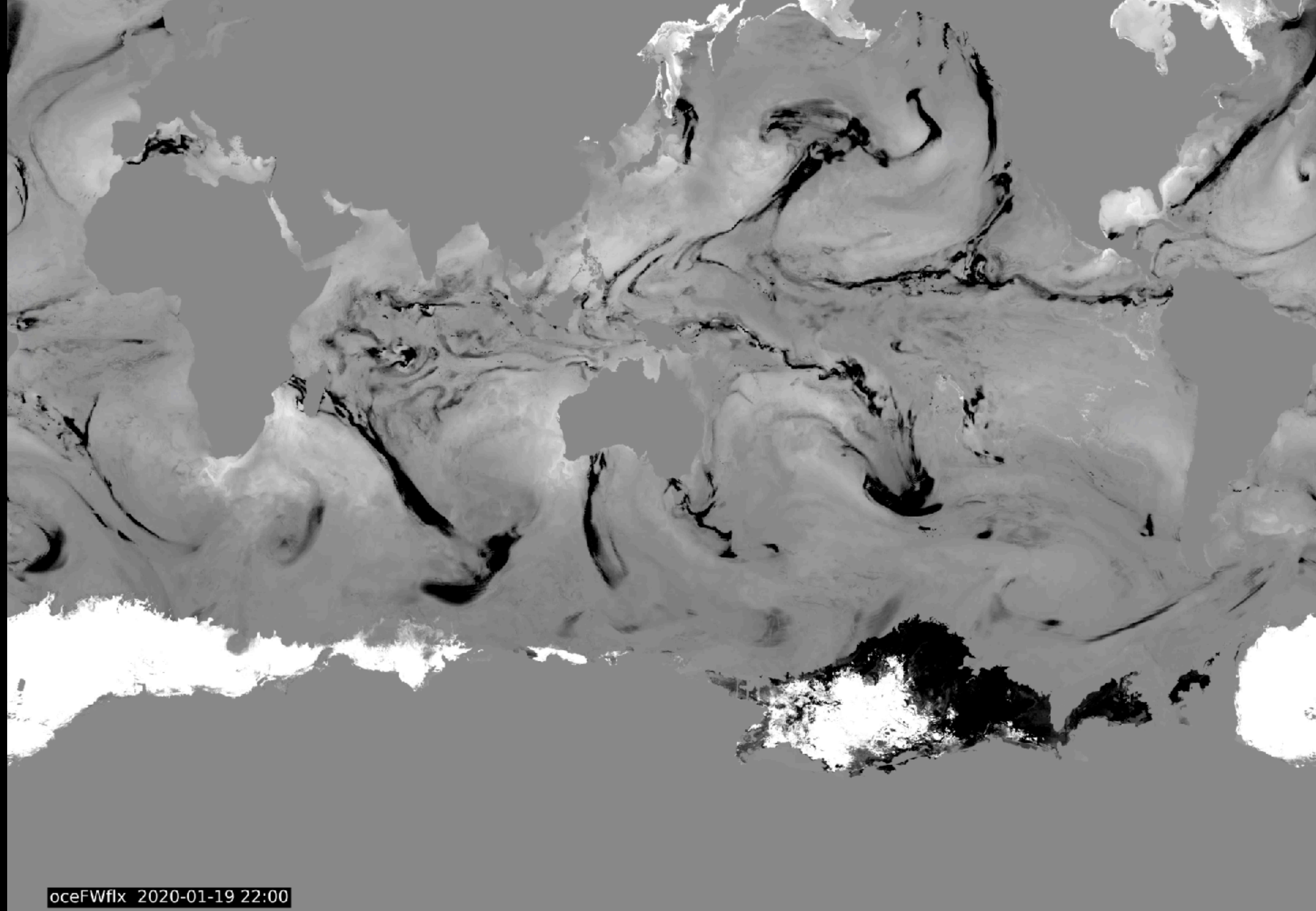
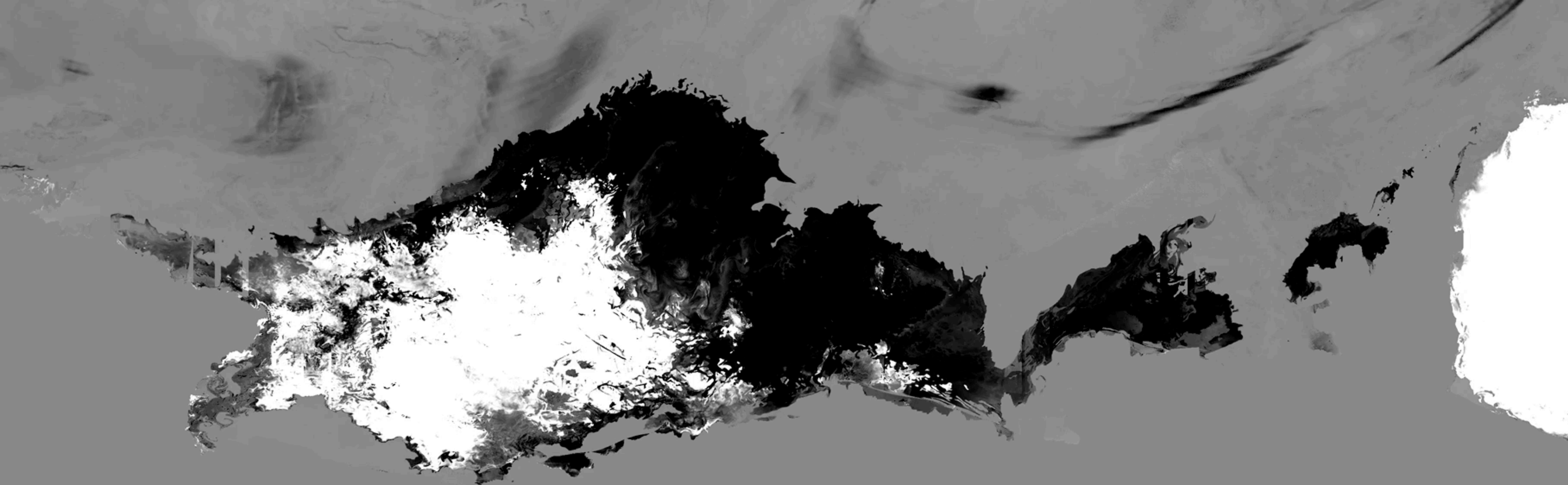


Data Visualization at the **NASA Advanced Supercomputing Division**

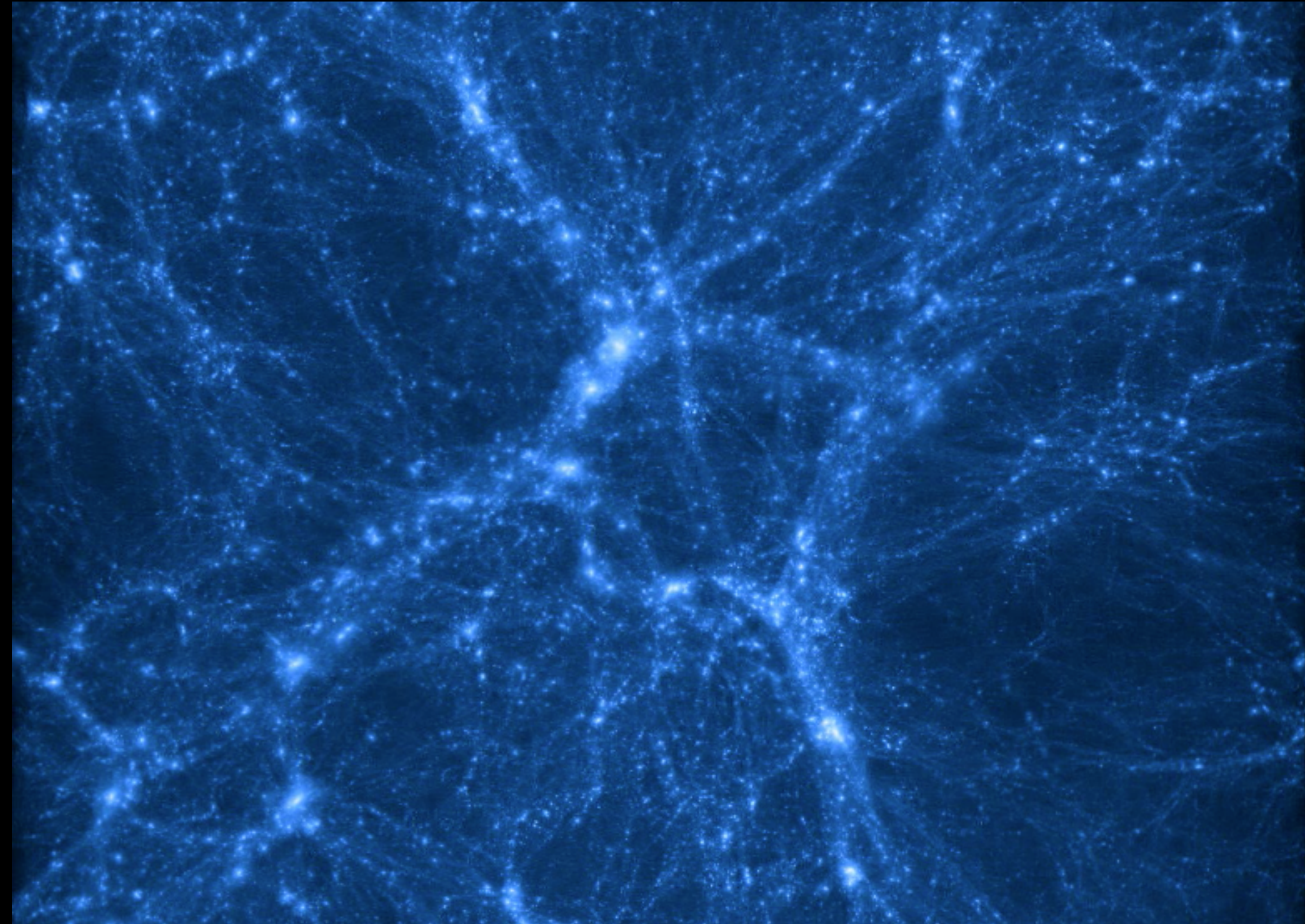
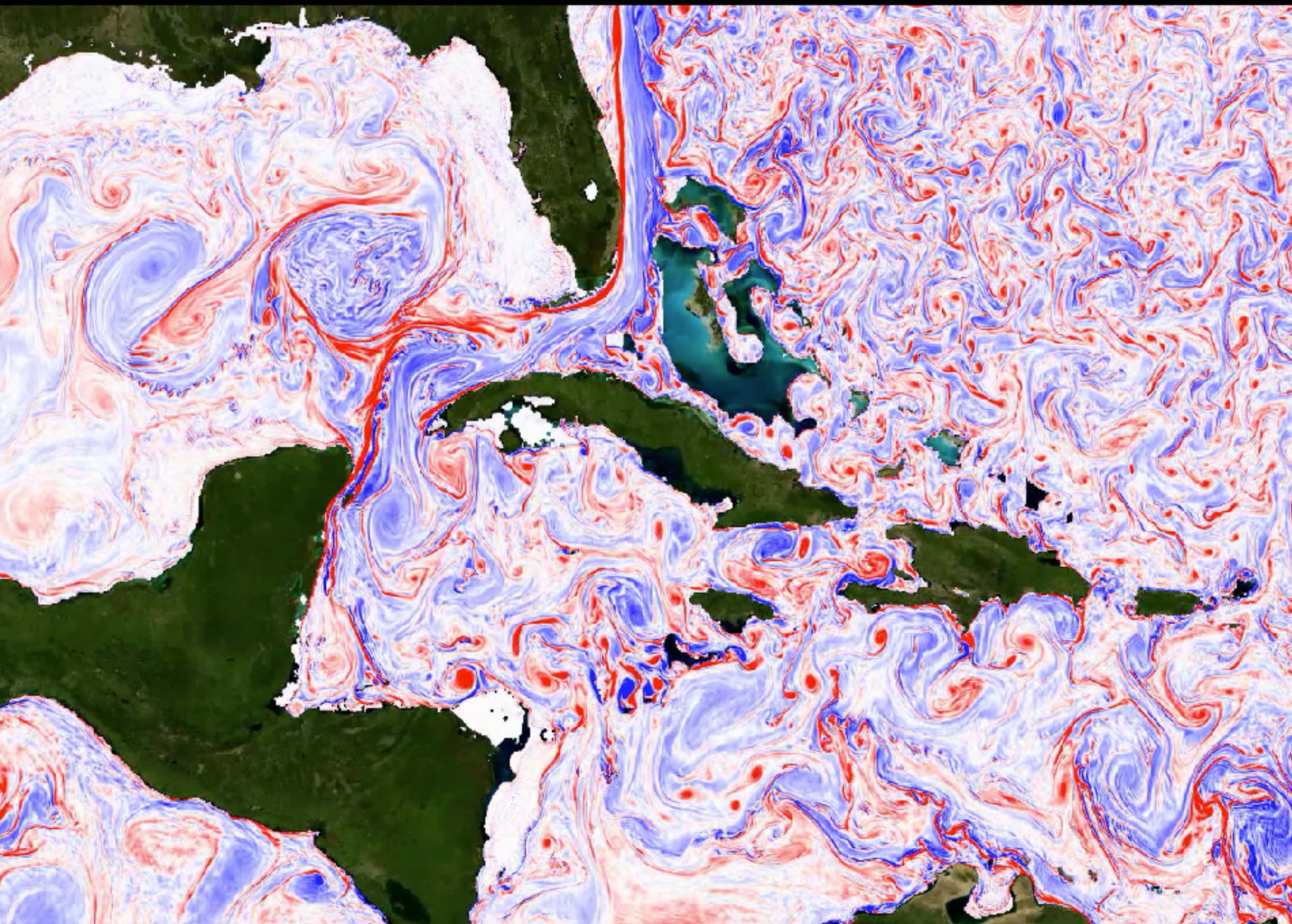
Nina McCurdy and Patrick Moran, *NASA Ames Research Center*

