

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

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# 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/](https://sage.nasa.gov/sageiii-iss/browse_images/quicklook/)

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Introduction Mission Overview Monthly Zonal Means Weekly Curtain Daily Profile Plots

## Introduction (Quicklook)

Welcome to the SAGE III/ISS portal for a "quick-look" at mission Level 2 solar data products. Primarily, the vertically resolved data are segregated by time progressing from the entire length of the mission to-date, to monthly zonal means, to weekly curtains and culminating in daily groupings of individual profiles. The monthly zonal means combine both sunrise and sunset events, while all other images are grouped by the rising or setting of the sun as seen from the ISS. For all but a few days a year the solar event is the same at the ground/atmosphere as it is from the ISS.

There are two streams of data to view: publicly released data which is available at the Atmospheric Sciences Data Center (ASDC), and expedited preliminary results. The main difference between the two streams is the time delay between observations and release to the public. High quality is worth waiting for! New images are available here soon after a new month of data is released to the public through the ASDC.

The climate and trend quality publicly released products use the Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) meteorological fields, which are generally available three weeks after the last day of the preceding month. That means there can be a 3-7 week delay between observations and release to the public. High quality is worth waiting for! New images are available here soon after a new month of data is released to the public through the ASDC.

### Measurement Coverage

SAGE III takes measurements across the globe using a technique called occultation, which involves looking at the light from the Sun or Moon as it passes through Earth's atmosphere at the edge, or limb, of the planet. The ISS provides a unique vantage point from which to take those measurements.

Every time the sun, or moon, rises and sets, SAGE uses the light that passes through the atmosphere to measure gases and particles in that region of the atmosphere.

The coverage from the ISS is shown below, including a 3-7 week delay, including all latitudes from the tropics, and Northern Hemisphere. The figure shows the coverage from the ISS from 2021-01 to 2022-01.

Click [here](#) to view an animation of the SAGE measurement occultation technique.

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<sub>2</sub>
- 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

[Introduction](#)

[Mission Overview](#)

[Monthly Zonal Means](#)

[Weekly Curtain](#)

[Daily Profile Plots](#)

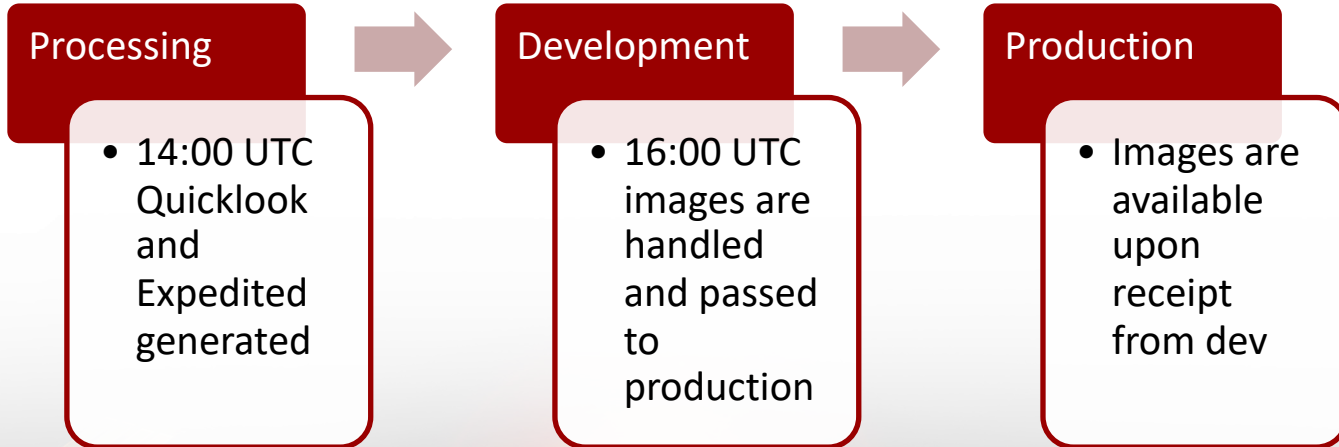
**Mission Overview Latitudinal Reference Map (Quicklook)**



