



National Aeronautics and
Space Administration

EARTHDATA

NASA Earth Science's Data Storage and Proximate Compute Strategy

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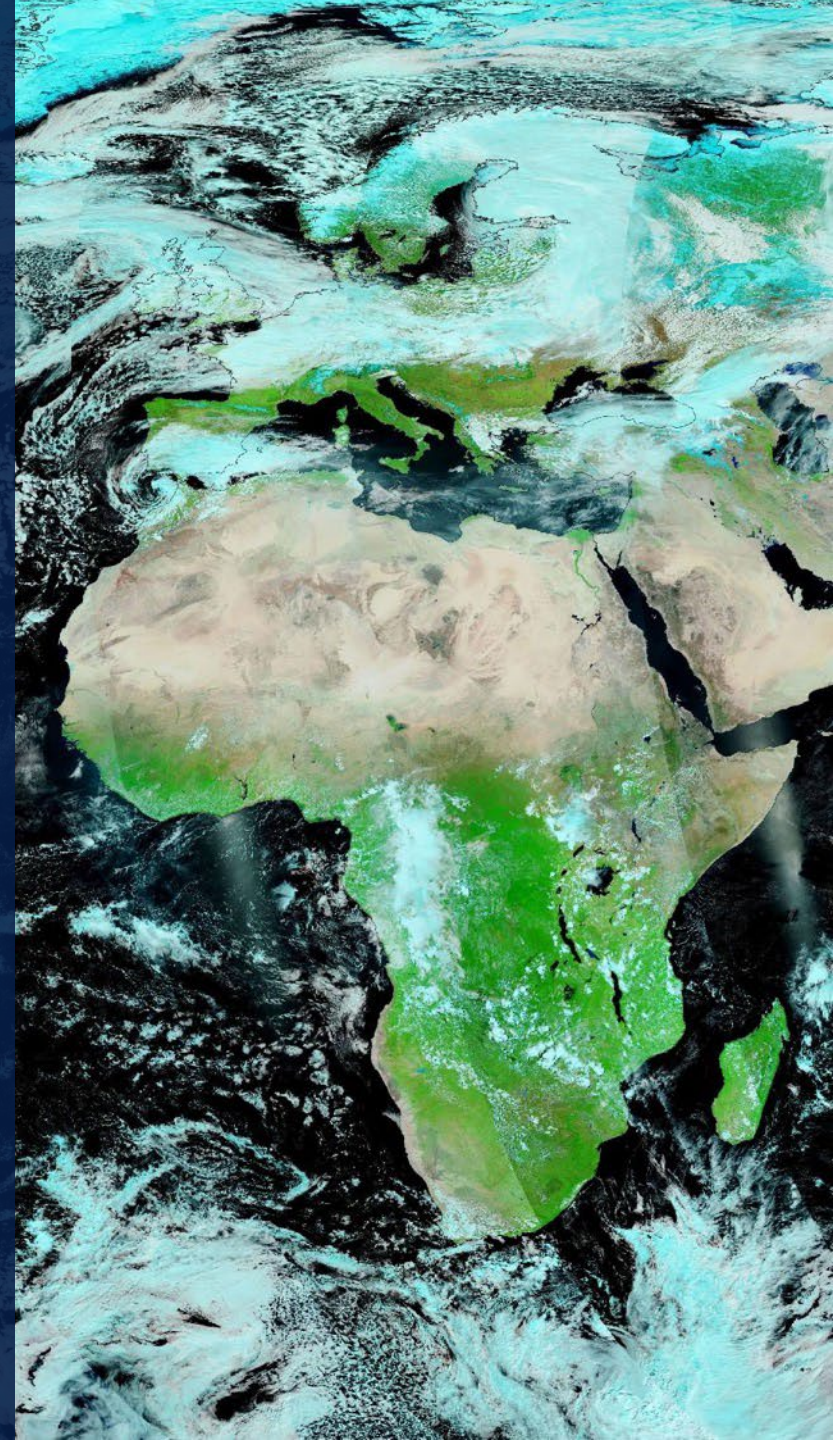


Outline

- Background on NASA's Earth Science Data Systems (ESDS)
- NASA's Data Proximate Compute Evolution
- Looking Forward



