Minority University - Space Interdisciplinary Network Project

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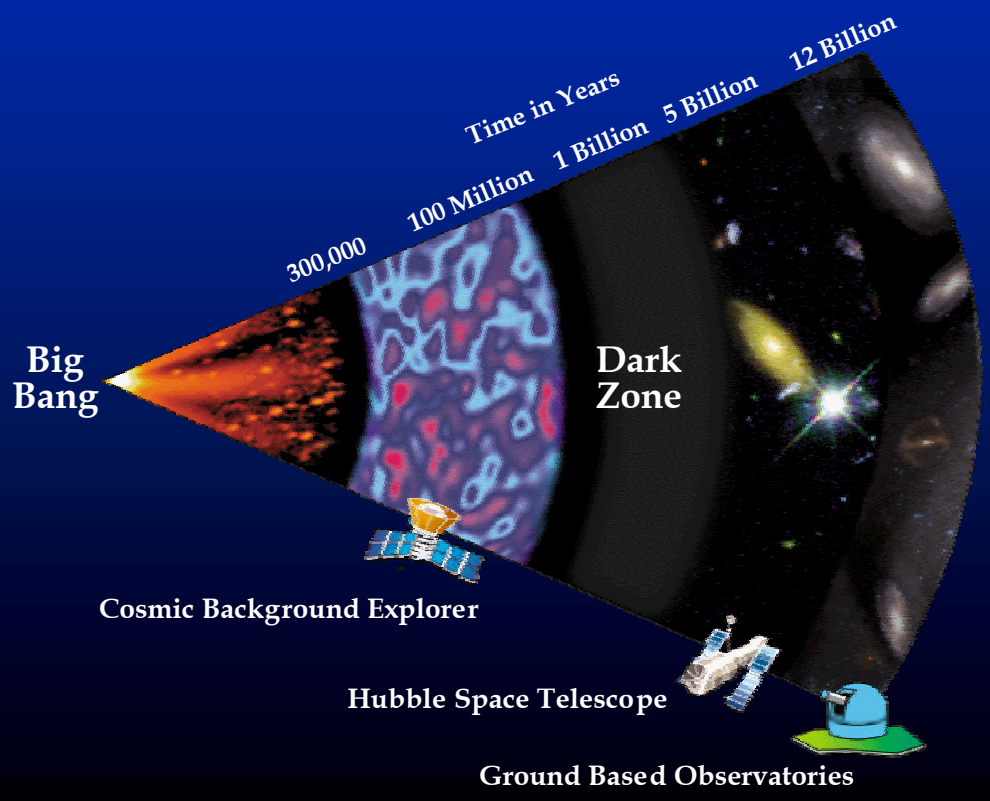