# When are Plots Posted?



## ➤ A Tale of Three Servers



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



# Under the Hood

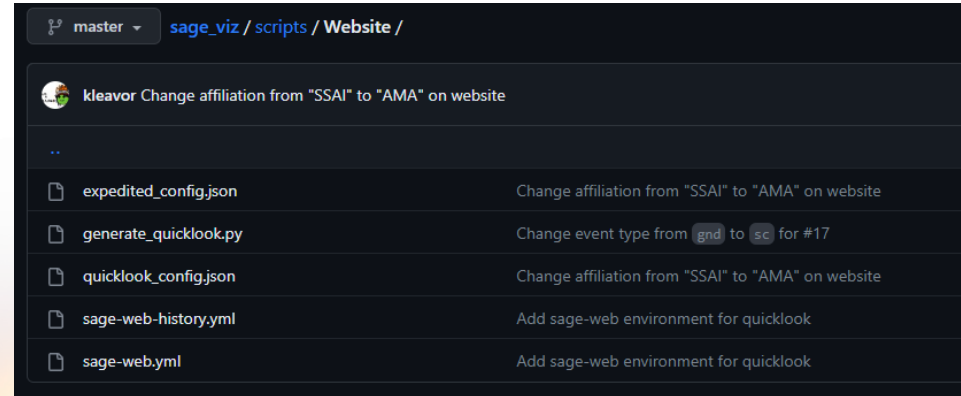


## ➤ Processing is performed in Python

- 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

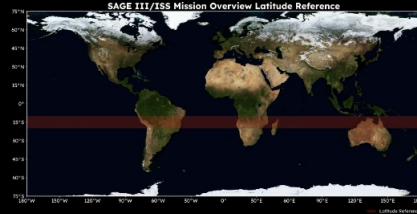


# Mission Overview



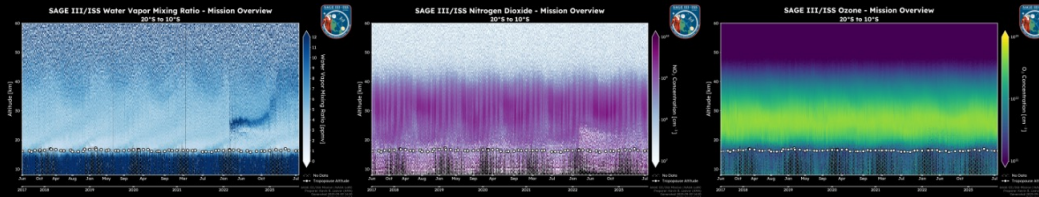
## Mission Overview Latitudinal Reference Map (Quicklook)

Select latitude band

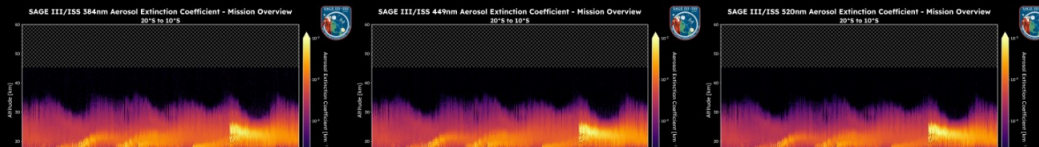


Note: Bands at higher latitudes are likely to contain larger sampling gaps and plots may exhibit discontinuities.