Background on NASA's Earth Science Data Systems



EARTH FLEET

Key

- International Partners
- U.S. Partner
- ISS Instrument
- JPSS Instrument
- Cubesat
- Launch Date TBD
- Earth System Observatory Mission
- (Pre) Formulation
- Implementation
- Operating
- Extended

Invest/CubeSats

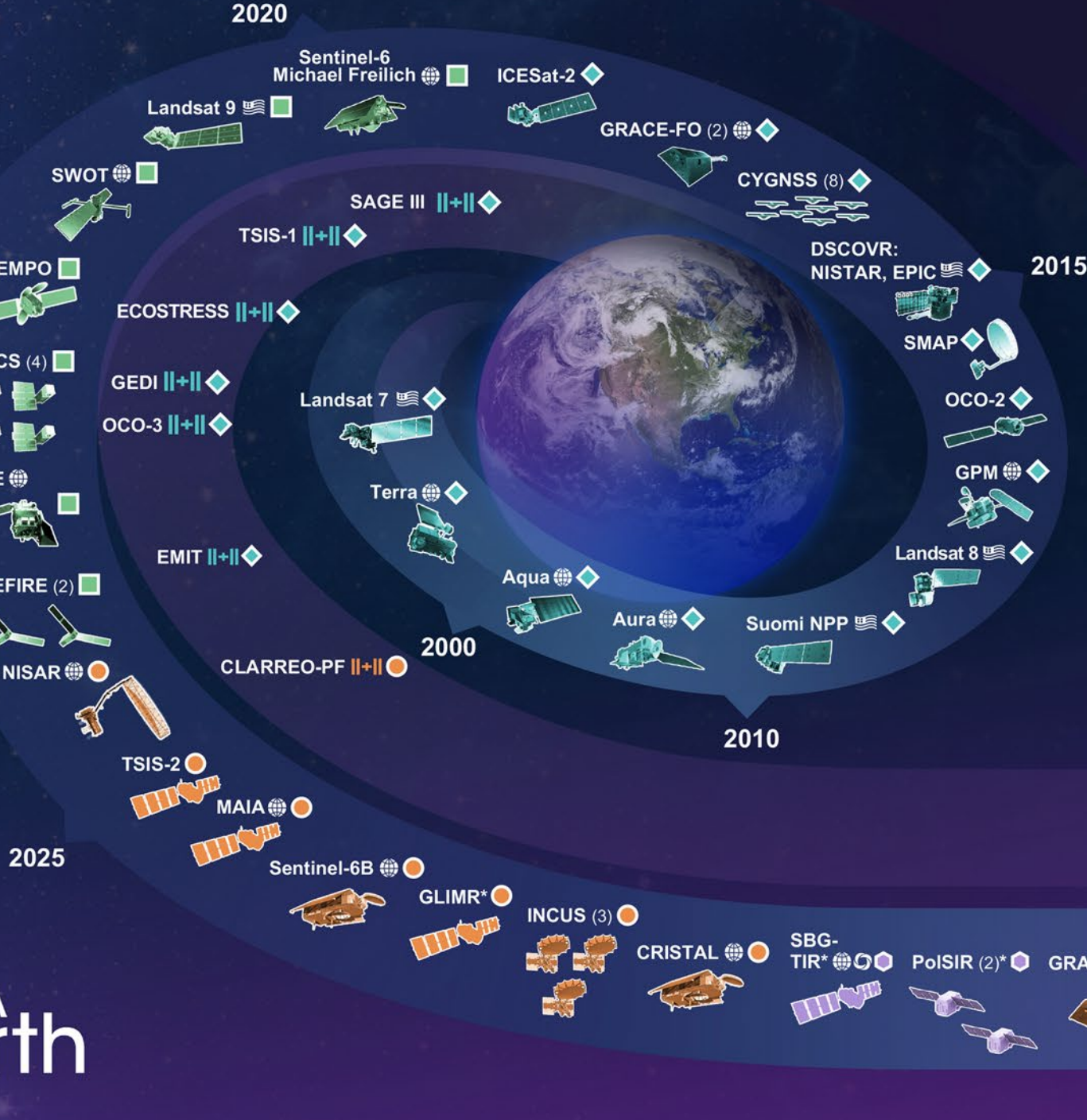
- MURI-FD 2023
- SNOOPI 2024
- ARGOS* 2024
- ARCSTONE* 2025
- GRITSS* 2025
- GRATTIS* 2026