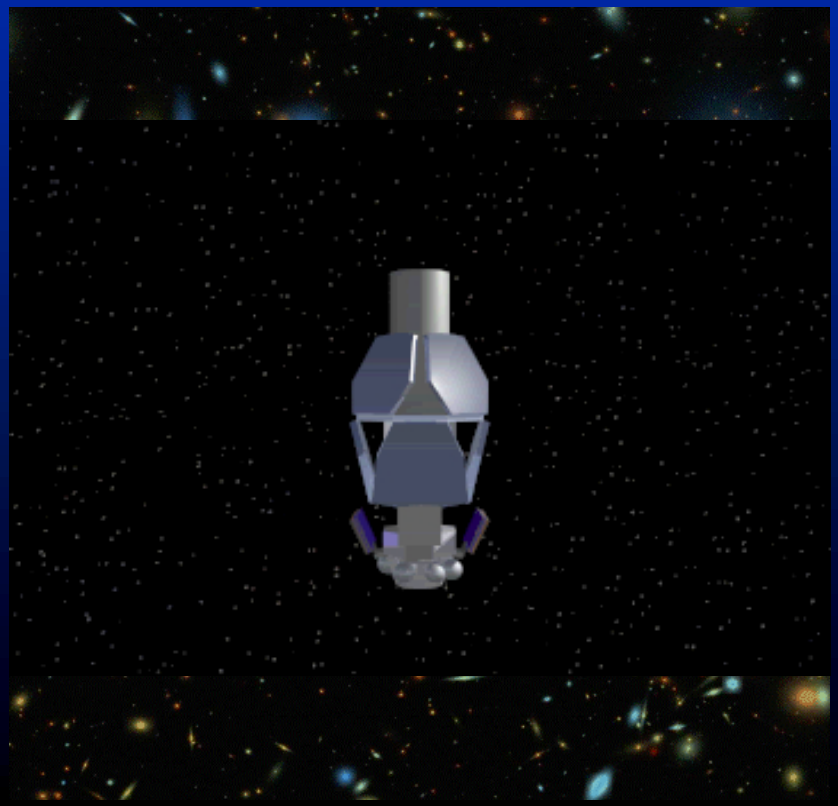
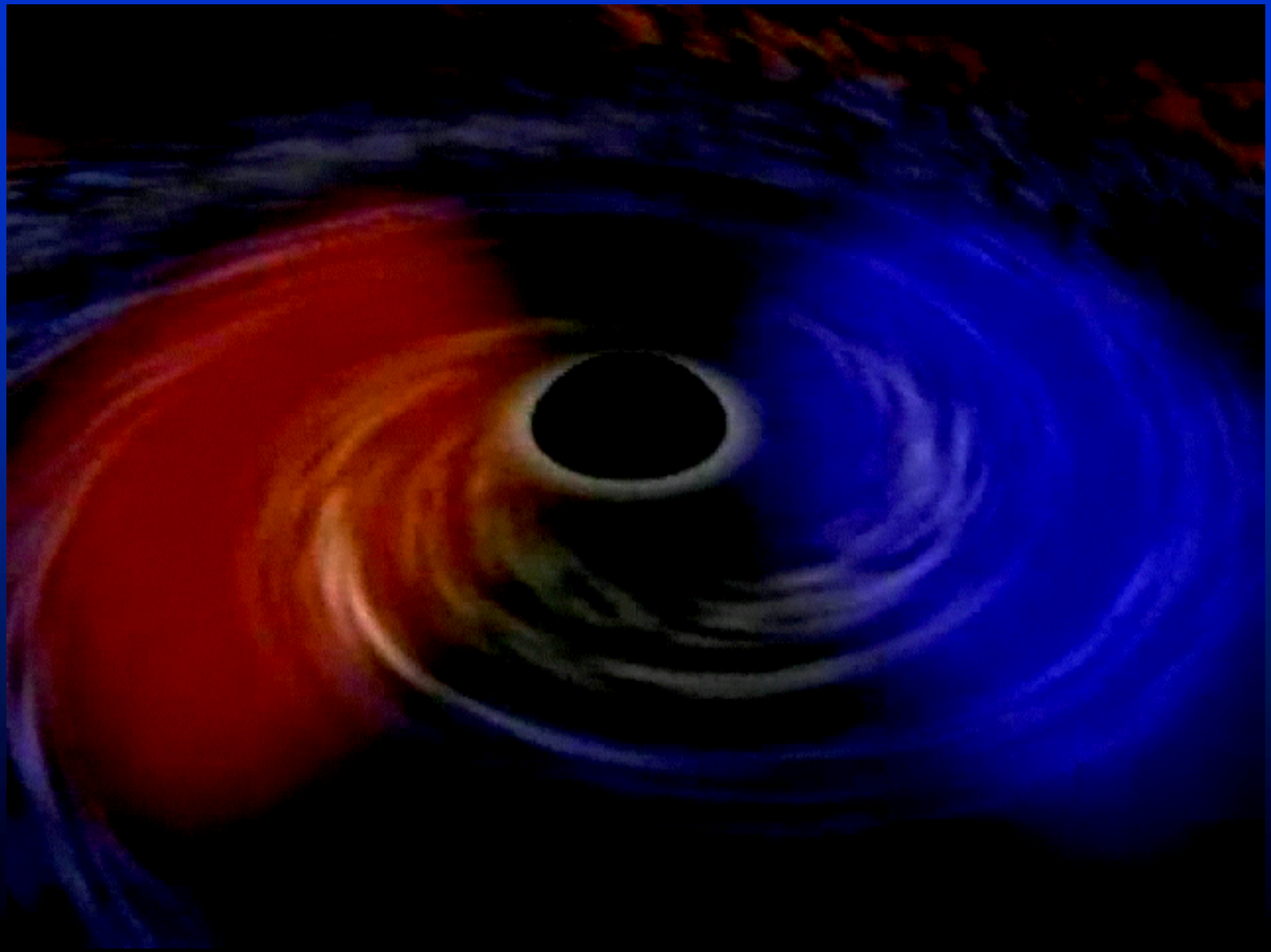
Visiting a Time When Galaxies Were Young

