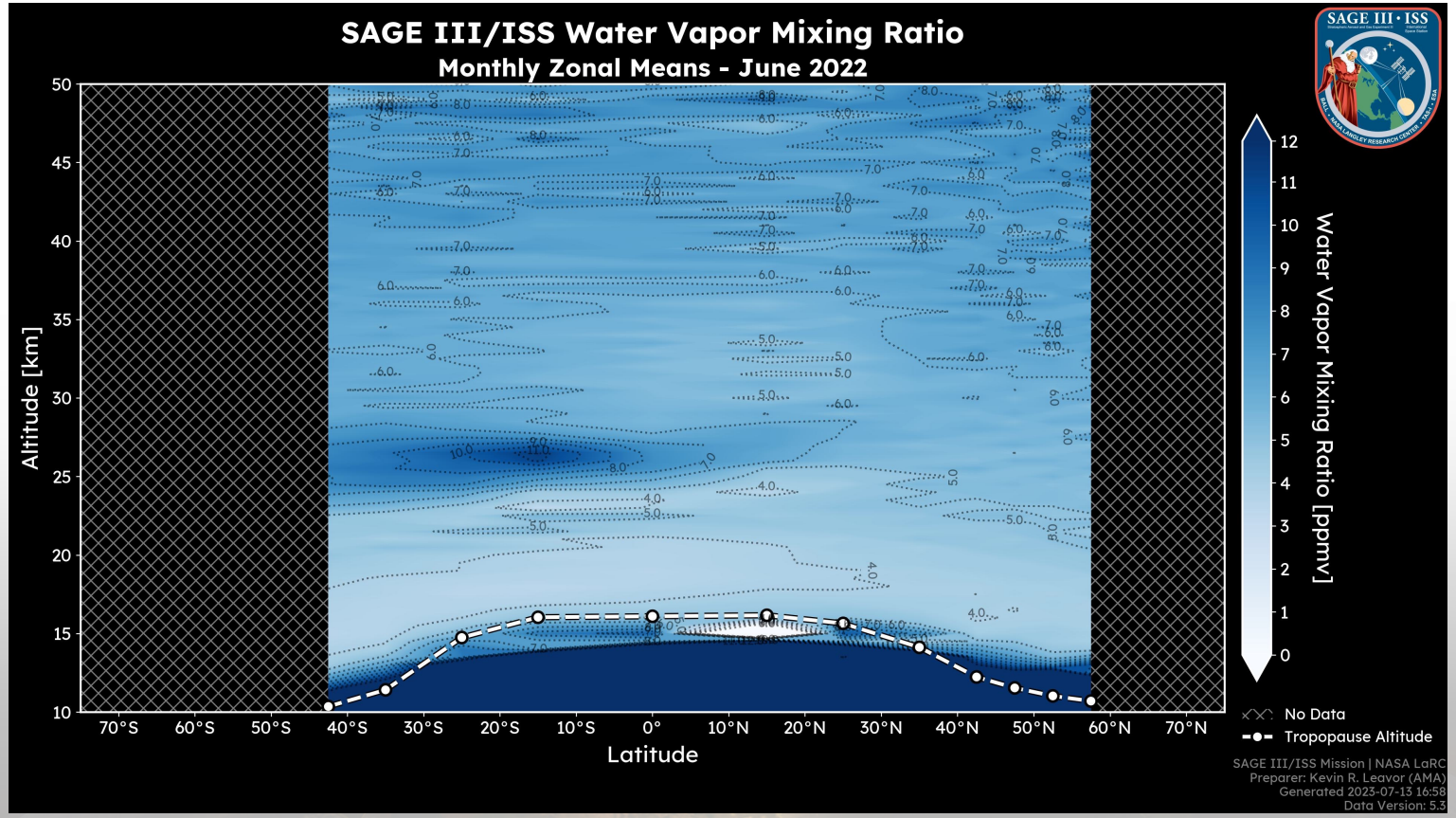
Aerosol Extinction Coefficient



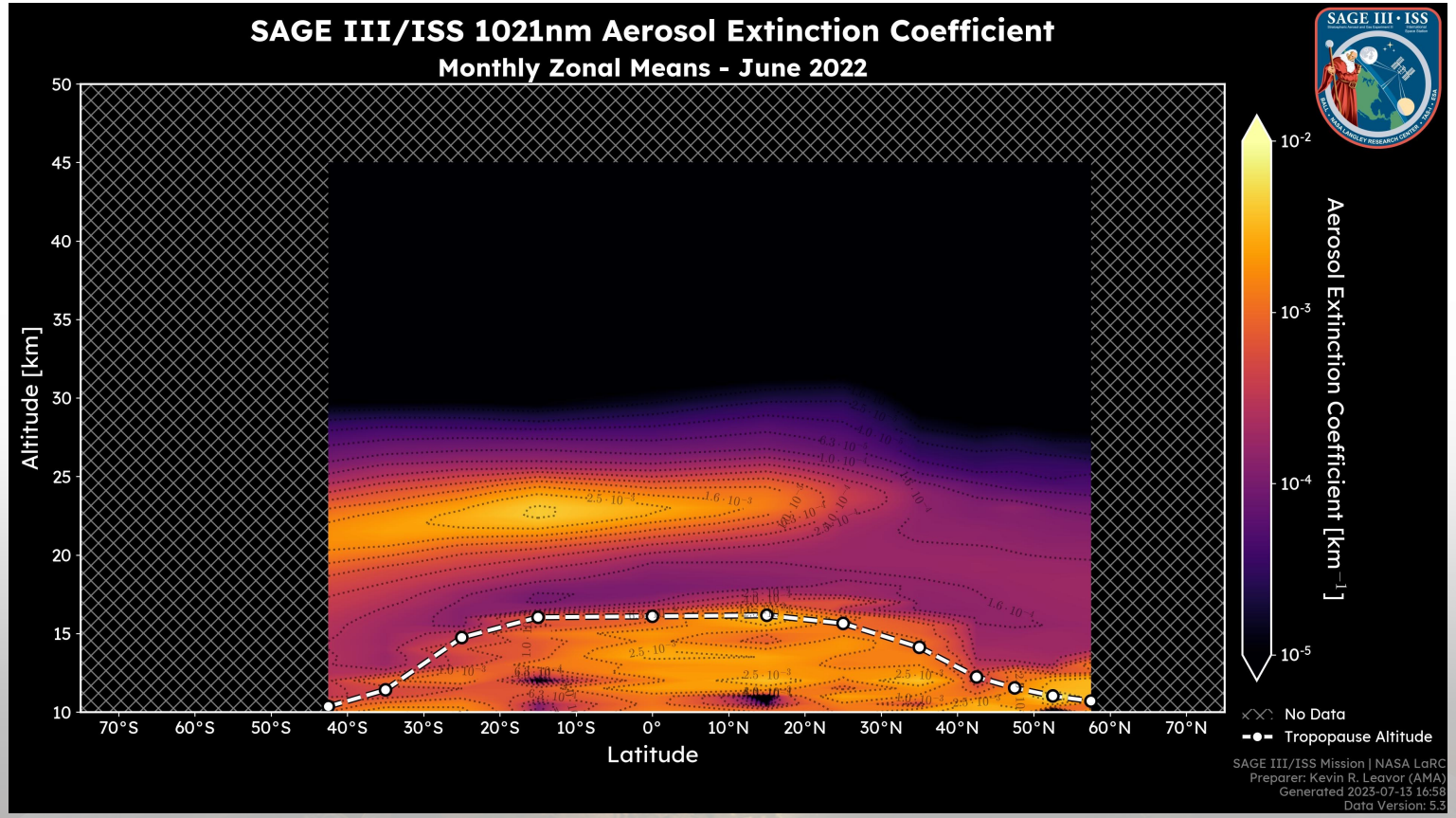
All Images are 4K Resolution



All Images are 4K Resolution



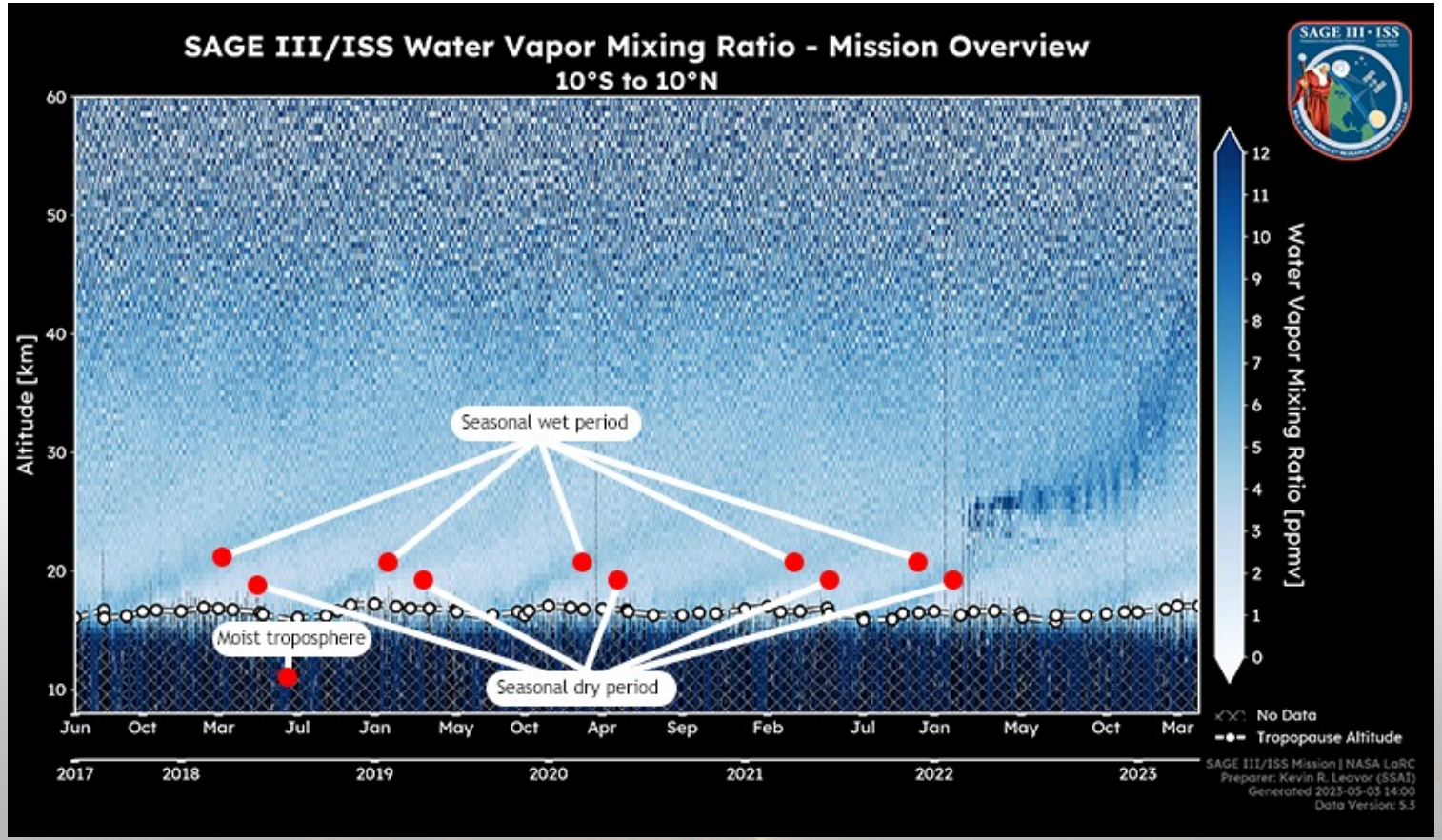
All Images are 4K Resolution



Philosophy

- **Consistent Data Encoding**
  - We want you to always know what you're looking at
- **Common Visualizations at a Glance**
  - Quickly find frequently used diagnostics, analyses, and views
- **Ease of Access**
  - Navigation is performed temporally or spatially and navigable using selections
  - Handful of clicks to get to particular dates and/or views
- **Self-Describing**
  - Detailed introduction page with hover descriptions and animations of products
  - Hover Text/Tooltips for each image
- **No Hiding**

Philosophy


SAGE III/ISS Water Vapor Mixing Ratio - Mission Overview
10°S to 10°N
SAGE III • ISS
Altitude [km]
60
50
40
30
20
10
Seasonal wet period
Moist troposphere
Seasonal dry period
Jun
Oct
Mar
Jul
Jan
May
Oct
Apr
Sep
Feb
Jul
Jan
May
Oct
Mar
2017
2018
2019
2020
2021
2022
2023
Water Vapor Mixing Ratio [ppmv]
12
11
10
9
8
7
6
5
4
3
2
1
0
No Data
Tropopause Altitude
SAGE III/ISS Mission | NASA LaRC
Preparer: Kevin R. Leavor (SSAI)
Generated 2023-05-03 14:00
Data Version: 5.3

Suggestion Box?

Home Missions News & Outreach Science Publications Contact Us

Home » Contact Us

Please feel free to send us you

Name *

First

Email *

Comment *

Submit feedback

What's Next?