JPSS Instruments

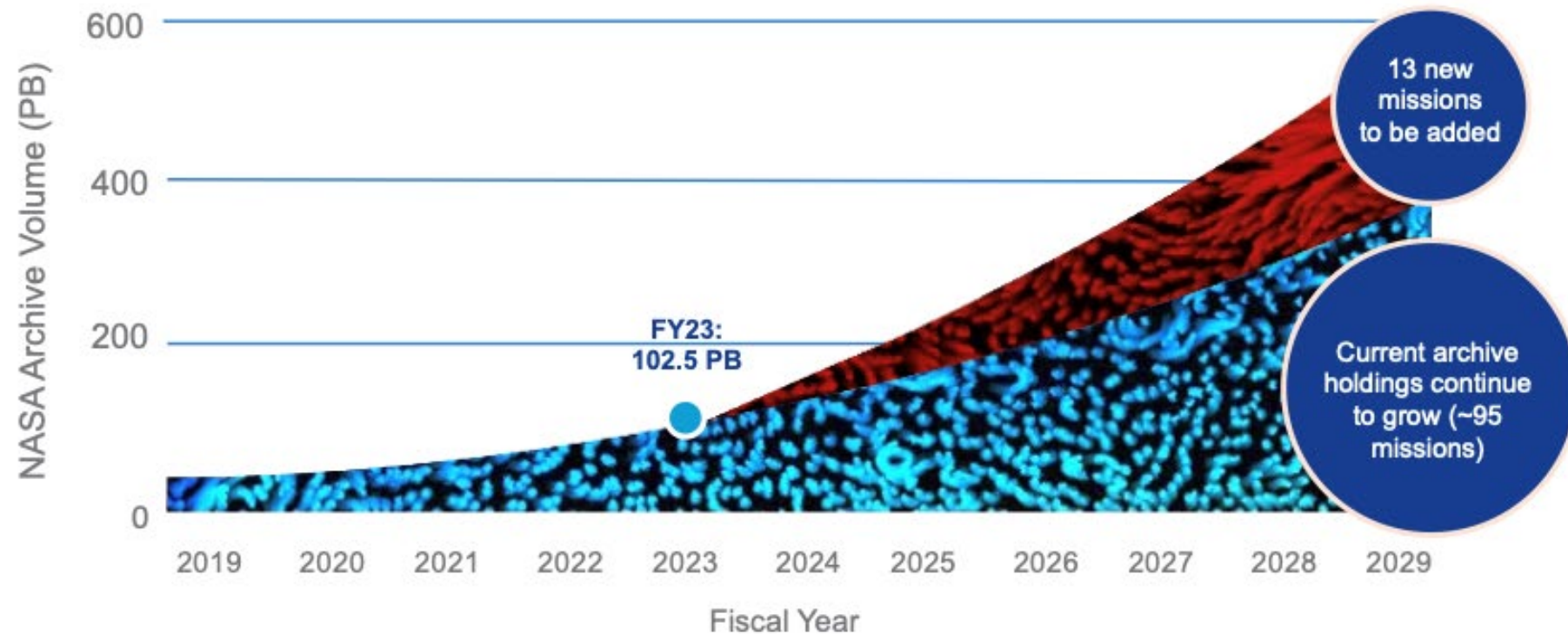
- OMPS-LIMB 2022
- LIBERA 2027
- OMPS-LIMB 2027
- OMPS-LIMB 2032