## H<sub>2</sub>O / NO<sub>2</sub> / O<sub>3</sub>



## Aerosol Extinction Coefficient

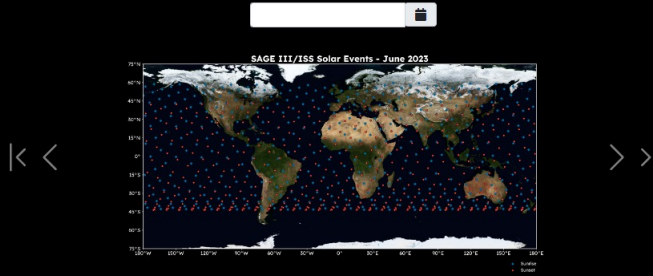




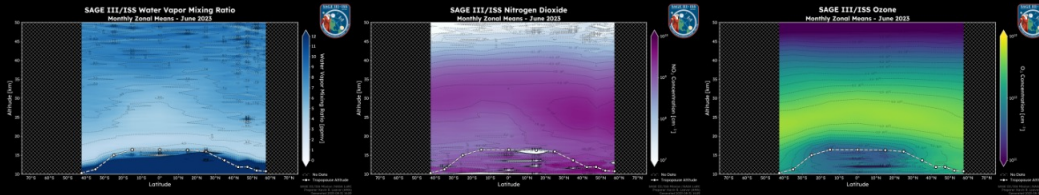
# Monthly Zonal Means



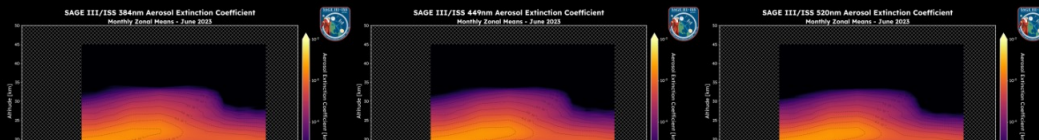
## Monthly Event Coverage Map (Quicklook)

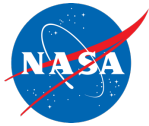


## H<sub>2</sub>O / NO<sub>2</sub> / O<sub>3</sub>



## Aerosol Extinction Coefficient

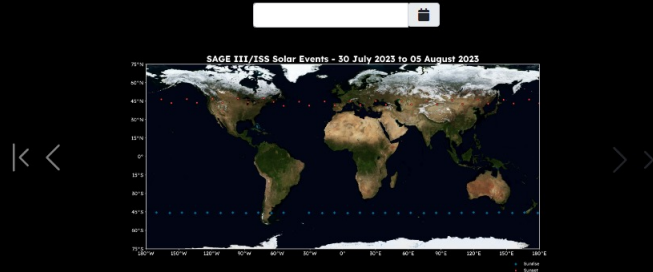




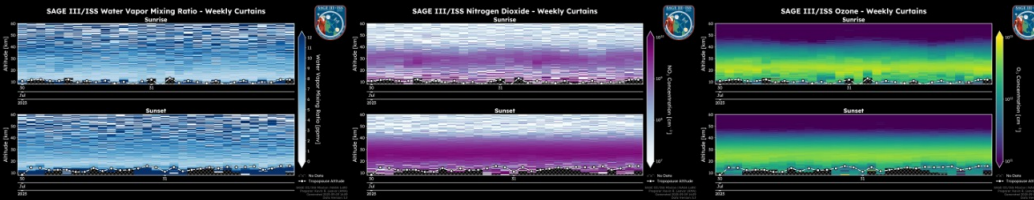
# Weekly Curtain Plots



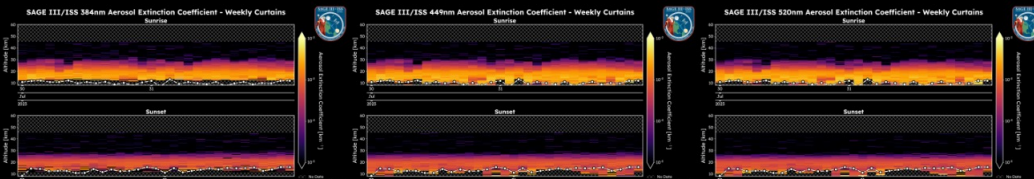
## Weekly Event Coverage Map (Quicklook)



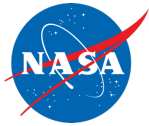
## H<sub>2</sub>O / NO<sub>2</sub> / O<sub>3</sub>