- NGST will observe the "dark zone," (100 million to 1 billion years after the Big Bang) a period when primordial seeds began to evolve into the galaxies and stars we see today



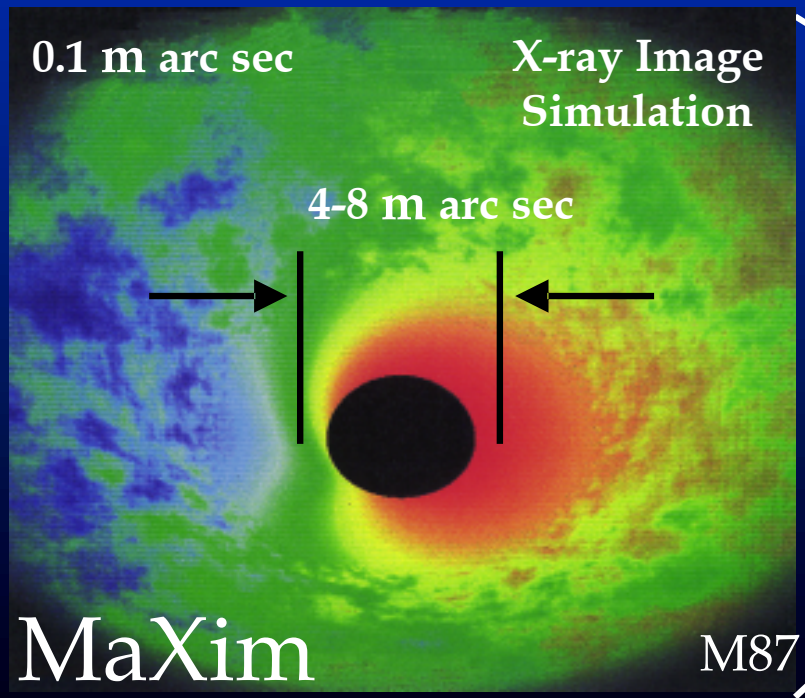




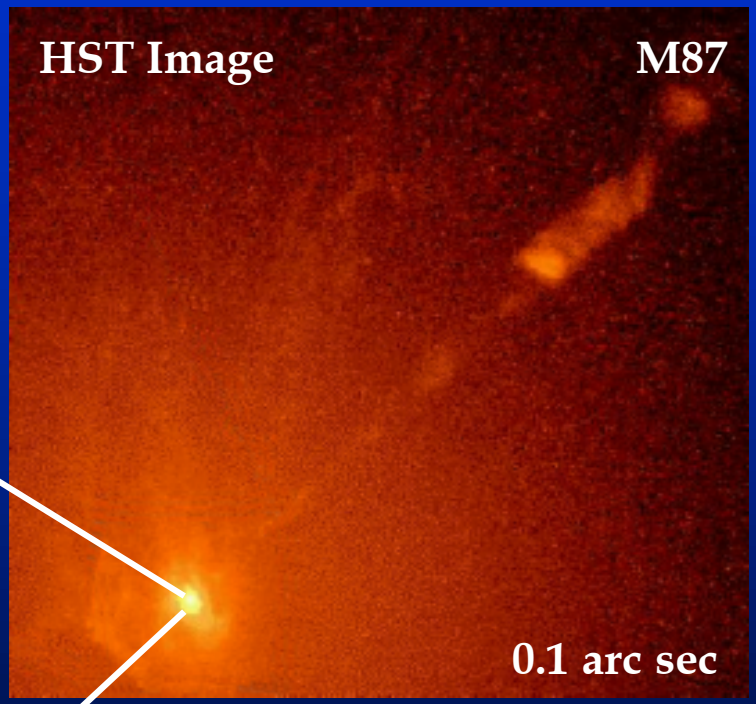
MaXim Micro Arc second X-ray Imaging Mission

Take direct image of a black hole event horizon

- Ultimate journey to visit a black hole
- Fundamental importance to physics
- Will capture the public imagination