ISS INSTRUMENTS

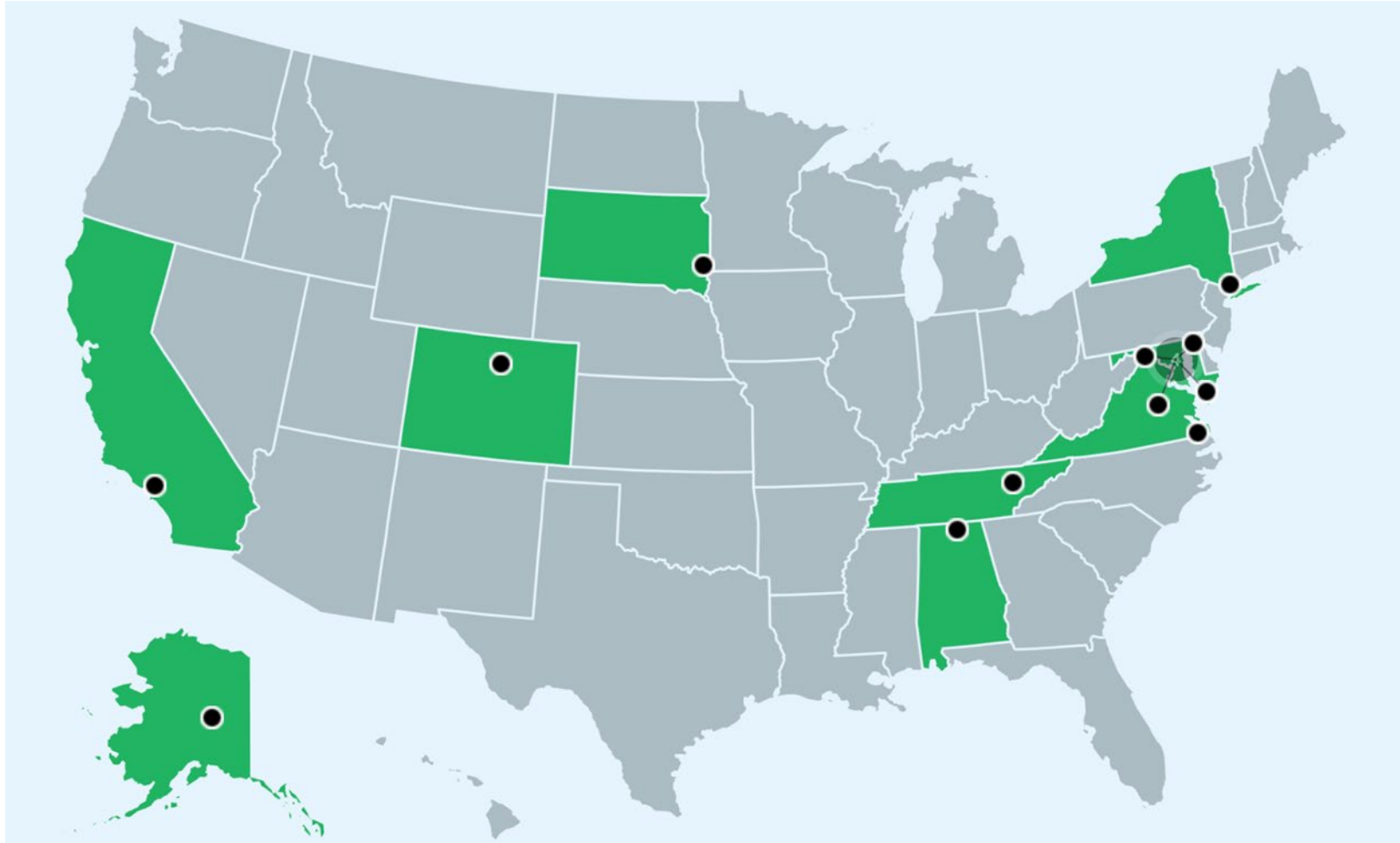
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