## Aerosol Extinction Coefficient



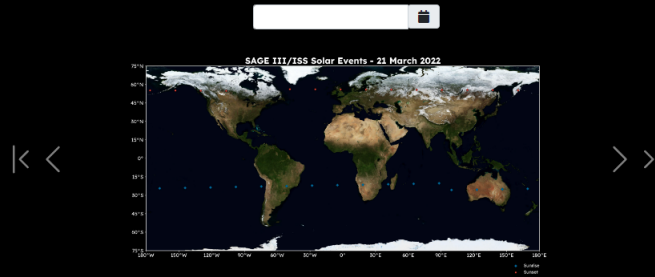




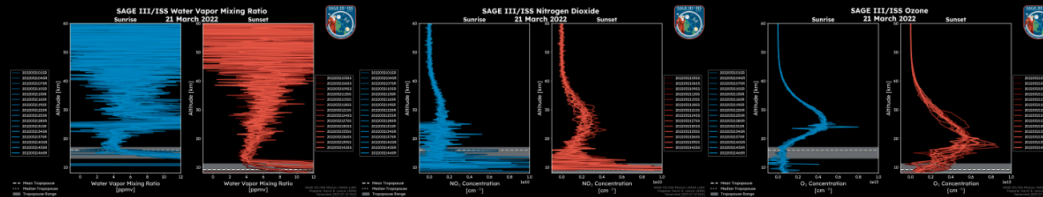
# Daily Profile Plots



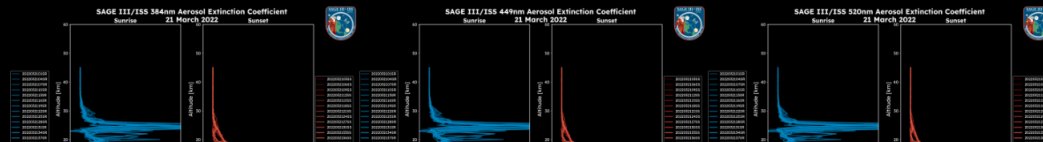
## Daily Event Coverage Map (Quicklook)