- **Standard Movies/Animations**
- **Additional Derived Products**
  - Example being considered - Ångström Exponent
- **Separate NO_2 by SR/SS**
- **Continuing Consideration for Interactive Data Access**
  - Mainly limited by the "access" part
  - Think "Web App" and "Dashboard"
- **Continuing Mobile Improvements**
- **Validation Portal!**
  - See Mary Cate and Carrie's Presentation
- **Eagerly Awaiting User Feedback**

Summary

- **Quicklook Portal Available Since June 2023**
  - Article: sage.nasa.gov/2023/07/new-sage-iii-iss-quicklook-and-expedited-data-portal/
- **Focus on Ease of Access and Community Needs**
  - Provide frequent analyses and at-a-glance comprehension
- **Both Quicklook and Expedited Products are Available**
  - Quicklook covers release data
  - Expedited covers up to “yesterday”
- **Images are Provided at High Quality**
- **We Want to Hear from You!**

Remembering Danny

Questions?

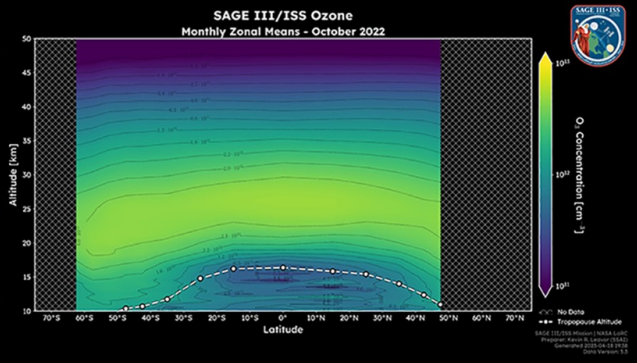
Ozone Concentration

Ozone concentration is a measure of how much ozone (O_3) gas is present in the air. Ozone is a naturally occurring gas in the Earth's atmosphere that helps protect us from harmful UV radiation from the sun. However, when ozone is found at ground level, it is a pollutant that can be harmful to human health and the environment.

SAGE III's main job is to measure the good ozone in the upper atmosphere that provides the "Earth's sun-screen."

SAGE reports ozone concentration as number of molecules per volume. At the peak (about 25 km) there can be about 10 trillion ozone molecules in a cubic centimeter. That may sound like a lot, but relative to all the other molecules also in that cubic centimeter ozone is about 10 in-a-million!

The size of the concentration is the balance between processes that create and destroy ozone. The main creation path is sunlight splitting diatomic oxygen, the familiar O_2 we breath, to make atomic oxygen, O, that can combine with O_2 to make triatomic oxygen, aka ozone. Chemical reactions with natural and man-made molecules can destroy ozone. Increases in ozone destroying man-made molecules forces the balance to less ozone and was the basic cause of the ozone layer declining globally. In general, ozone is created in the tropical mid-stratosphere and moves toward the poles, both North and South by winds in the upper atmosphere.

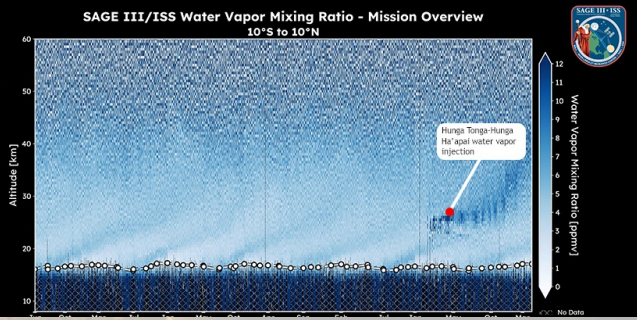


All SAGE measurements for a month, then grouped by latitude and averaged.

Water Vapor Mixing Ratio

Water vapor mixing ratio is a way to measure the amount of moisture or humidity present in the air. It is defined as the mass of water vapor present in a unit of dry air.

Think of it this way: when you breathe in air, you're actually breathing in a mixture of gases, including oxygen, nitrogen, and carbon dioxide. Water vapor is also present in the air, and it's what makes the air feel humid or dry.

The mixing ratio is a way to express how much water vapor there is in comparison to the other gases in the air. For example, a mixing ratio of 0.01 means that for every 100 units of dry air, there is 1 unit of water vapor.

Water vapor is greenhouse gas and concentrations in the stratosphere can heat the upper troposphere. It also plays a role in many chemical reactions in the stratosphere. The main source of stratospheric water vapor (SWV) is from the relatively moist