Data Visualization leverages our visual perceptual system to help make sense of data

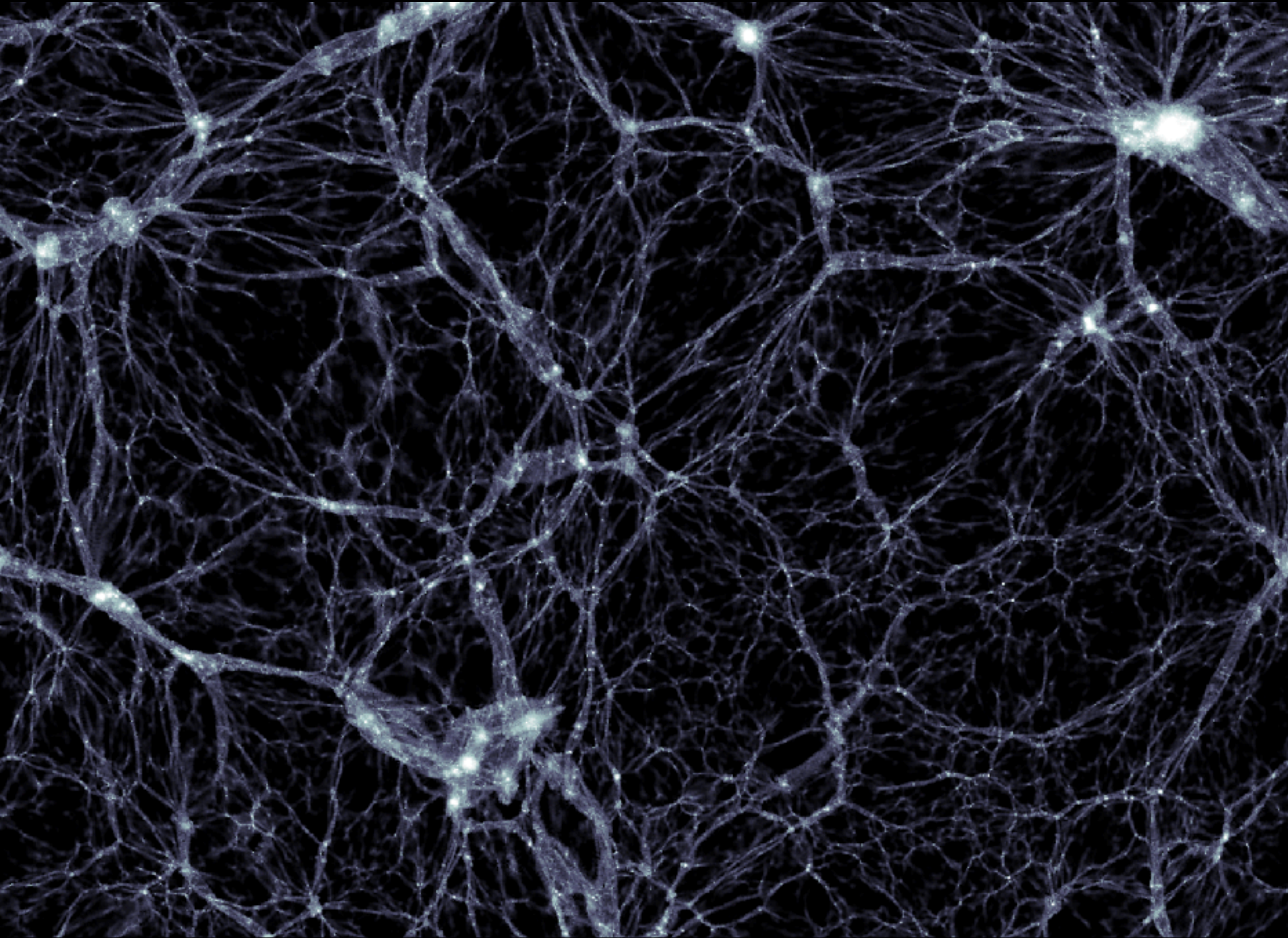




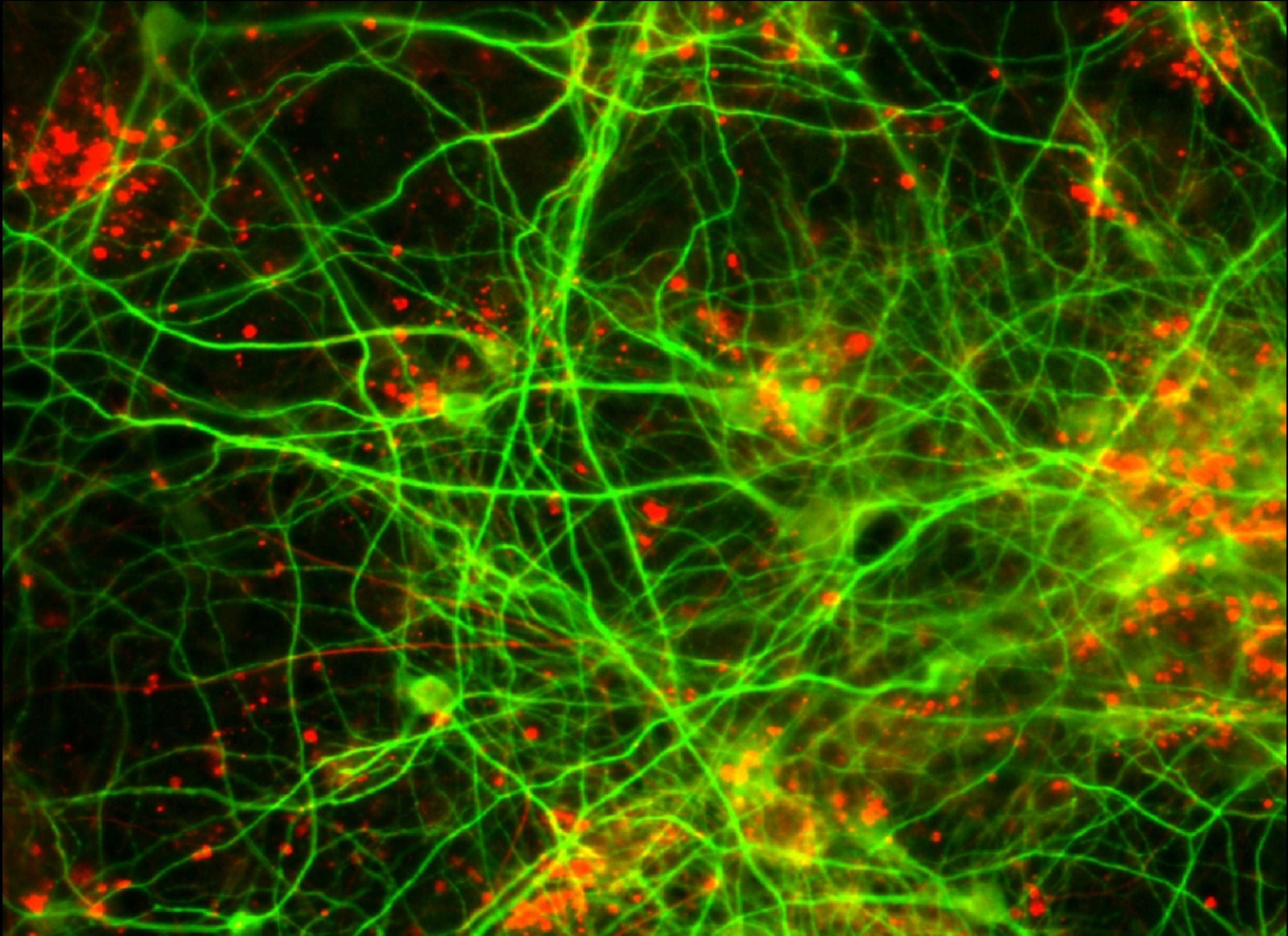
oceFWflx 2020-01-19 22:00



Images: Chris Henze, NASA/Ames

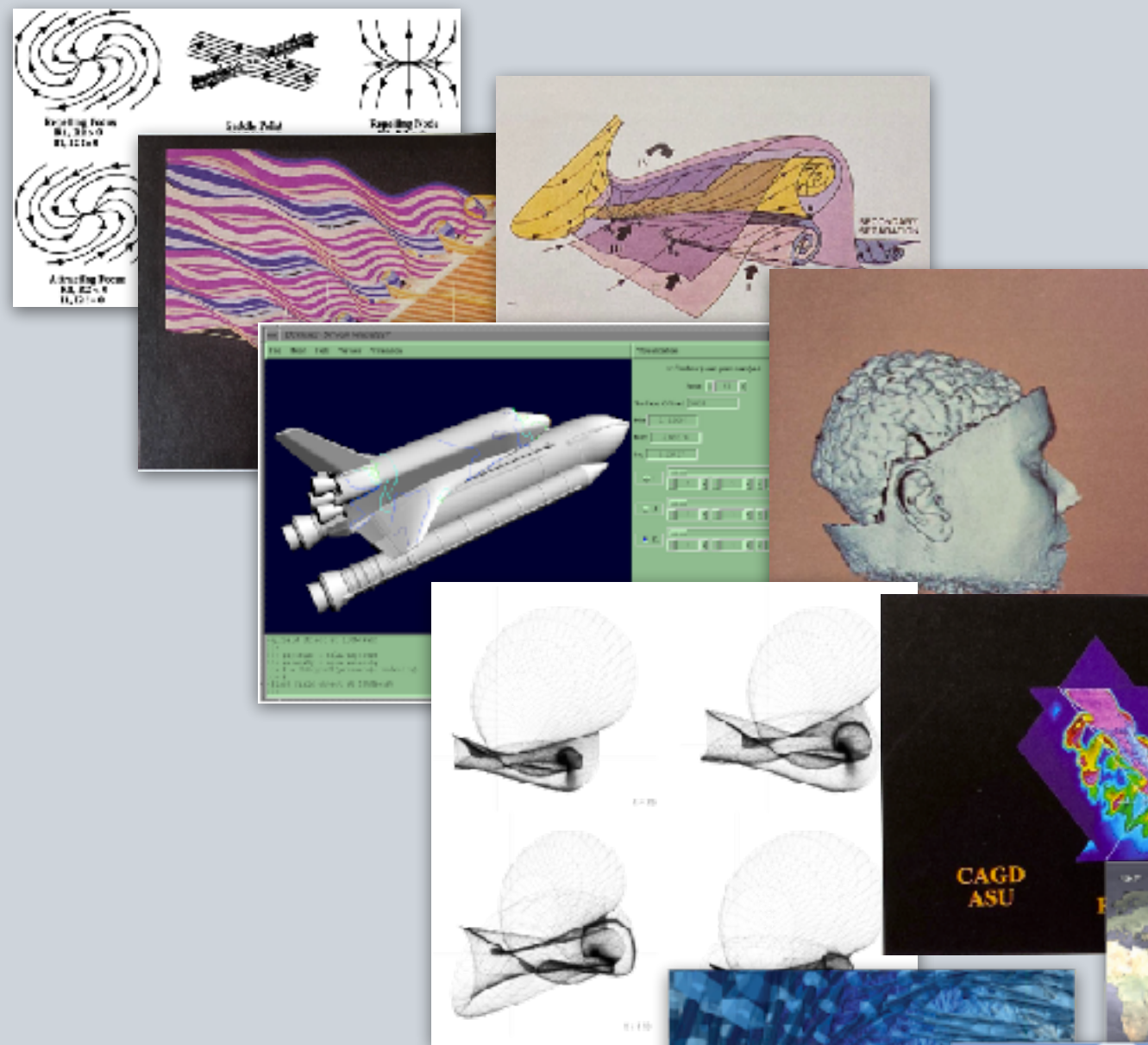


LSS/Universe Today



Embryonic mouse cortex cells/OIST

1990 TVCG

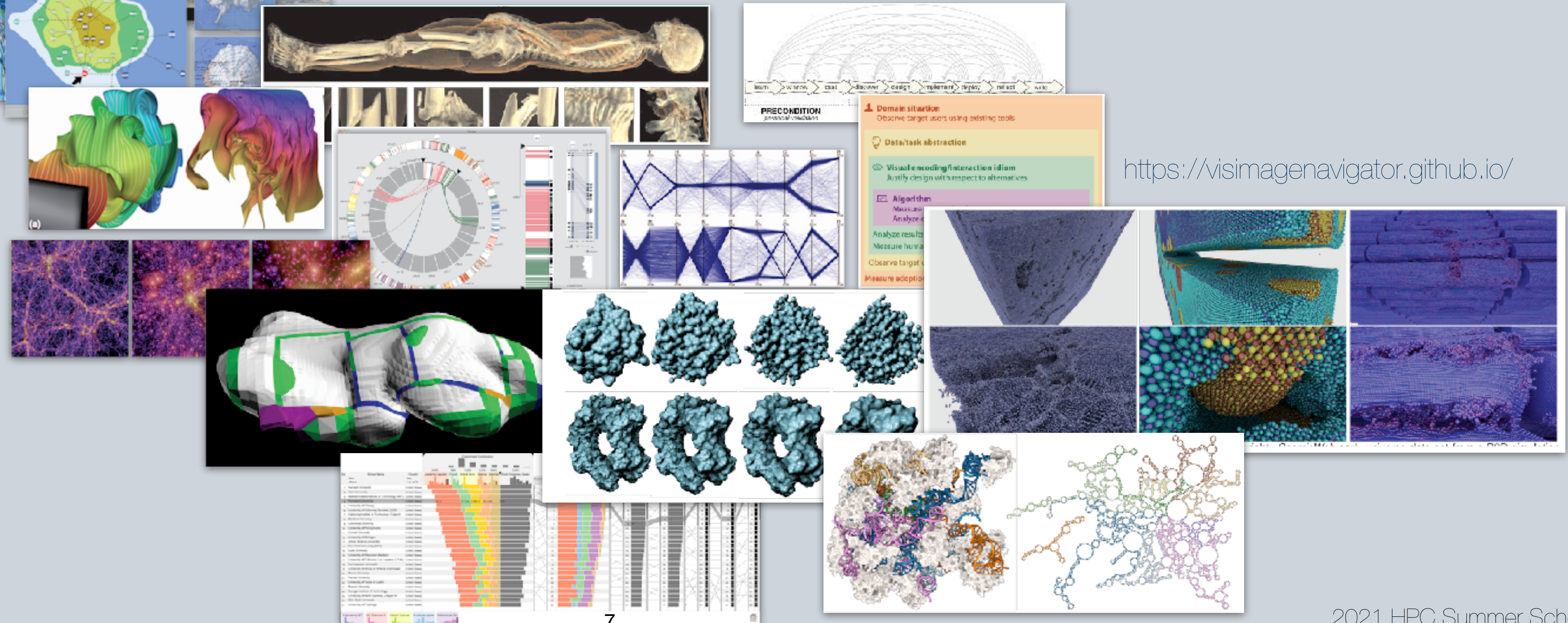


(APRIL 19–21 2021 | TIANJIN, CHINA) **IEEE PACIFIC VIS**

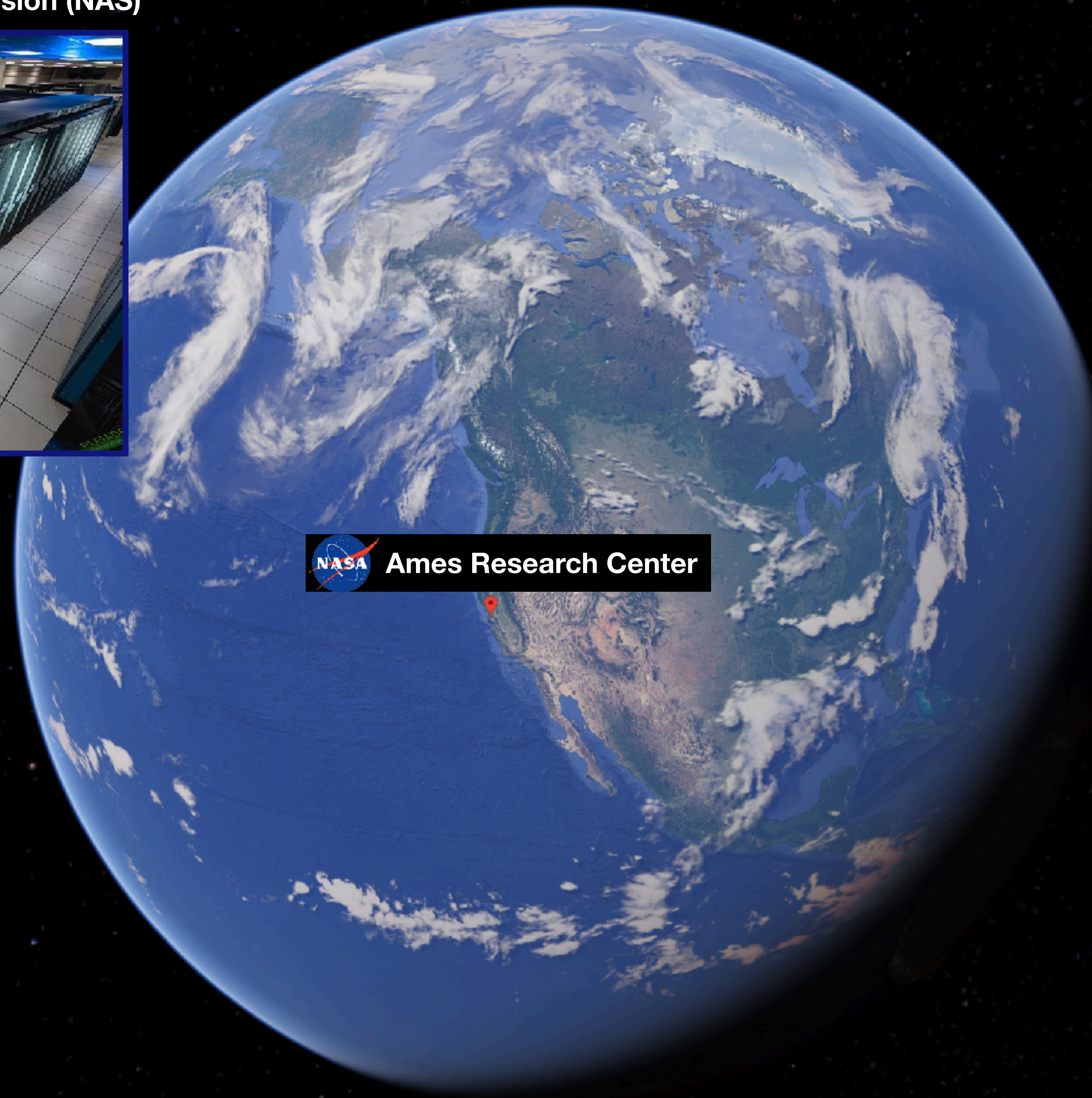
(OCTOBER 24–29 2021 | NEW ORLEANS, USA) **IEEE VIS**

(JUNE 14–18 2021 | ZÜRICH, SWITZERLAND) **EUROVIS**

VIS!



NASA Advanced Supercomputing Division (NAS)



 **Ames Research Center**

NAS SUPERCOMPUTERS

AITKEN



- Manufacturer: SGI/HPE
- 4 E-Cells (1,152 nodes),
8 Apollo 9000 racks (1,024)
- Theoretical peak: 8.41 Pflop/s
- LINPACK rating: 5.79 Pflop/s
- HPCG rating: 113.47 Tflop/s
- Total cores: 177,152
- Total memory: 745 TB

ELECTRA



- Manufacturer: SGI/HPE
- 32 compute racks (3,456 nodes)
- Theoretical peak: 8.32 Pflop/s
- LINPACK rating: 5.44 Pflop/s
(#53 on November 2020 TOP500 list)
- HPCG rating: 65 Tflop/s (#49 on November
2020 HPCG list)
- Total cores: 124,416
- Total memory: 589 TB

PLEIADES



- Manufacturer: SGI/HPE
- 158 computer racks (11,207 nodes)
- Theoretical peak: 7.09 Pflop/s cluster
- LINPACK rating: 5.95 Pflop/s
(#46 on November 2020 TOP500 list)
- HPCG rating: 175 Tflop/s
(#25 on November 2020 HPCG list)
- Total CPU cores: 241,324
- Total memory: 927 TB
- 3 racks (83 nodes total) enhanced with
NVIDIA graphics processing units (GPUs)
 - 614,400 CUDA cores
 - 0.646 Pflop/s total