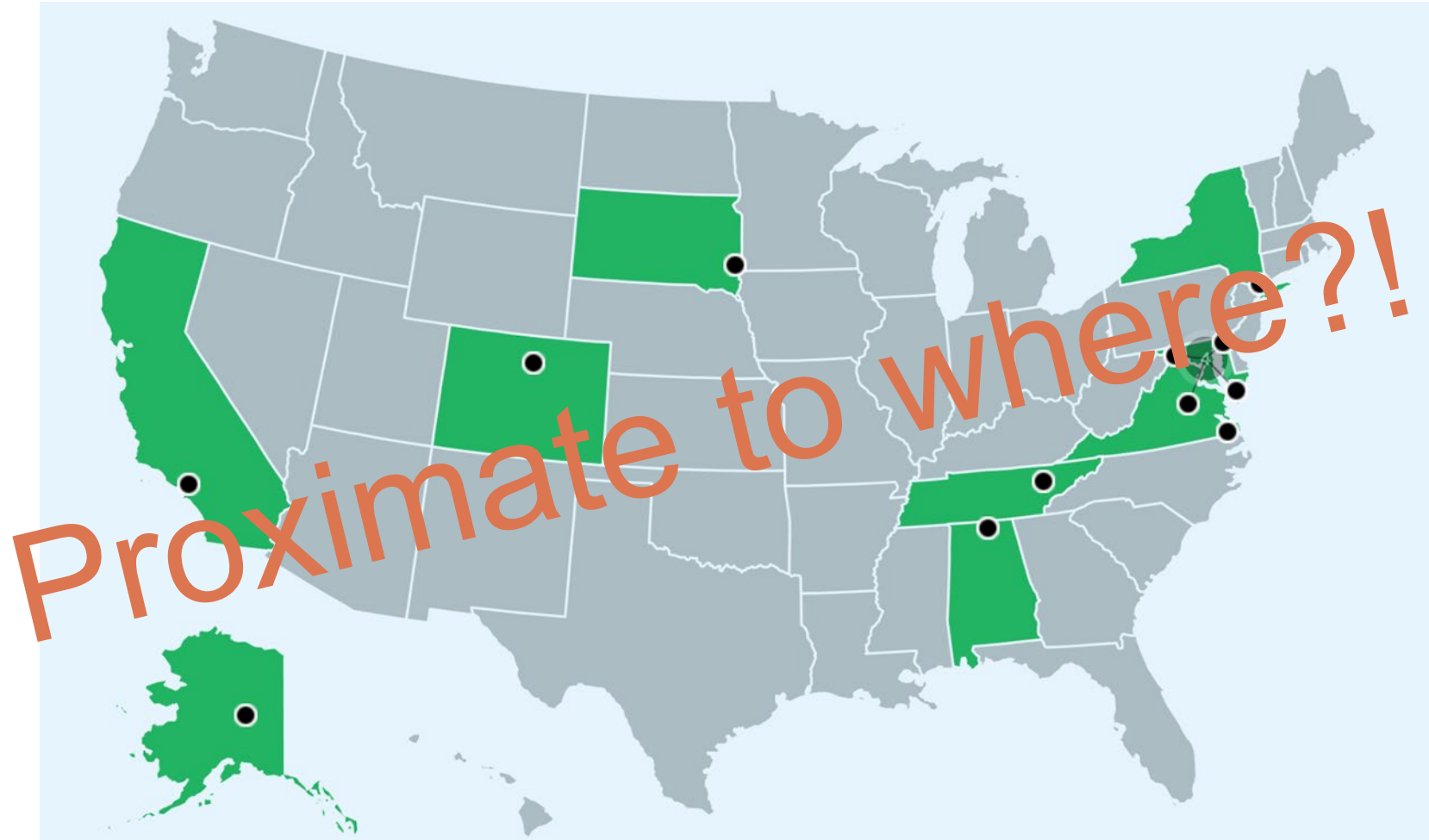
Earth Science Data Archive Growth Projection