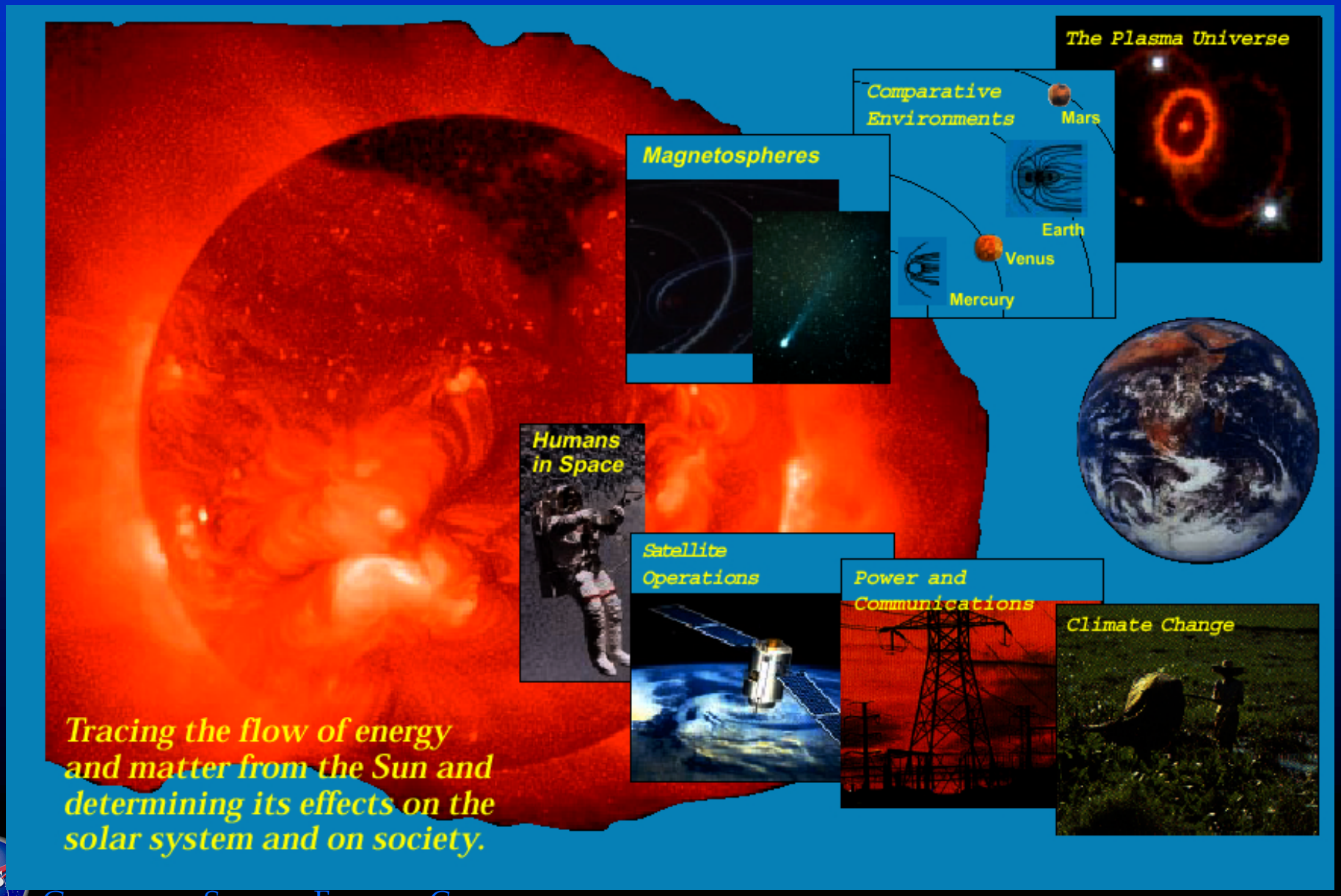
Requires 0.1-1 μ arc second imaging



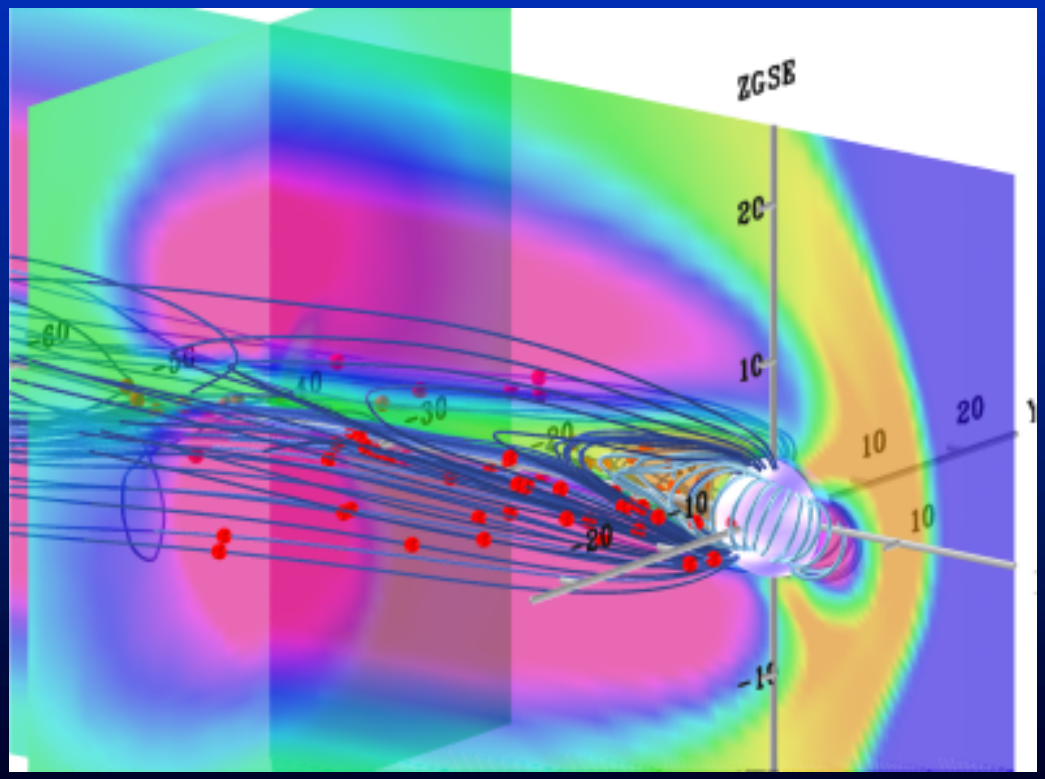
X-ray interferometry is the best approach