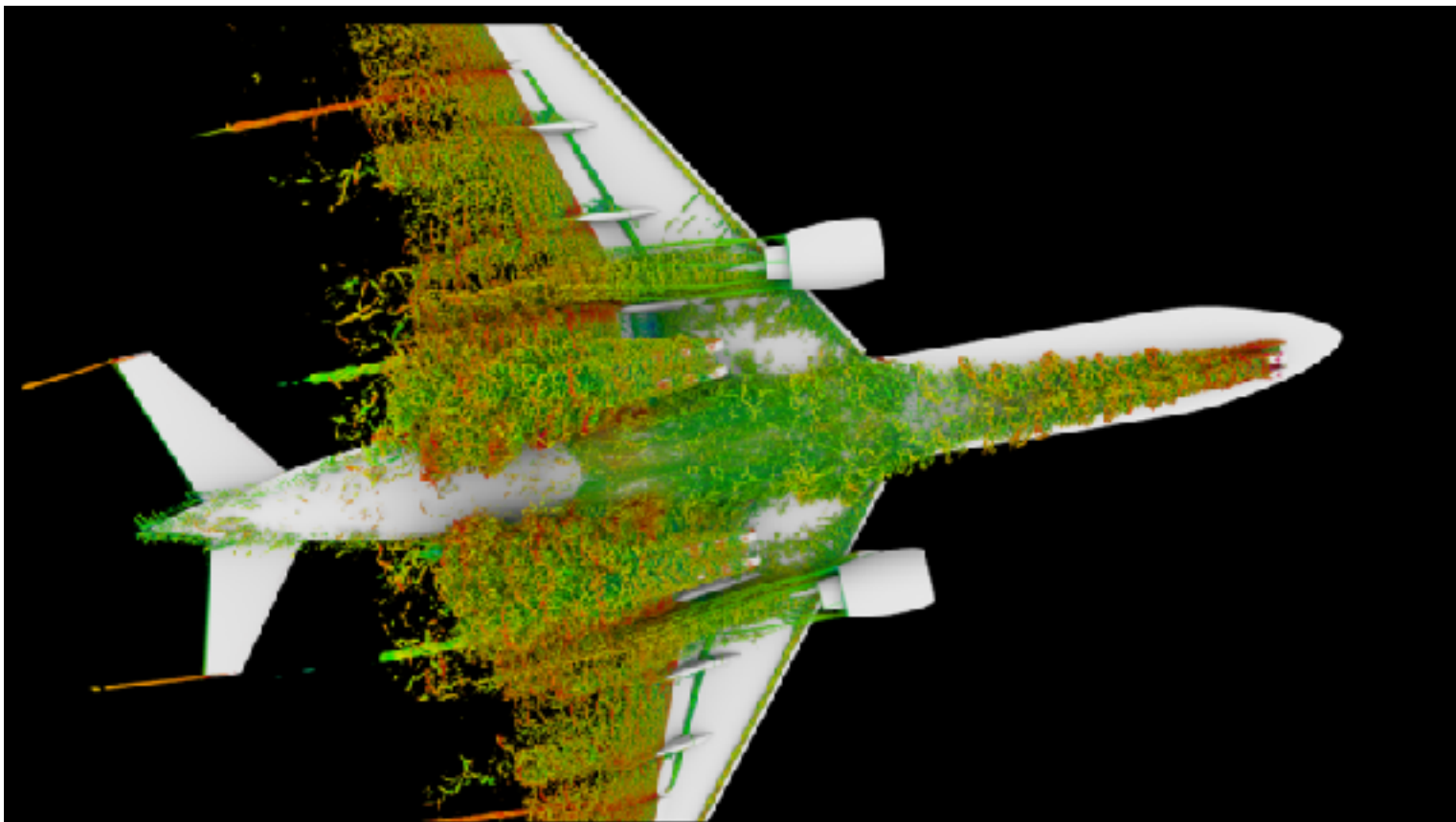
ENDEAVOUR



- Manufacturer: HPE
- 2 compute racks (2 nodes)
- Theoretical peak: 154.8 Tflop/s
- Total cores: 1,792
- Total memory: 12 TB

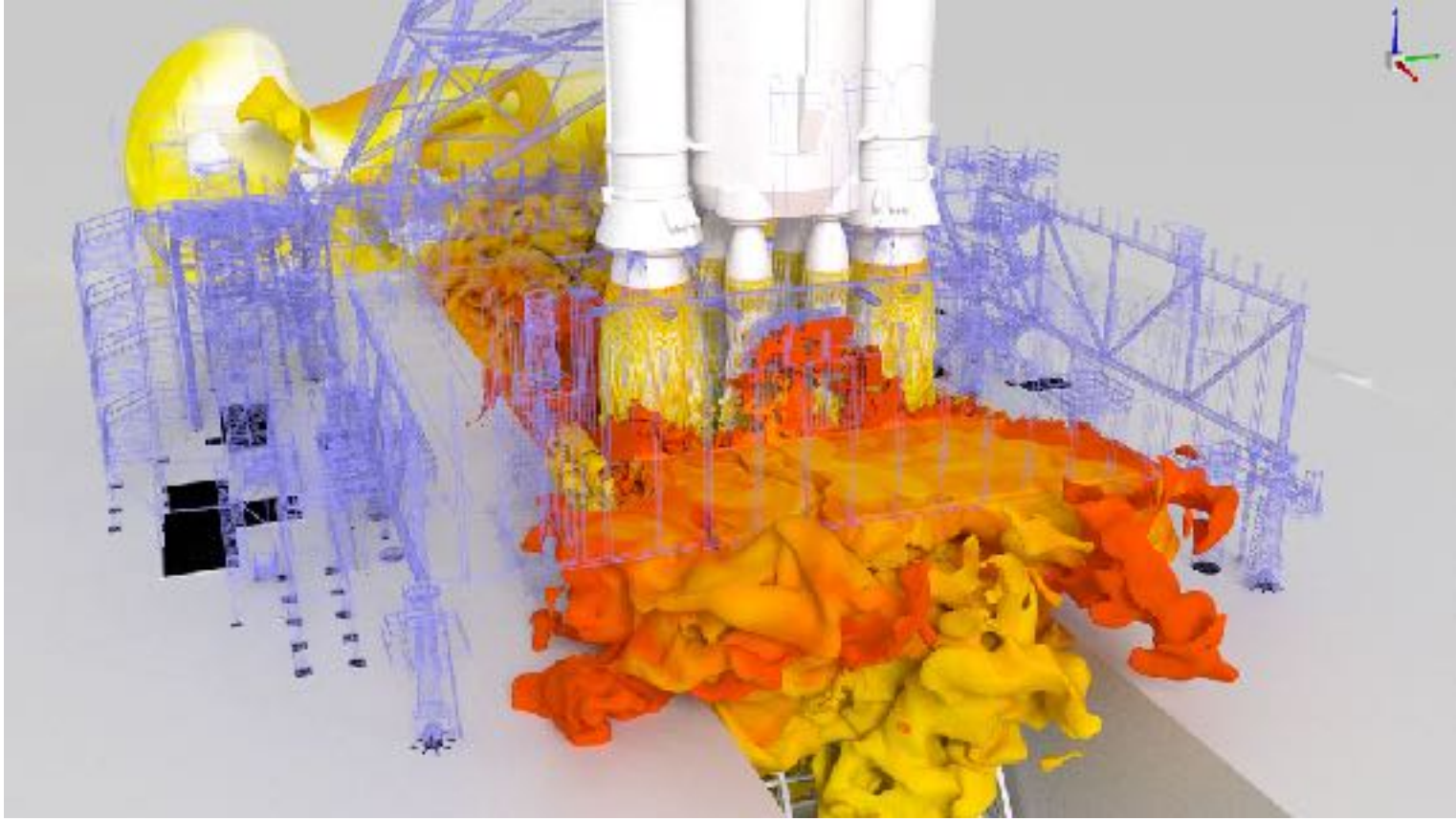
COMPUTING AT THE NAS

AERONAUTICS



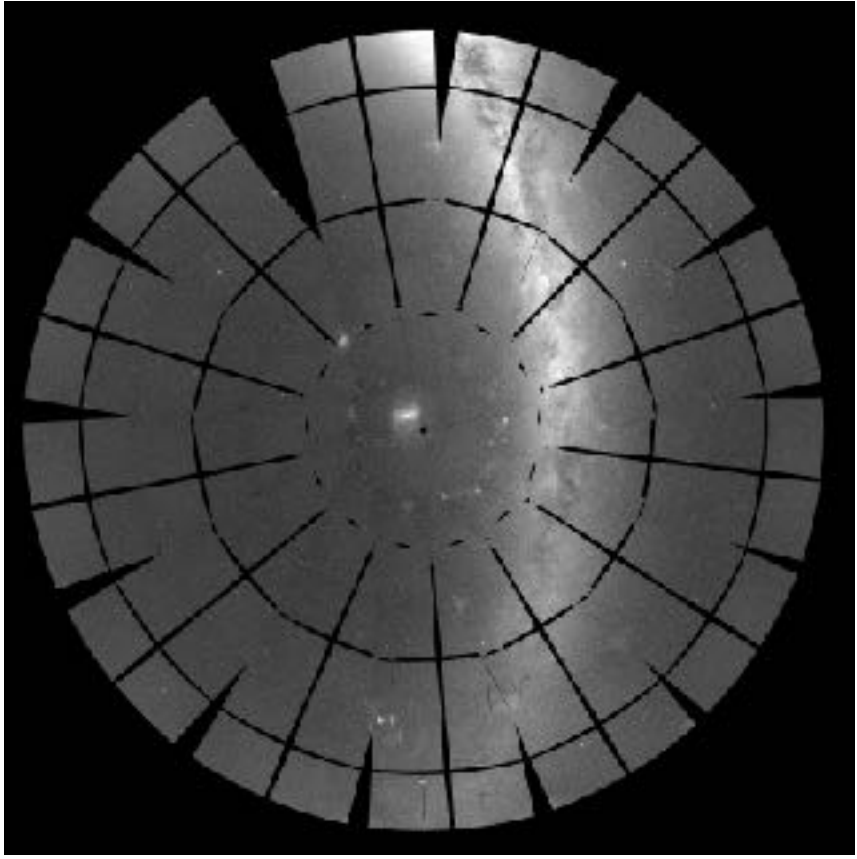
Benedikt Koenig, Dassault Systemes; Patrick Moran, NASA/Ames