## H<sub>2</sub>O / NO<sub>2</sub> / O<sub>3</sub>

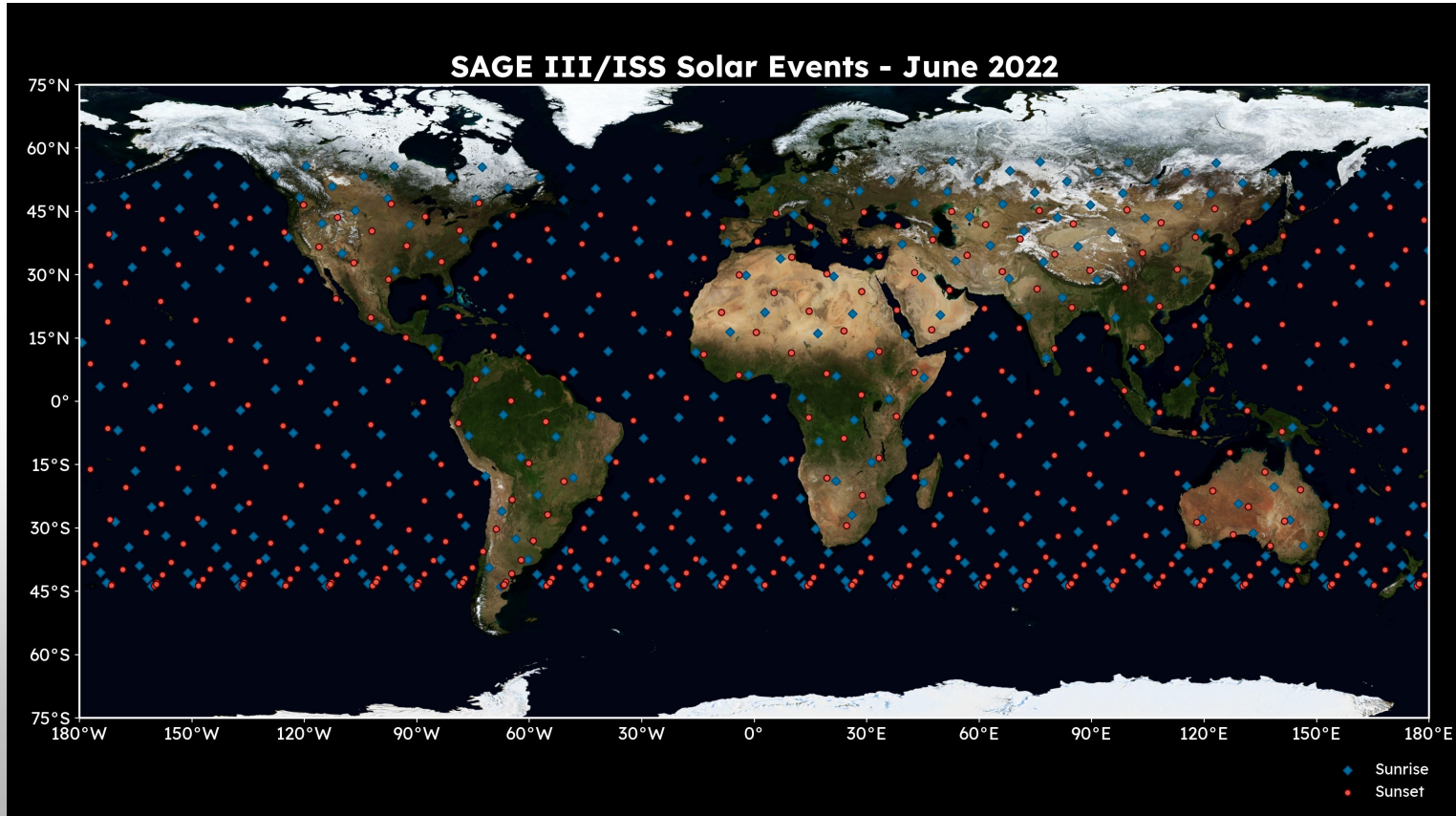


## Aerosol Extinction Coefficient



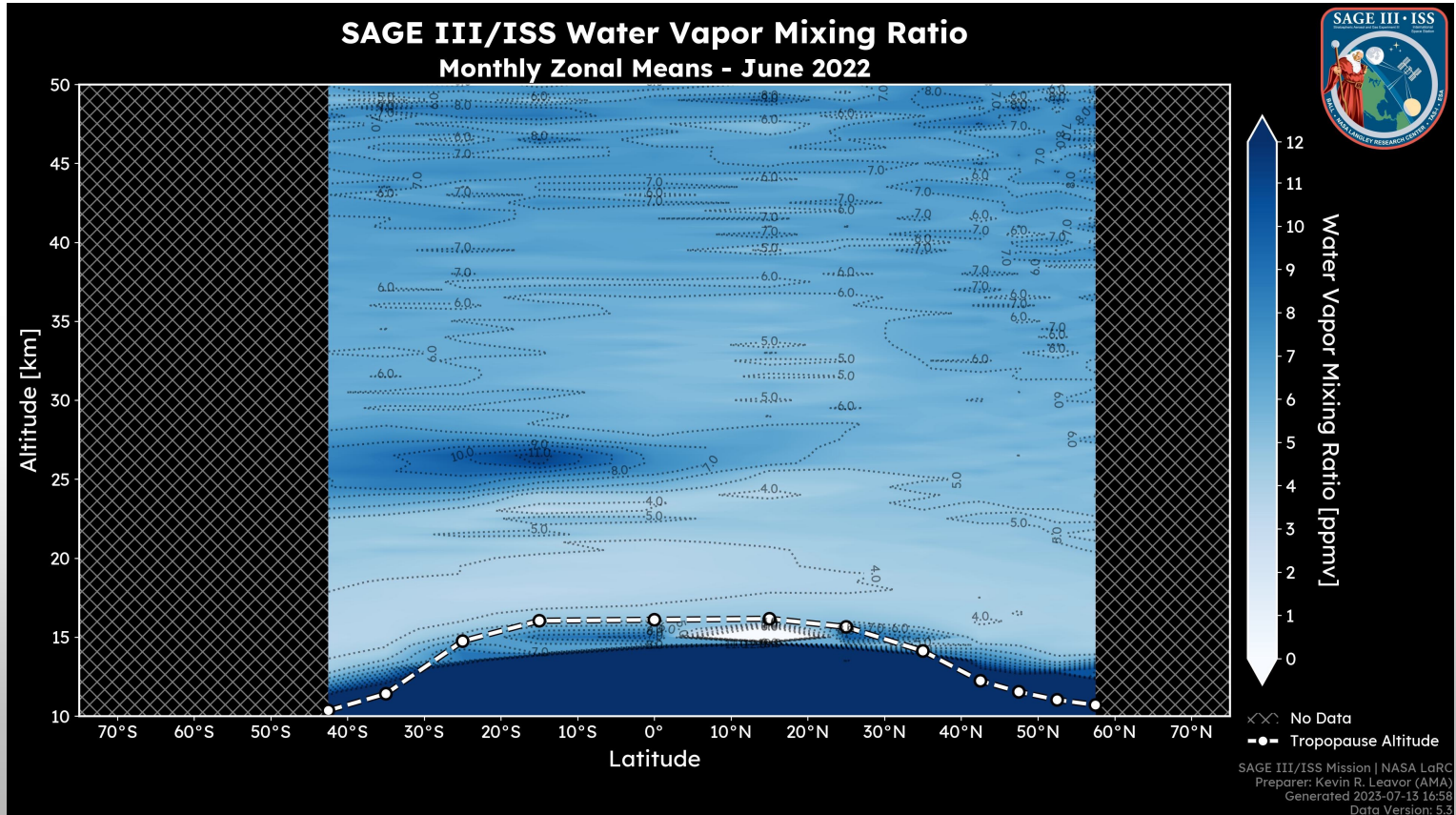