- Baseline of 20 m at 1 Å for 1 μ arc second
- Close to event horizon, energy is emitted in X-rays

Sun-Earth Connection Roadmap 2000-2020

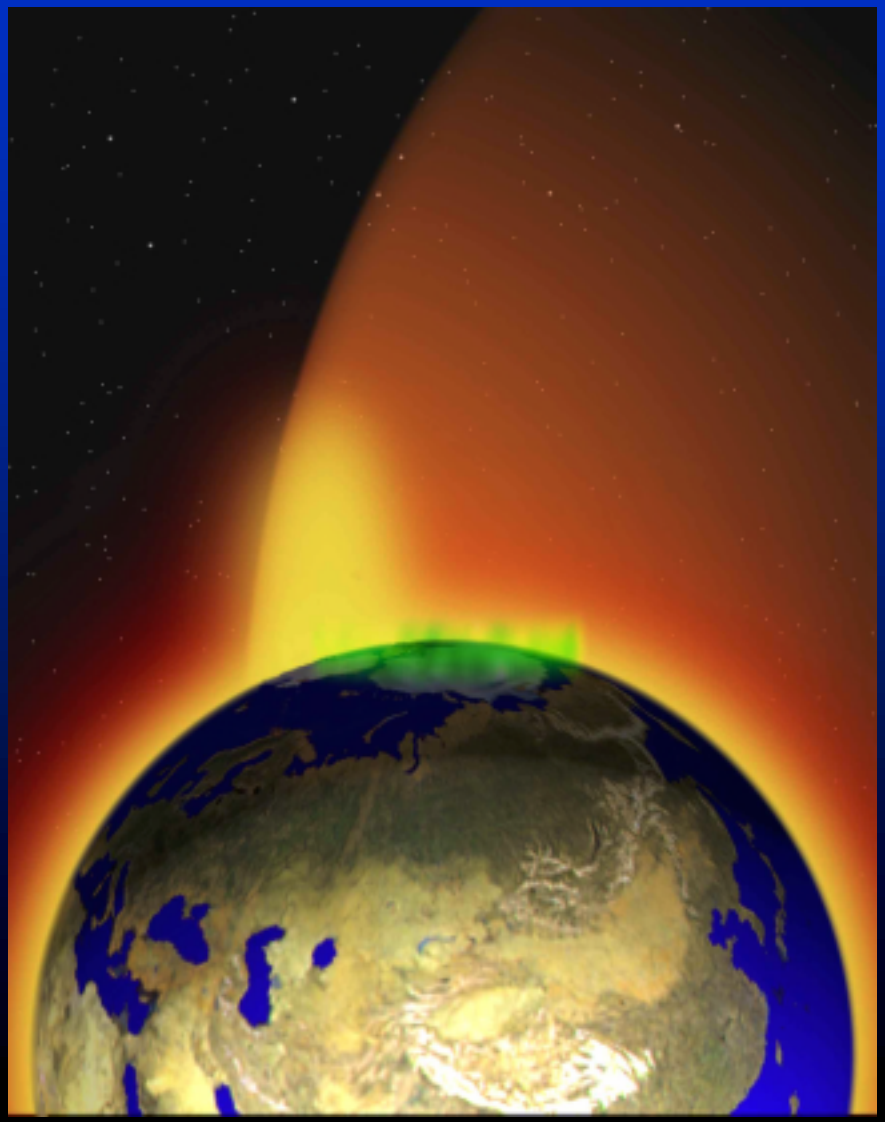


Magnetotail Constellation:
How does the magnetotail store, transport, and release matter and energy?



3D simulation courtesy of J. Raeder/UCLA

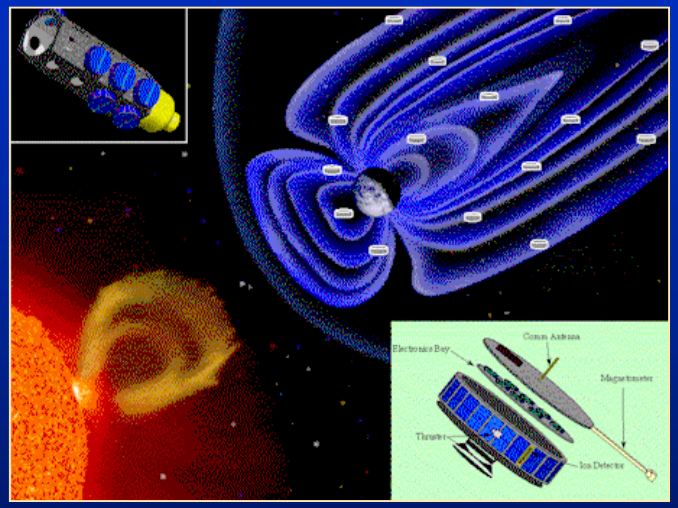
- Mission Description:
  - Constellation of 50-100 *nano-satellites* maps the magnetic and plasma flow fields.
- Measurement Strategy:
  - Simultaneous multi-point measurements.
  - Track fronts and vortexes as they are launched and travel in the magnetotail.