HUMAN SPACE FLIGHT

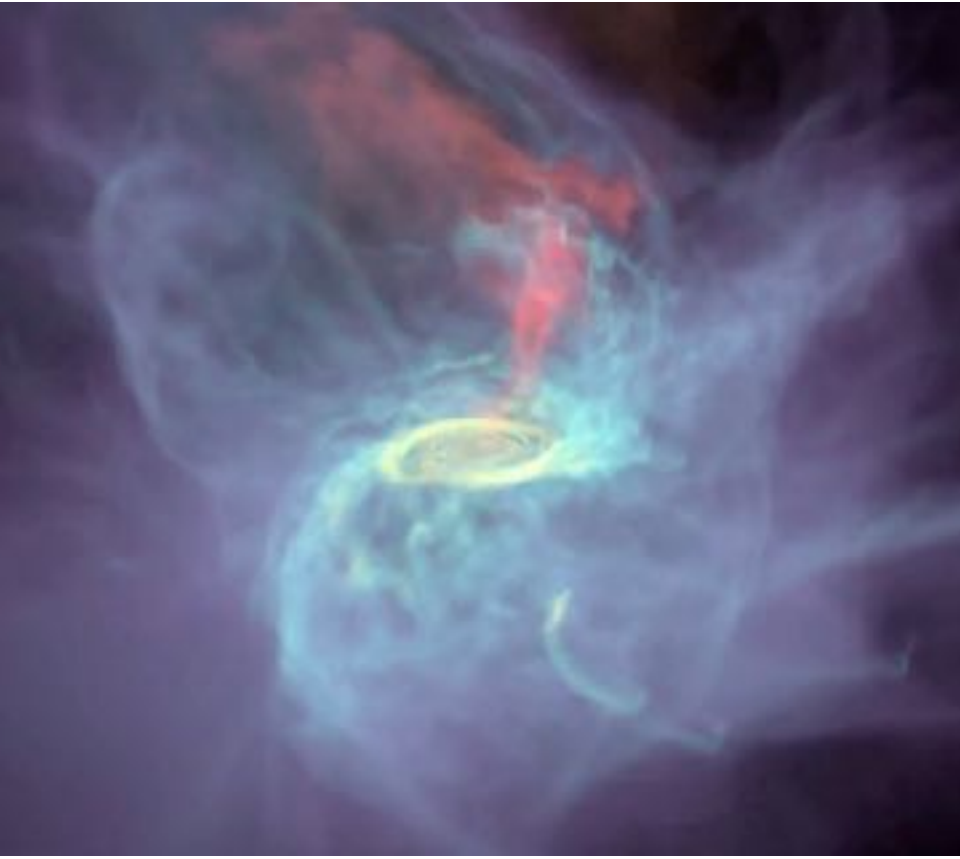


Michael Barad, Timothy Sandstrom, NASA/Ames

ASTROPHYSICS

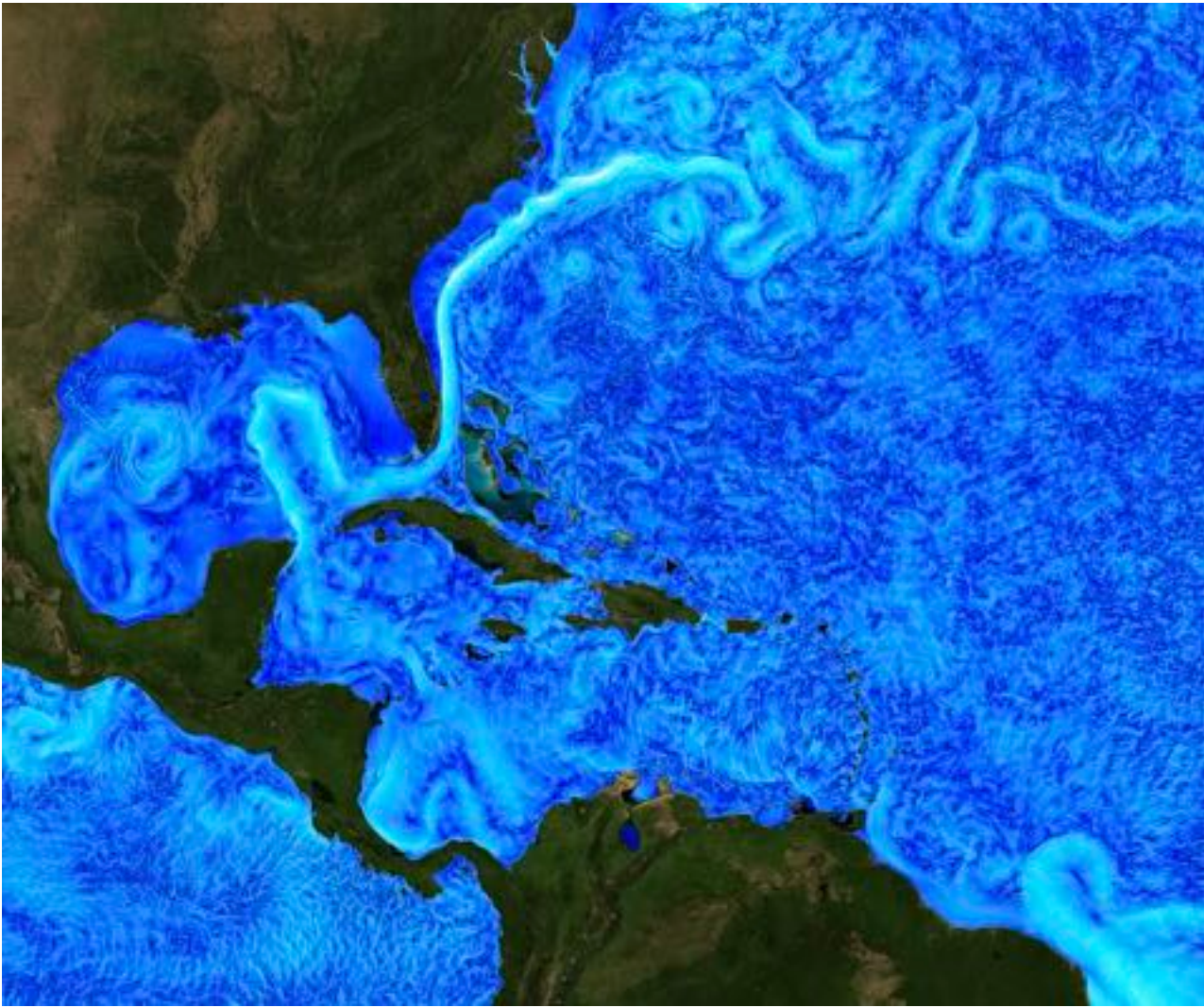


NASA/MIT/TESS; Roland Vanderspek, MIT

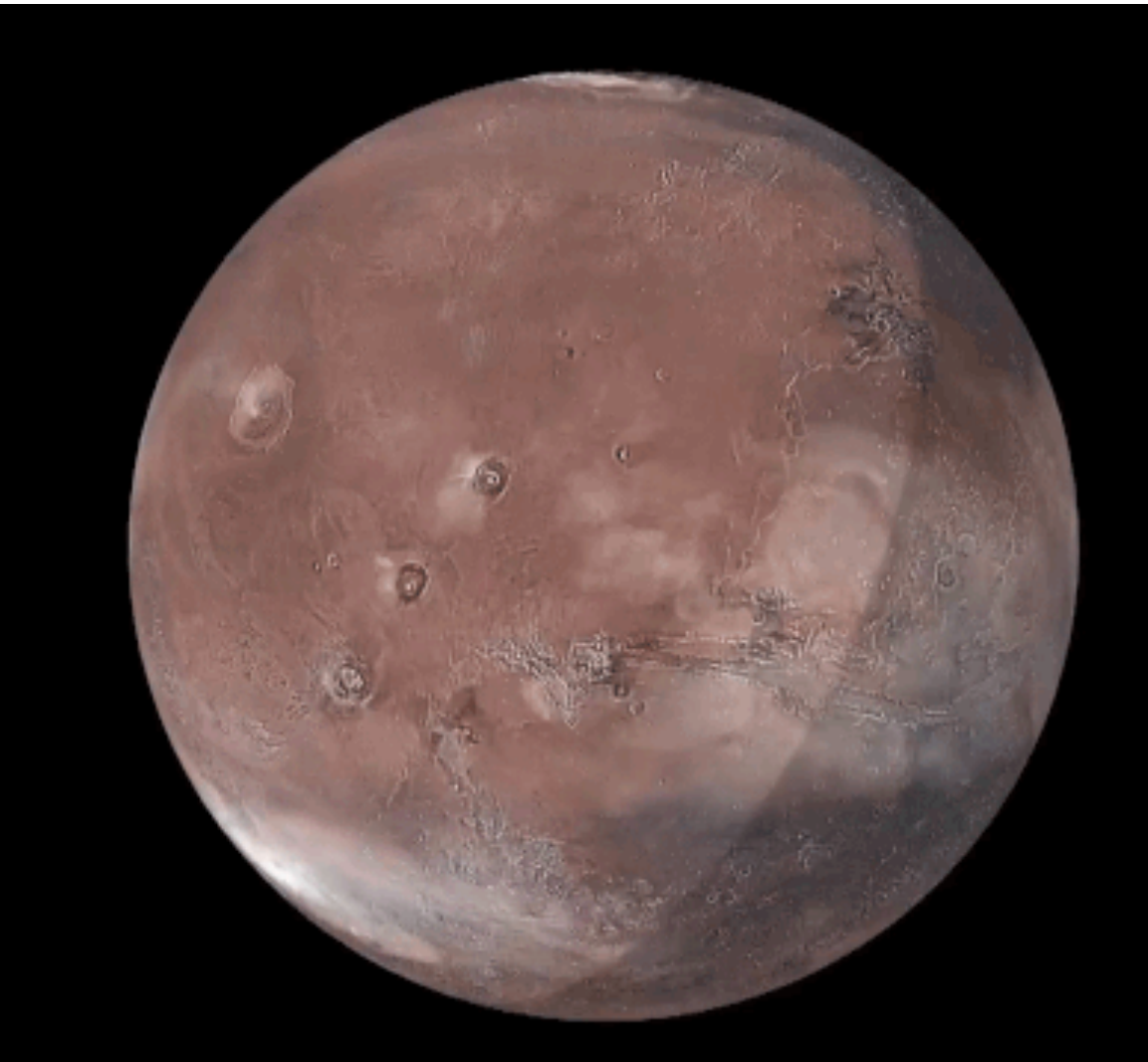


Timothy Sandstrom, NASA/Ames

EARTH & PLANETARY SCIENCE

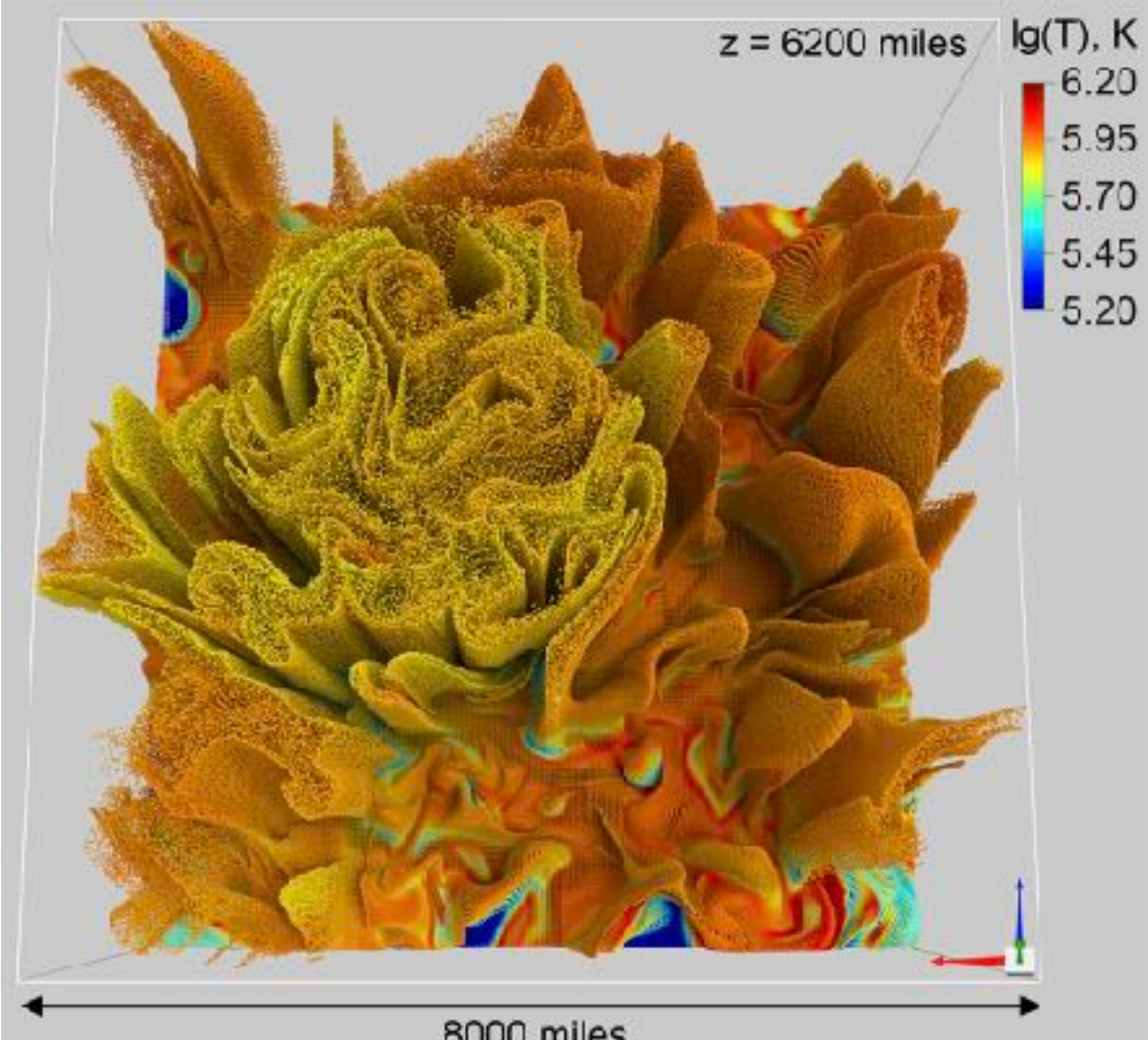


Chris Henze, NASA/Ames



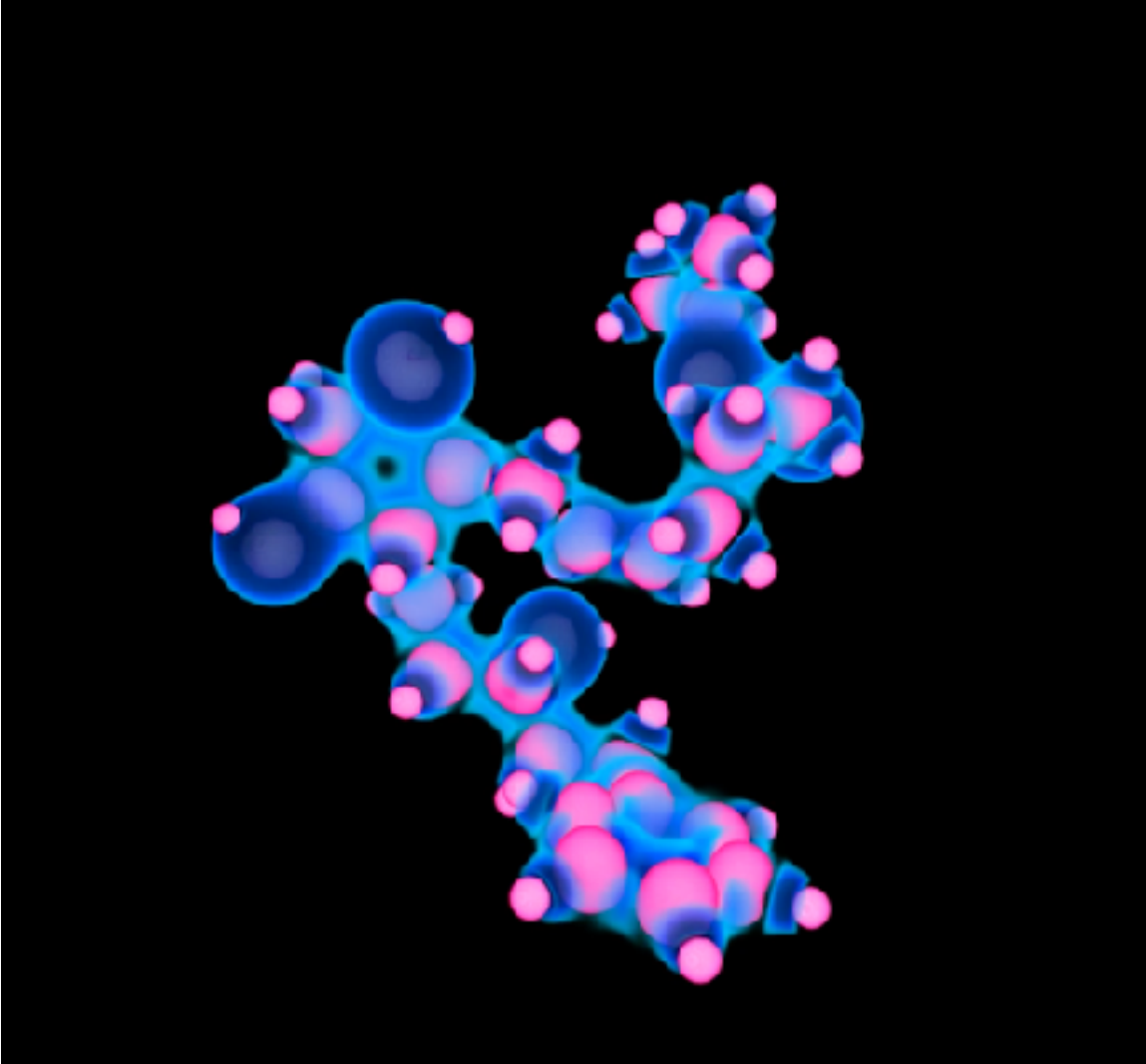
David Ellsworth, NASA/Ames

HELIOPHYSICS



Timothy Sandstrom, NASA/Ames

COVID-19



Chris Henze, NASA/Ames

VIS AT THE NAS

- We come with the compute!
 - Collaborate with NAS users to develop custom visualization and analysis products
 - Work primarily with grid data, point data, observational data
 - Assist with big data management and workflows
 - Primarily use custom software + open source rendering software