# All Images are 4K Resolution



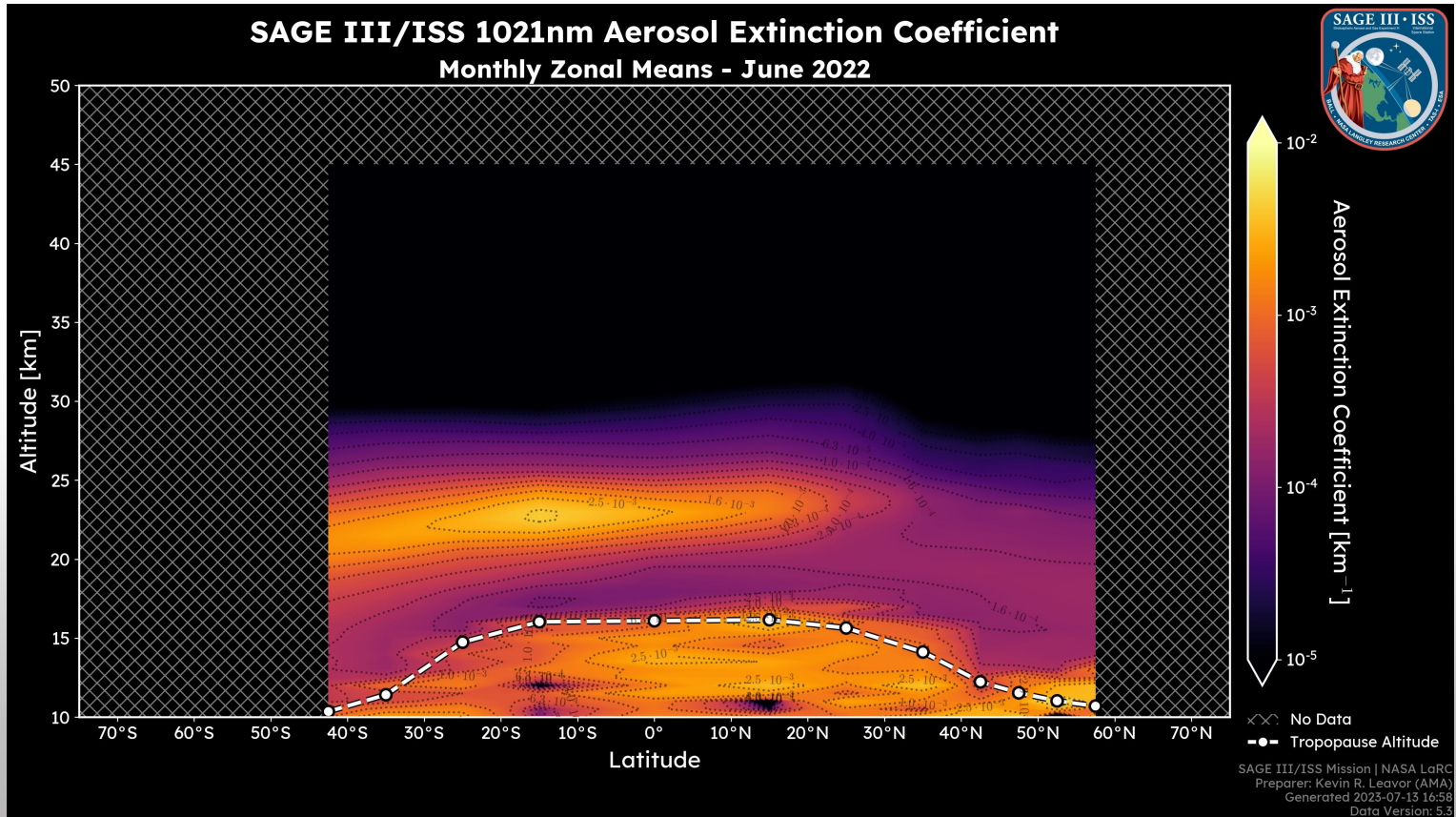


# All Images are 4K Resolution





# 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

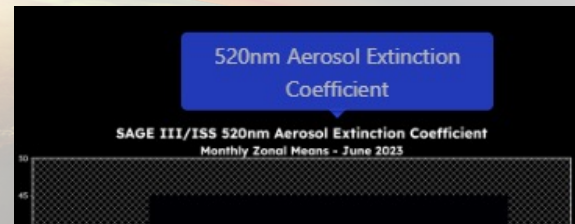
## ➤ Ease of Access

- Navigation is performed temporally or spatially and navigable using selections
- Handful of clicks to get to particular dates and/or views