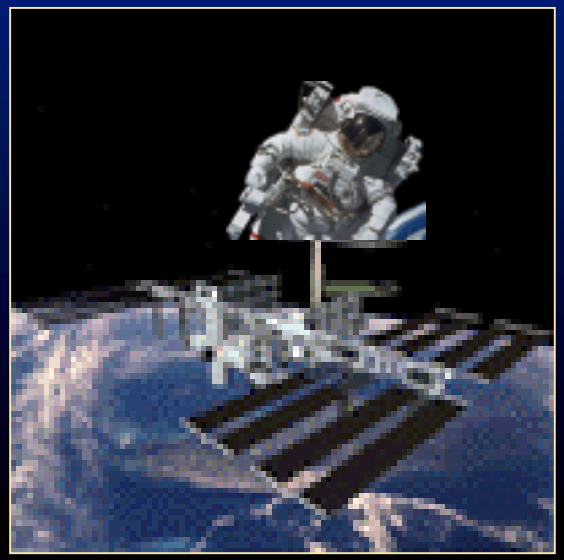


Where and When is Space Safe?

Predict Space Weather Throughout the Solar System, As We Do with Terrestrial Weather

- How to predict where and when space is hazardous
  - Space weather sensorweb
  - Observational networks between the Earth and the Sun
  - Continuous measurements of the global sun (including poles and far side)
  - Physics-based, virtual solar systems





- Can we make space safe?
  - Understand the natural processes that produce space radiation
  - Smart systems to compensate for outages; use predictions to protect systems and technology

The State of the Planet in 2020

- Changes in Climate
  - Continued increase in CO2
  - Possible shifts in precipitation
  - Possible shifts in ocean circulation
  - Impacts on ecosystems
- Population Growth
  - 5.5 B projected to 9 B by 2050
- Biodiversity
  - Habitat and species loss
  - Introduction of exotic species

Impact:

Habitability

Quality of Life

Economic Consequences

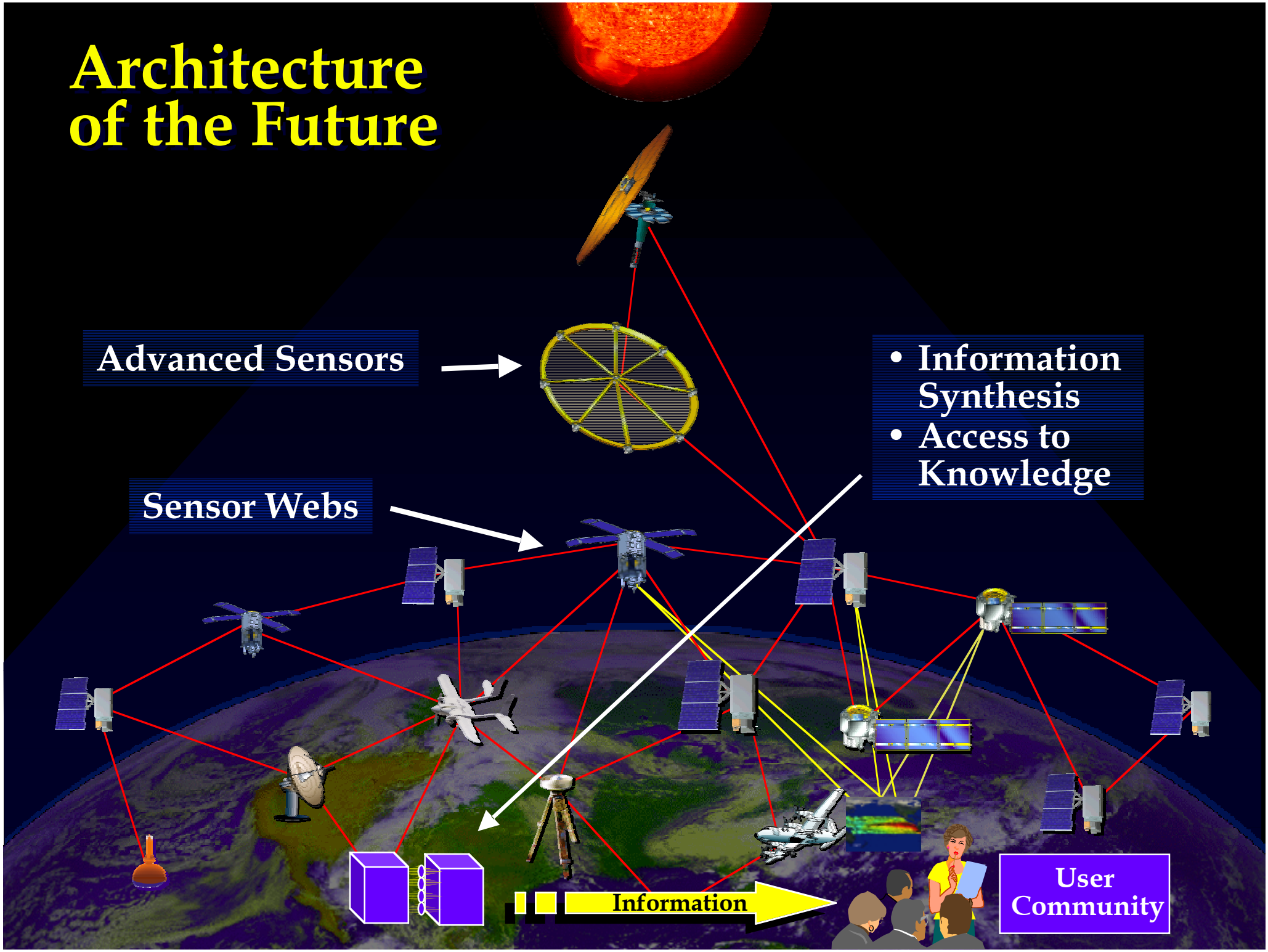
NASA's Earth Science Vision ...