VIS AT THE NAS

HYPERWALL



- Manufacturer: SGI
- 128-screen tiled LCD wall arranged in 8x16 configuration; measures 23-ft. wide by 10-ft. high
- 128 nodes
- 2 ten-core Intel Xeon E5-2680v2 (Ivy Bridge) processors per node
- Processor speed: 2.8 GHz
- Cache: 25 MB for 10 cores
- Memory type: DDR3 registered DIMMs
- 64 GB per node
- 57 Tflop/s peak processing power
- Total cores: 2,560 processor cores
- 128 NVIDIA GeForce GTX 780 Ti graphics processing units
- Peak processing power: 646 Tflop/s
- 393 GB of GDDR5 graphics memory
- 200 TB BeeGFS filesystem built on the hyperwall SSDs



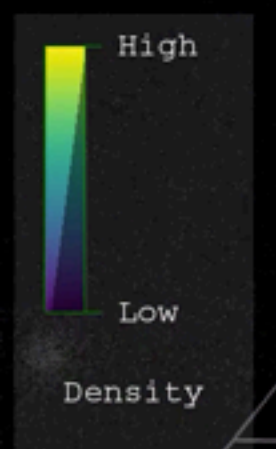
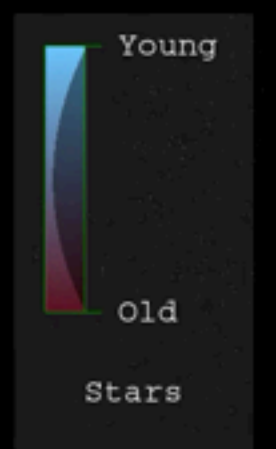
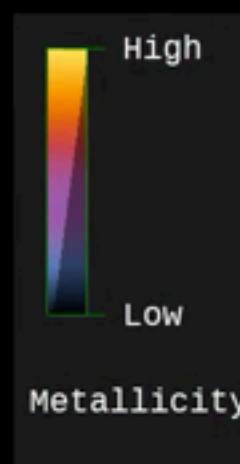
DEMOS!

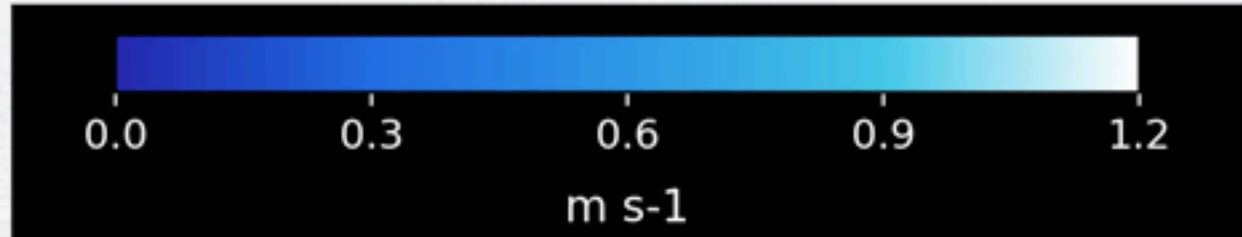
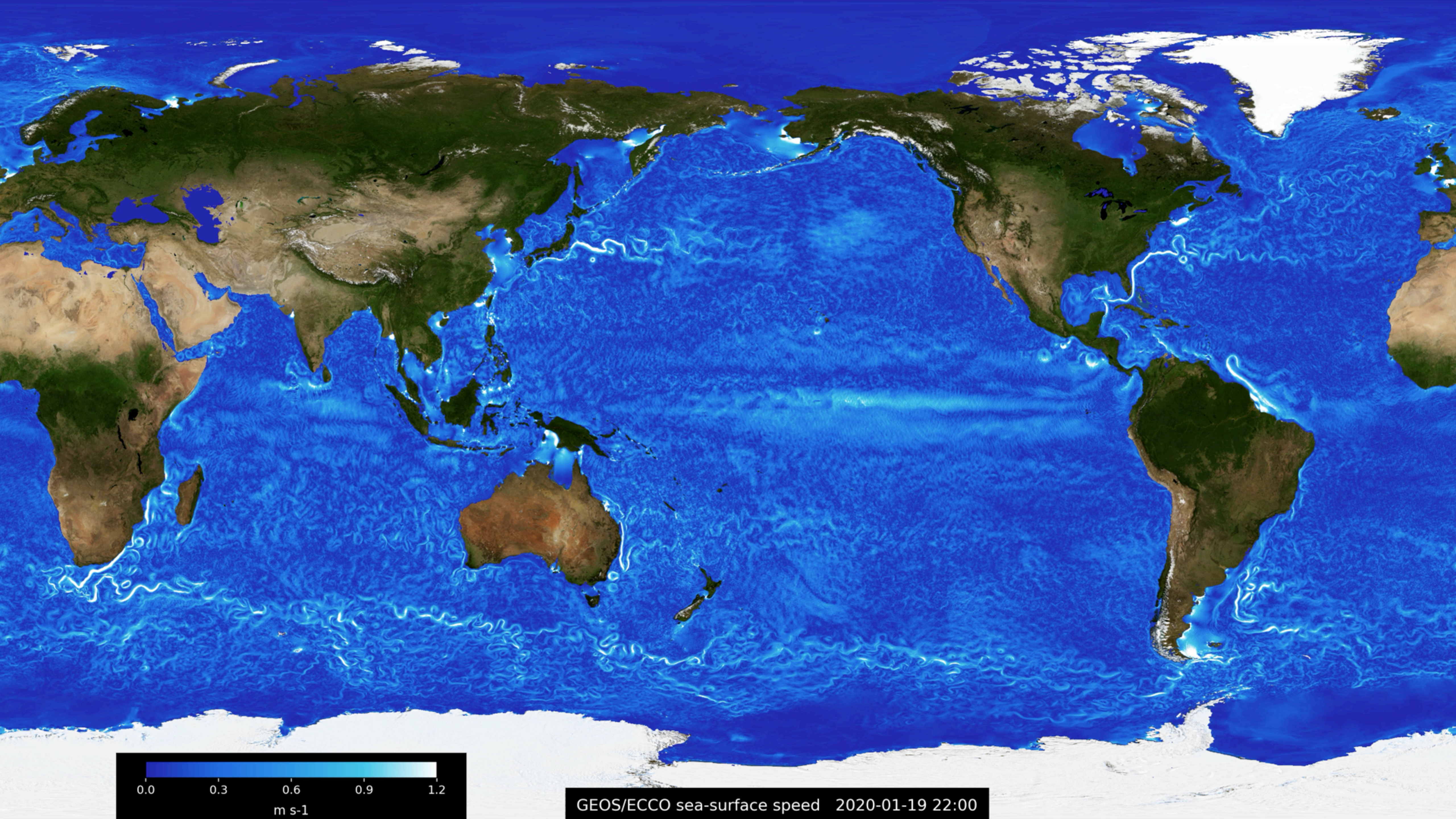