## ➤ Self-Describing

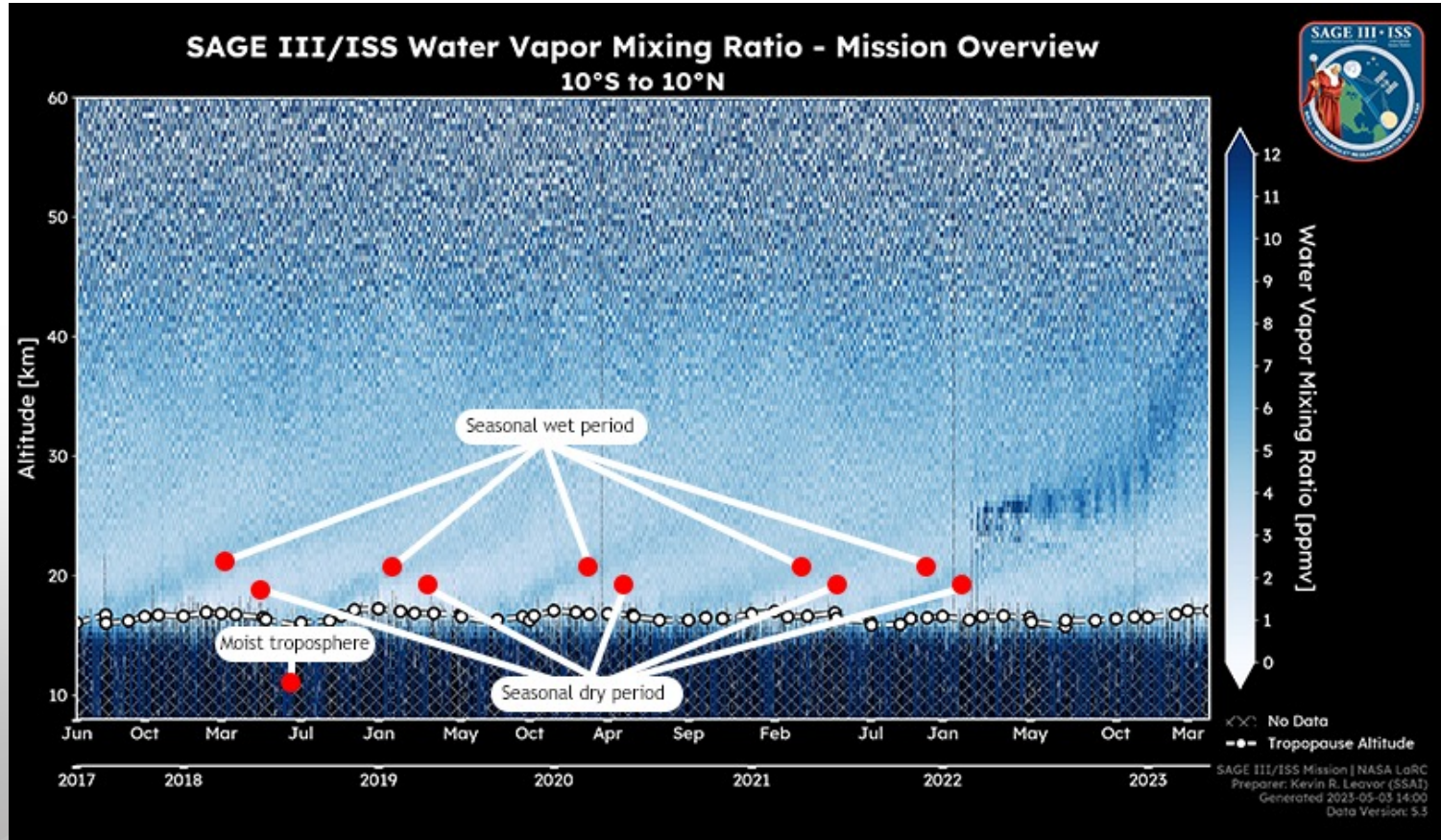
- Detailed introduction page with hover descriptions and animations of products
- Hover Text/Tooltips for each image

## ➤ No Hiding

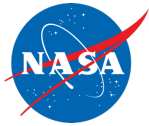




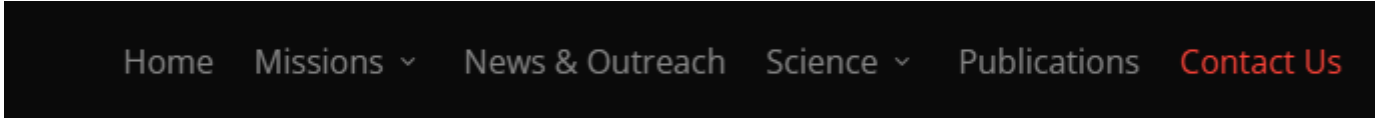
# Philosophy







# Suggestion Box?



Home » Contact Us

Please feel free to send us your

**Name \***

First

**Email \***

**Comment \***

with great power  
comes great responsibility

Submit feedback



# What's Next?



- **Standard Movies/Animations**
- **Additional Derived Products**
  - Example being considered - Ångström Exponent
- **Separate NO<sub>2</sub> 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/](https://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?



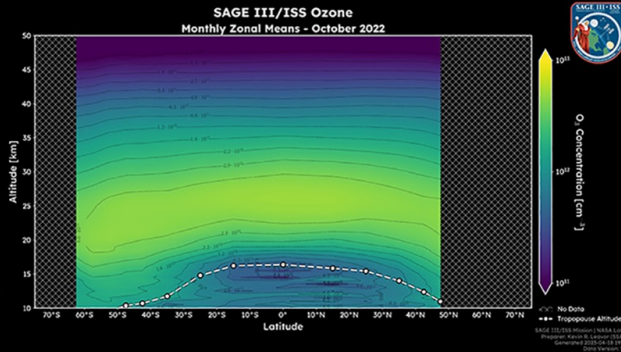
## Ozone Concentration

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 breathe, 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 forcos 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