NASA's Distributed Active Archive Centers (DAACs)

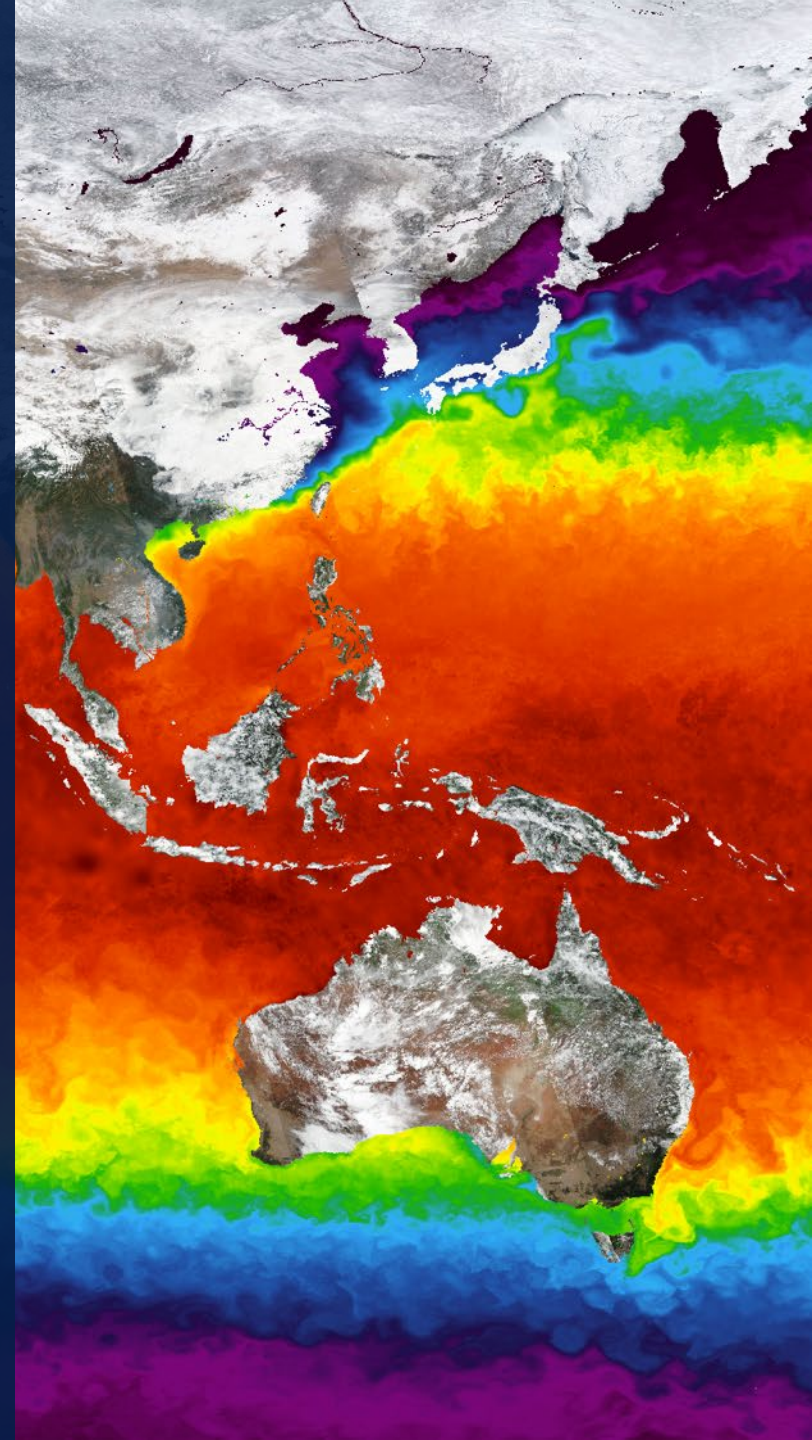


NASA's Distributed Active Archive Centers (DAACs)



NASA ESDS's Data-Proximate Compute Evolution

You shouldn't have to download the Earth to do Earth Science



Summary: We're using the cloud

In the cloud,

- The public or other organizations can (and do!) build value-add services
- End users can access more data, faster, enabling more exploratory use cases and larger scale analyses
- All of our data is co-located, enabling interdisciplinary analysis
- Our own services run on the same hardware with the same access as users, enabling repeatable open source open science
- Grant recipients do not need to procure costly hardware
- More seamless transitions between discovery and analysis are possible

2014 – 2019: Cloud Pathfinders

- 2014: Effectively no cloud footprint. Data-proximate compute means working at a data center, downloading all data, or working at some high-end computing facilities
- 2015: Earth Science Data and Information System (ESDIS) begins developing a cloud platform in Amazon Web Services (AWS). ESDIS stores a copy of Sentinel-1
- 2016: ESDIS introduces “Getting Ready for NISAR*” (GRFN). To prepare for a high-volume cloud-first mission. Public applications begin to be hosted AWS
- 2017: ESDIS begins development of a cloud-native ingest pipeline, Cumulus, to prepare for the upcoming Surface Water and Ocean Topography (SWOT) mission
- 2018-2019: First public-facing datasets in the cloud are available. Cloud platform cost and security controls mature to operational state. Flagship applications migrate.



2020 - 2024: Cloud Use

- 2020-ongoing: Datasets migrate to the cloud based on priority and demand
- 2020: NASA Openscapes effort begins building end-user capacity for data-proximate compute in the cloud. ESDIS invests in cloud-optimized formats, metadata, and services to make better use of cloud storage.
- 2022: SWOT mission launches, with its data processed and archived in the cloud. Visualization, Exploration, and Data Analysis (VEDA) supports pilot cloud analysis platform
- 2023: NASA's year of open science. ESDS emphasizes a Transform to Open Science, with data-proximate compute as a key pillar.
- 2024: ...