What we can do in 10-20 years:

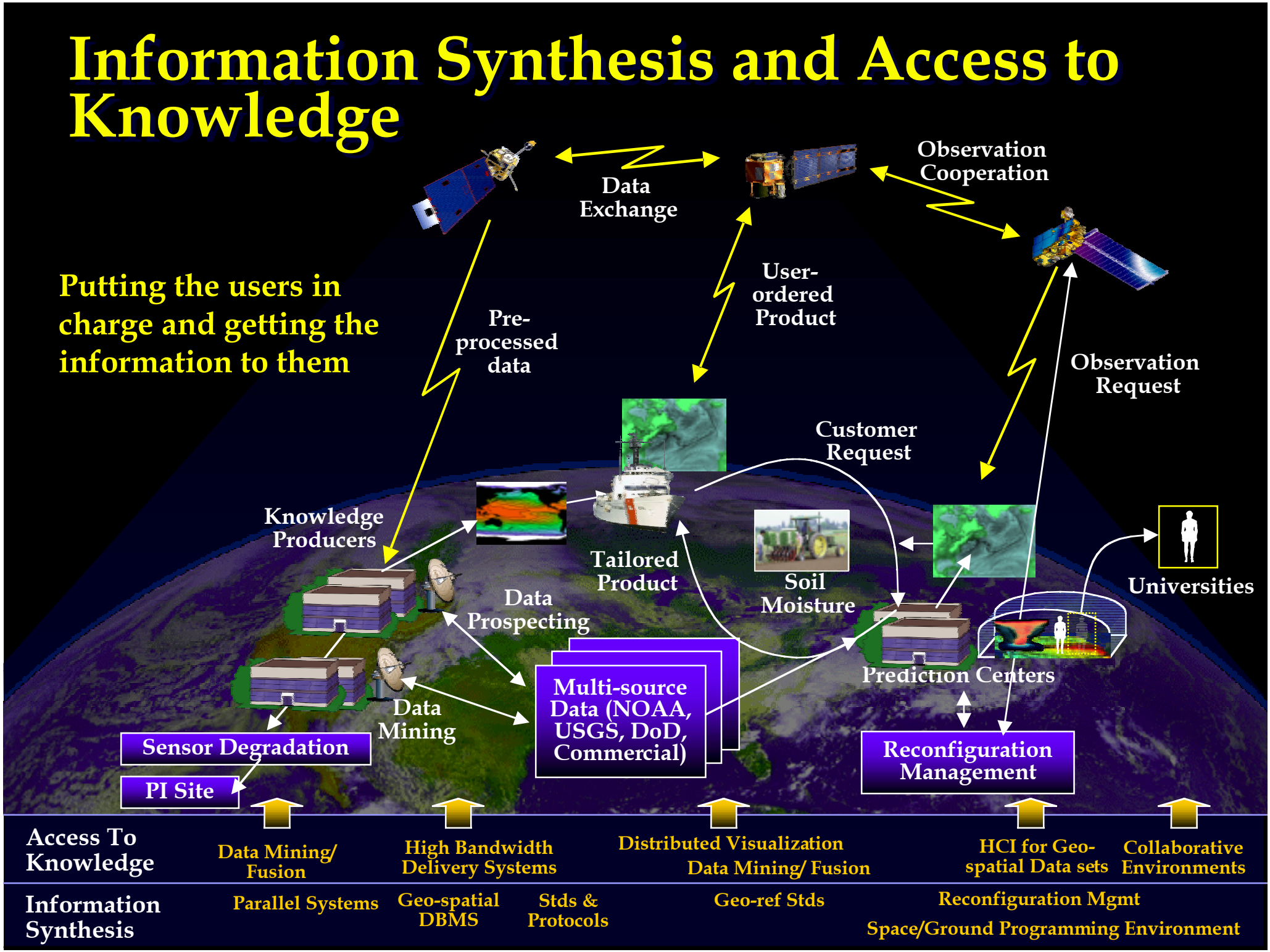
- *Enable* accurate 10-day weather prediction
- *Enable* accurate short range climate/environmental prediction (monthly-seasonal - interannual)
- *Enable* long-range climate/environmental prediction (decadal)
- *Enable* the prediction of global air and water quality
- *Enable* the prediction of natural hazards
- *Enable* the efficient management of natural resources