$t = 7.0 \text{ Gyr}$
 $z = 0.77$

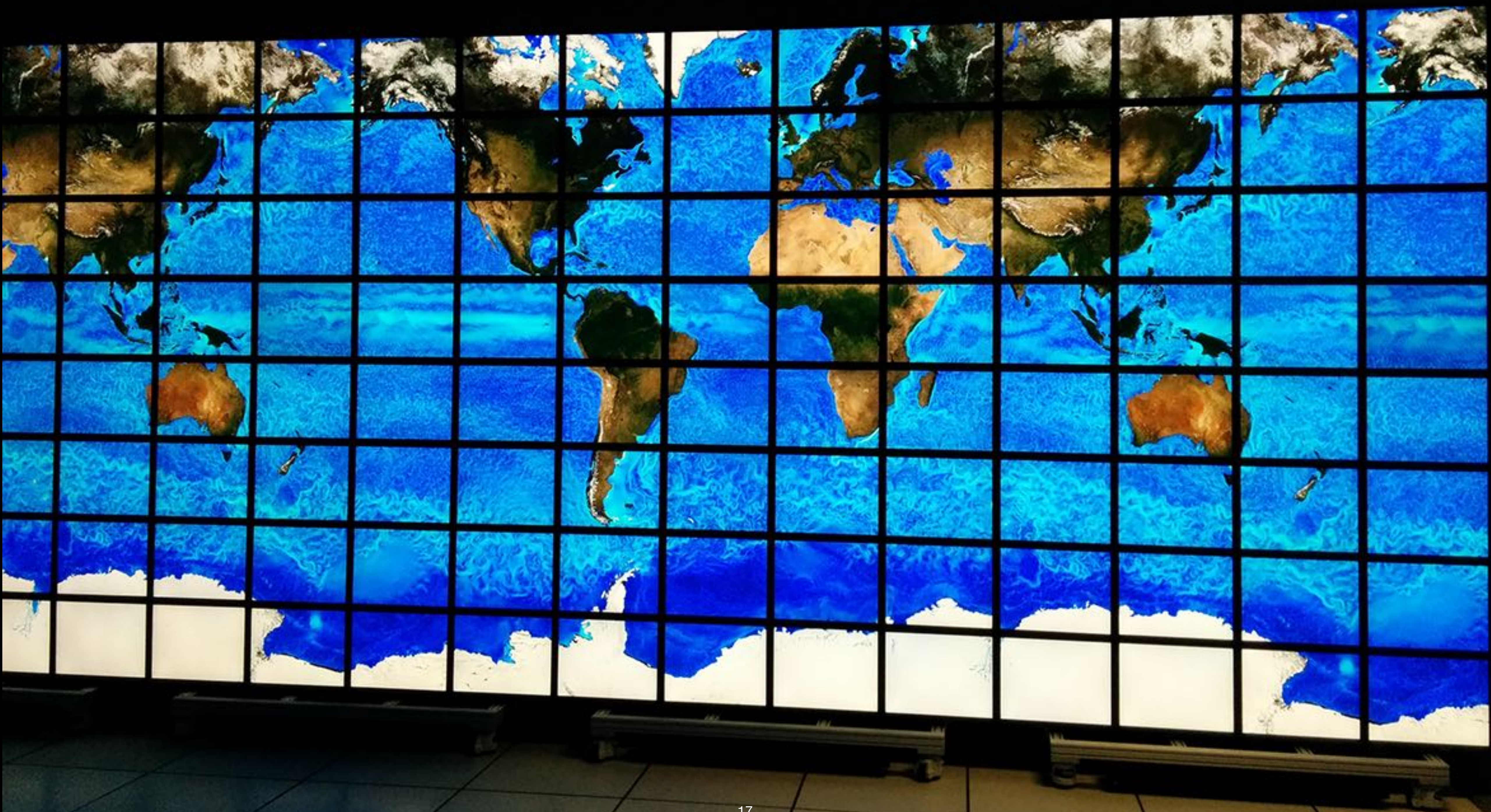


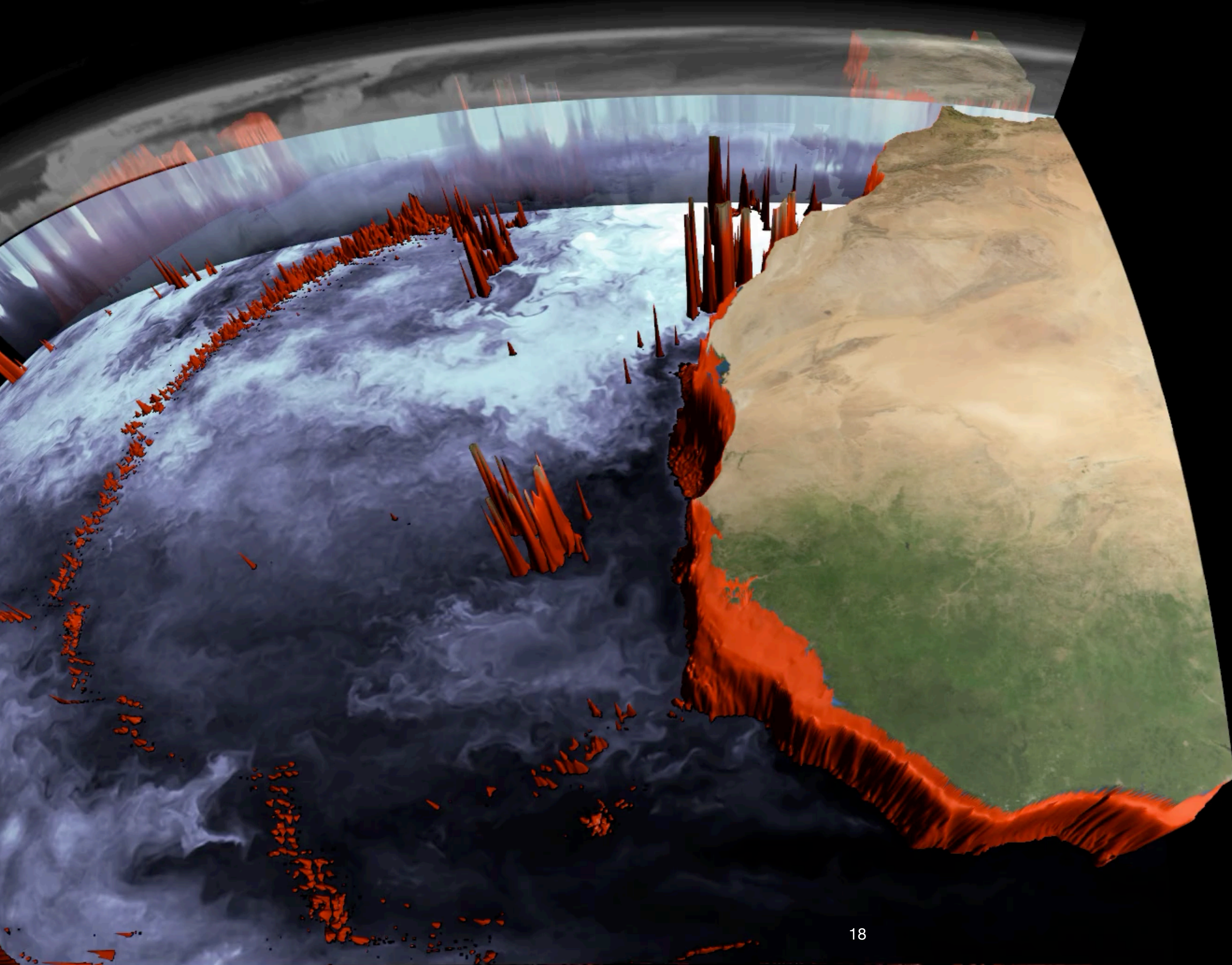
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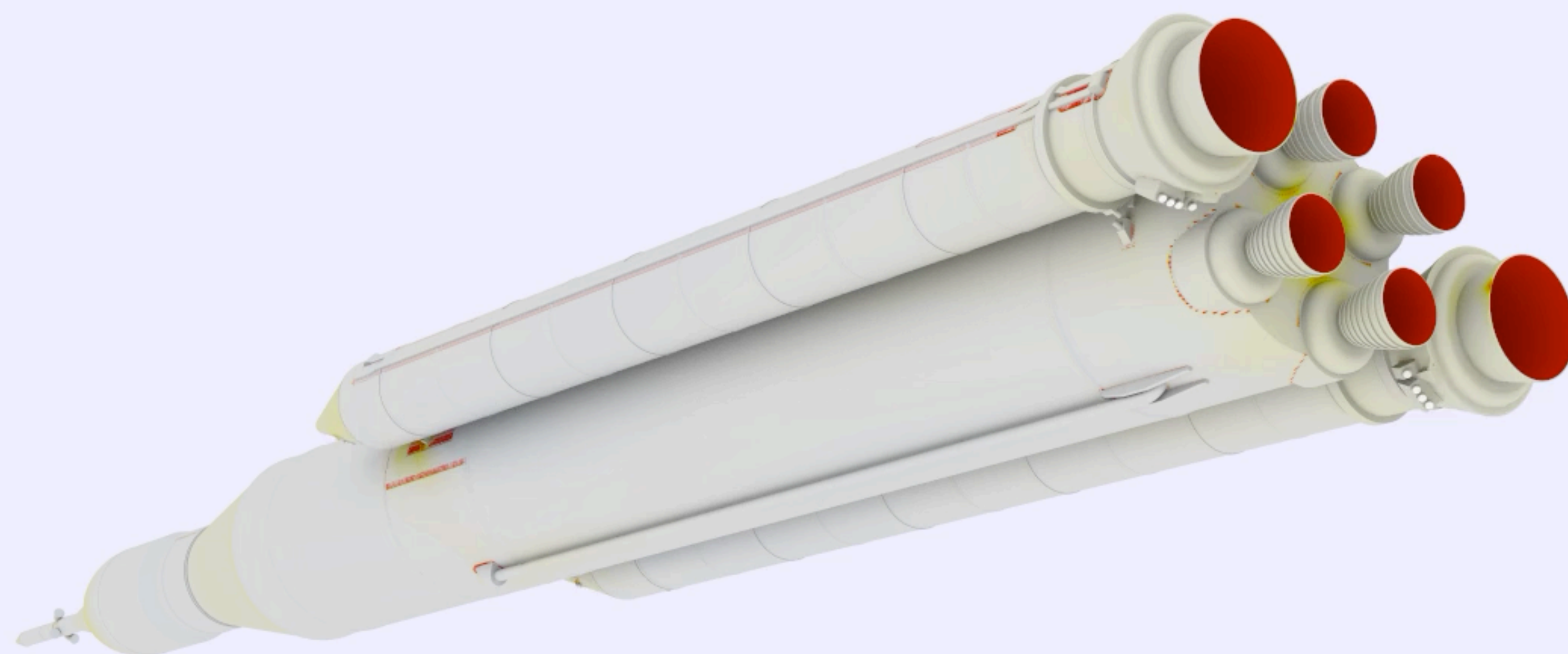