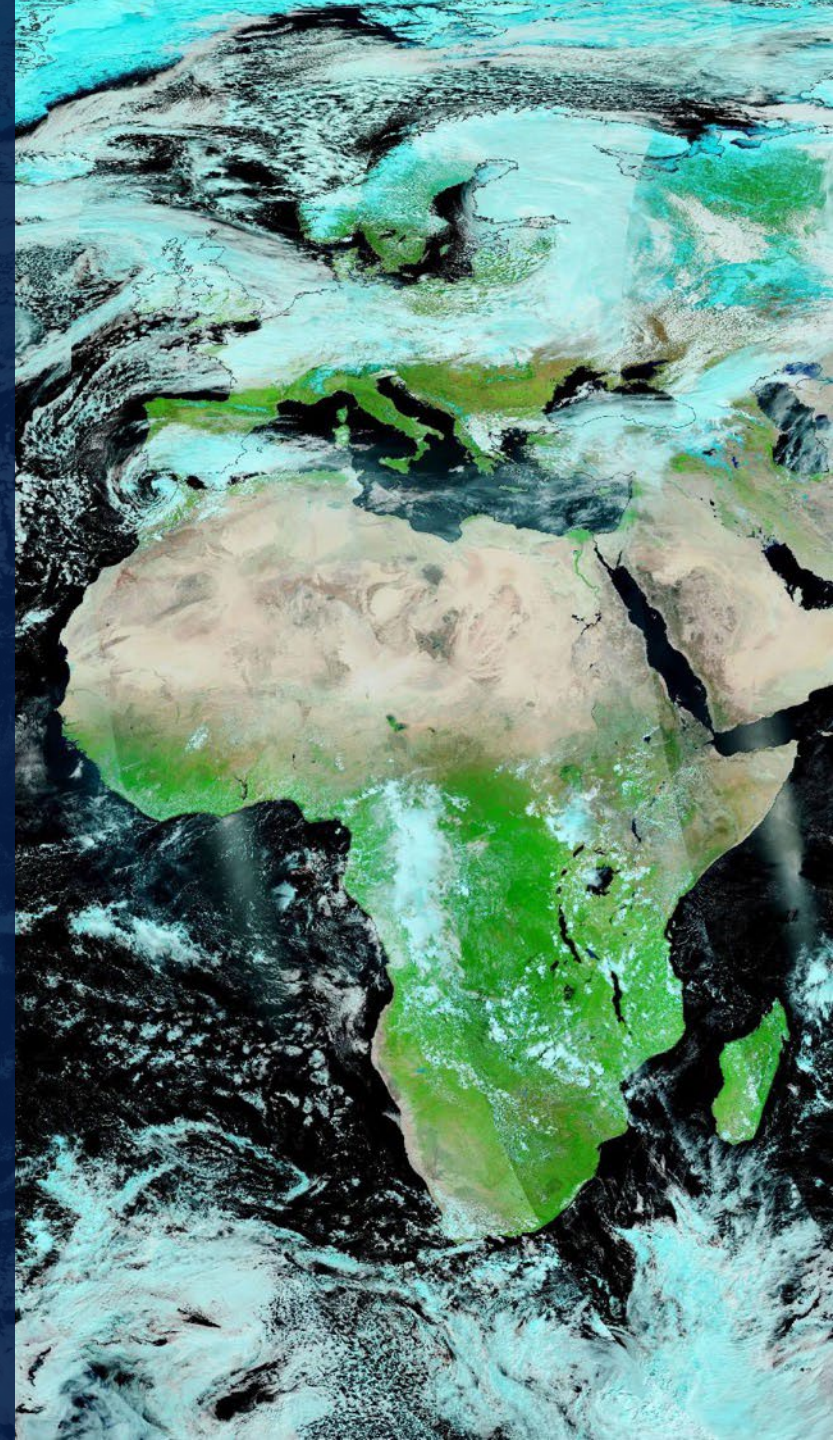
Present

Watch this space: <https://www.earthdata.nasa.gov/eosdis/system-performance-and-metrics>

2023

Unique Data Products (Collections) Distributed	18,045
Cloud Archive Volume	44.25 Petabytes
Cloud File Count	526 million
Average Archive Growth	91.64 Terabytes/day
Number of File Accesses in Cloud	526 M
End User Average Distribution Volume	315.4 Terabytes/day