GEOS/ECCO sea-surface speed 2020-01-19 22:00

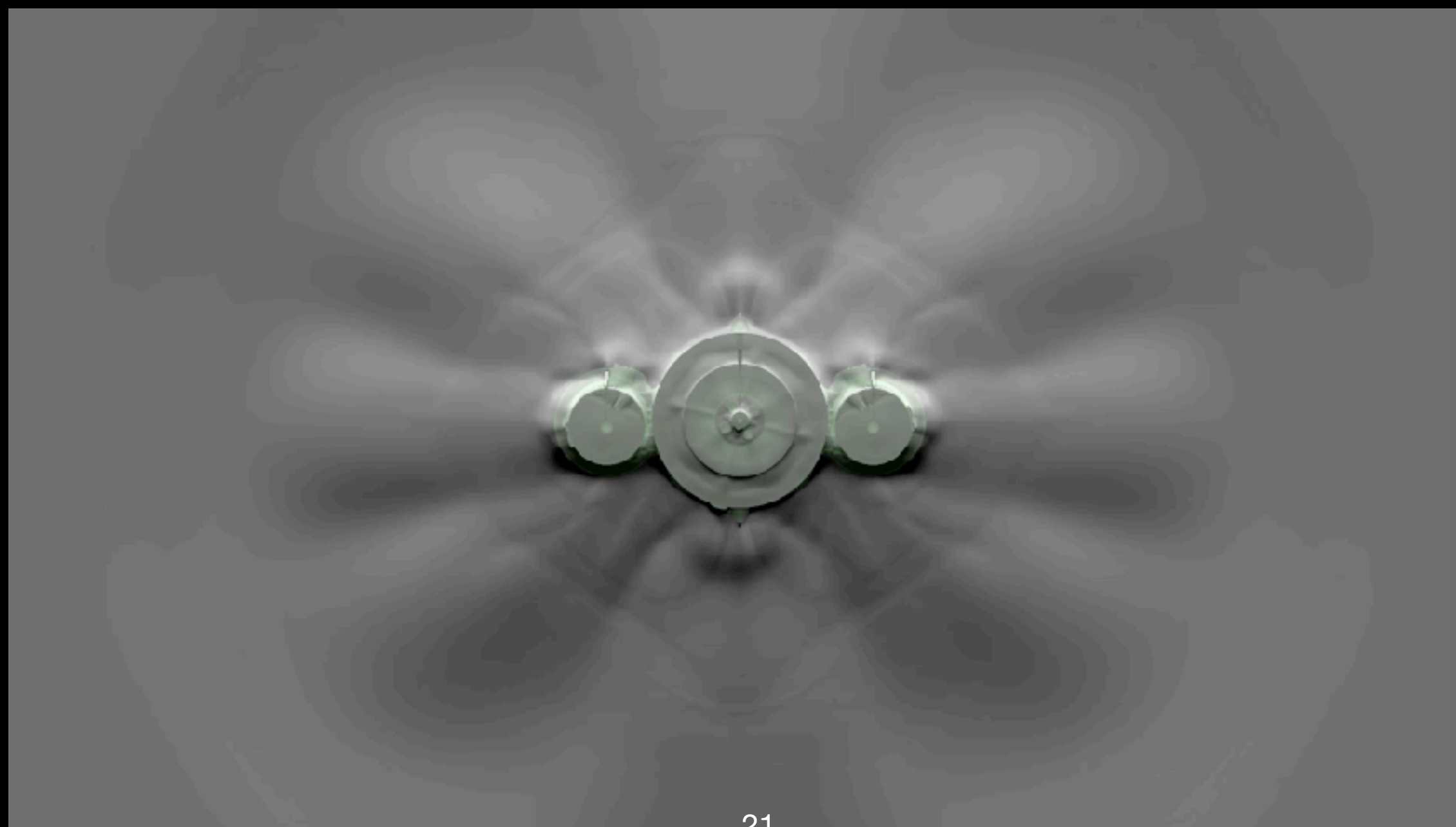
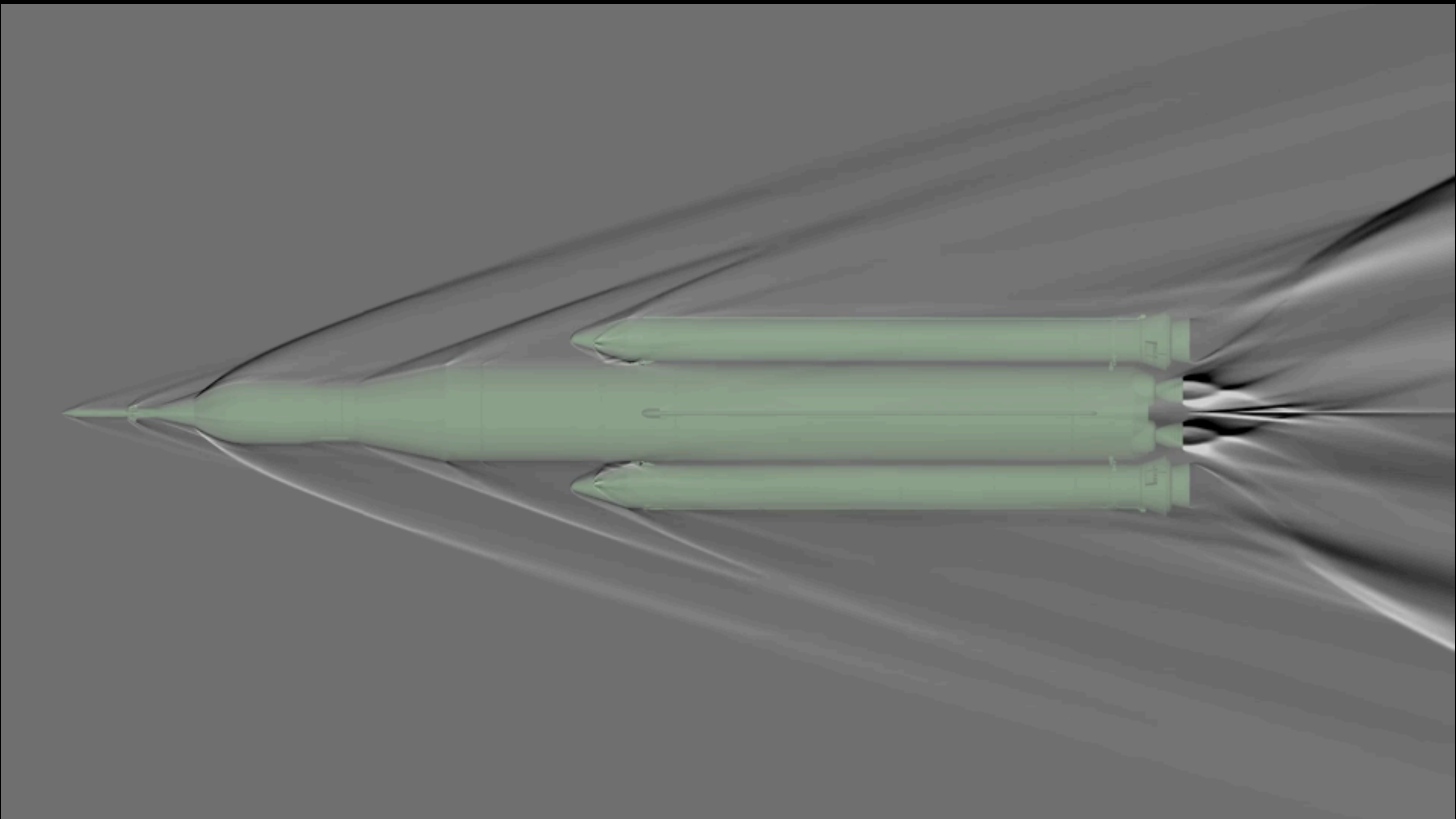
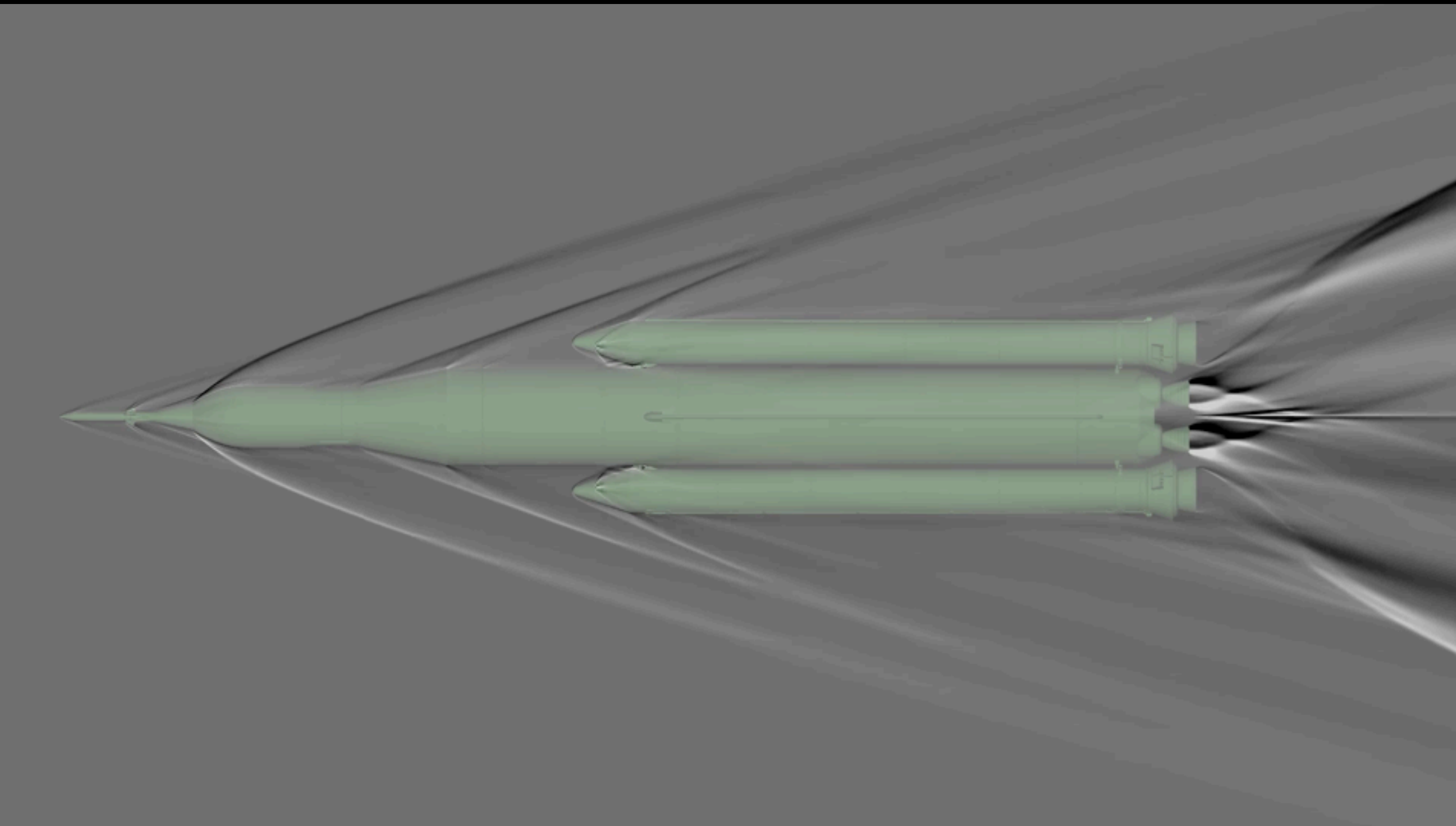








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Thank you!

Questions?

Nina McCurdy
nina.mccurdy@nasa.gov