Looking Forward



Near-Term Opportunities

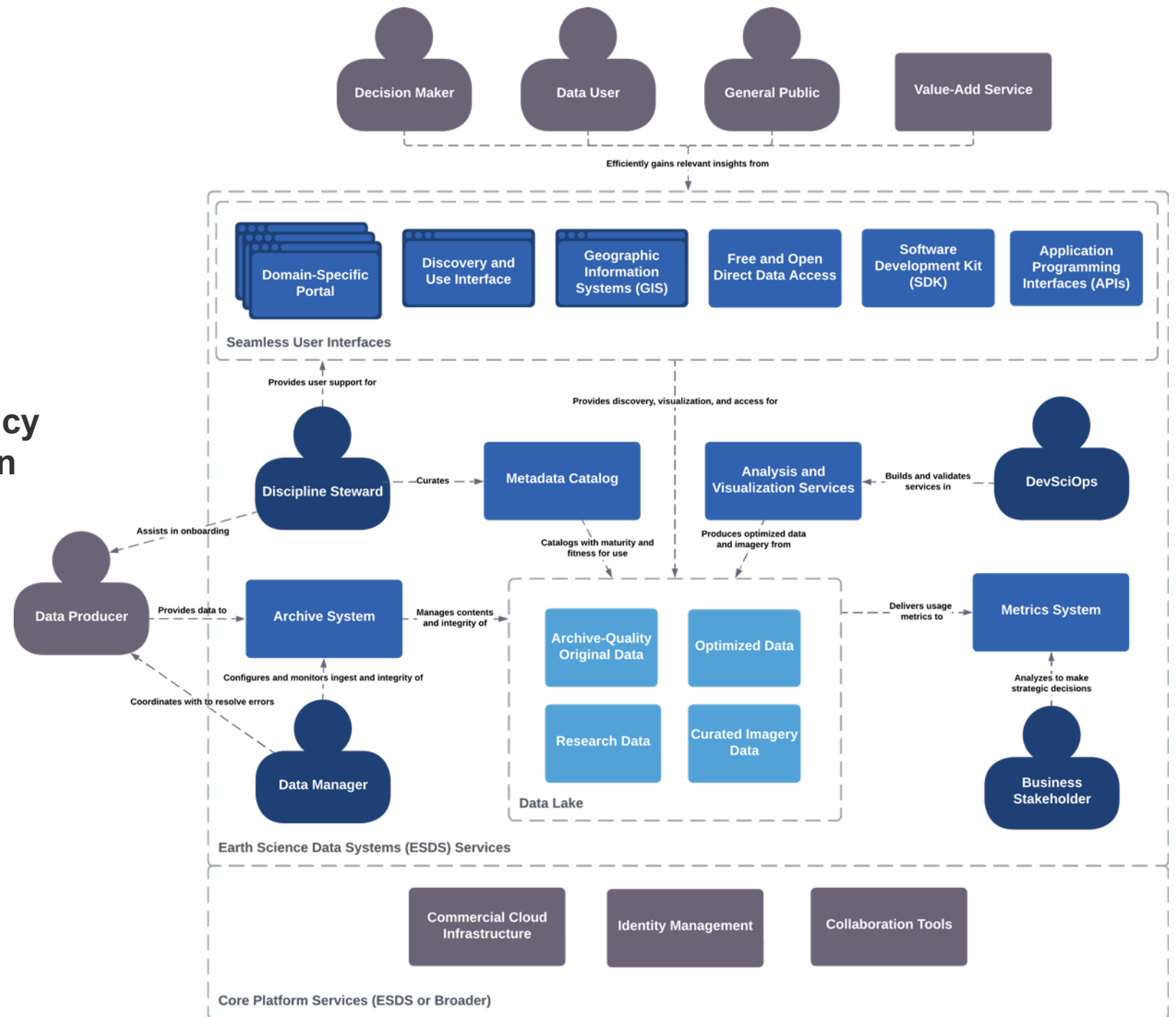
- “Relaxed registration” reducing barriers to data-proximate use
- More consistency in data formats and structure
- Improved access optimization in light of cloud storage
- Providing algorithms rather than data



ESDS Future State

Goals

1. Support open science
2. Reduce barriers to use
3. Increase operational efficiency
4. Drive Earth Science to Action



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Thank You!

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