... Enable Proactive Environmental Prediction

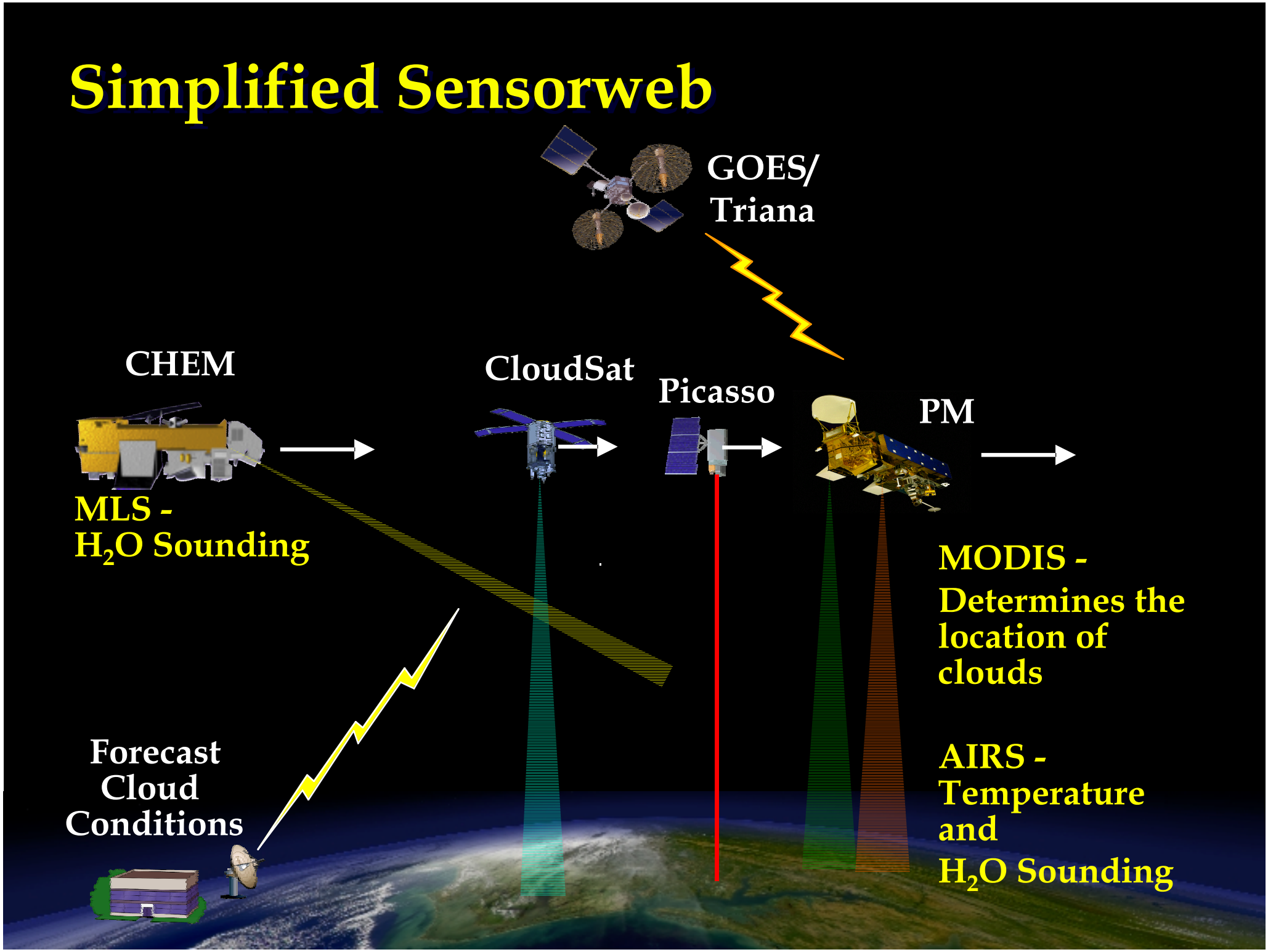
Architecture of the Future



Information Synthesis and Access to Knowledge

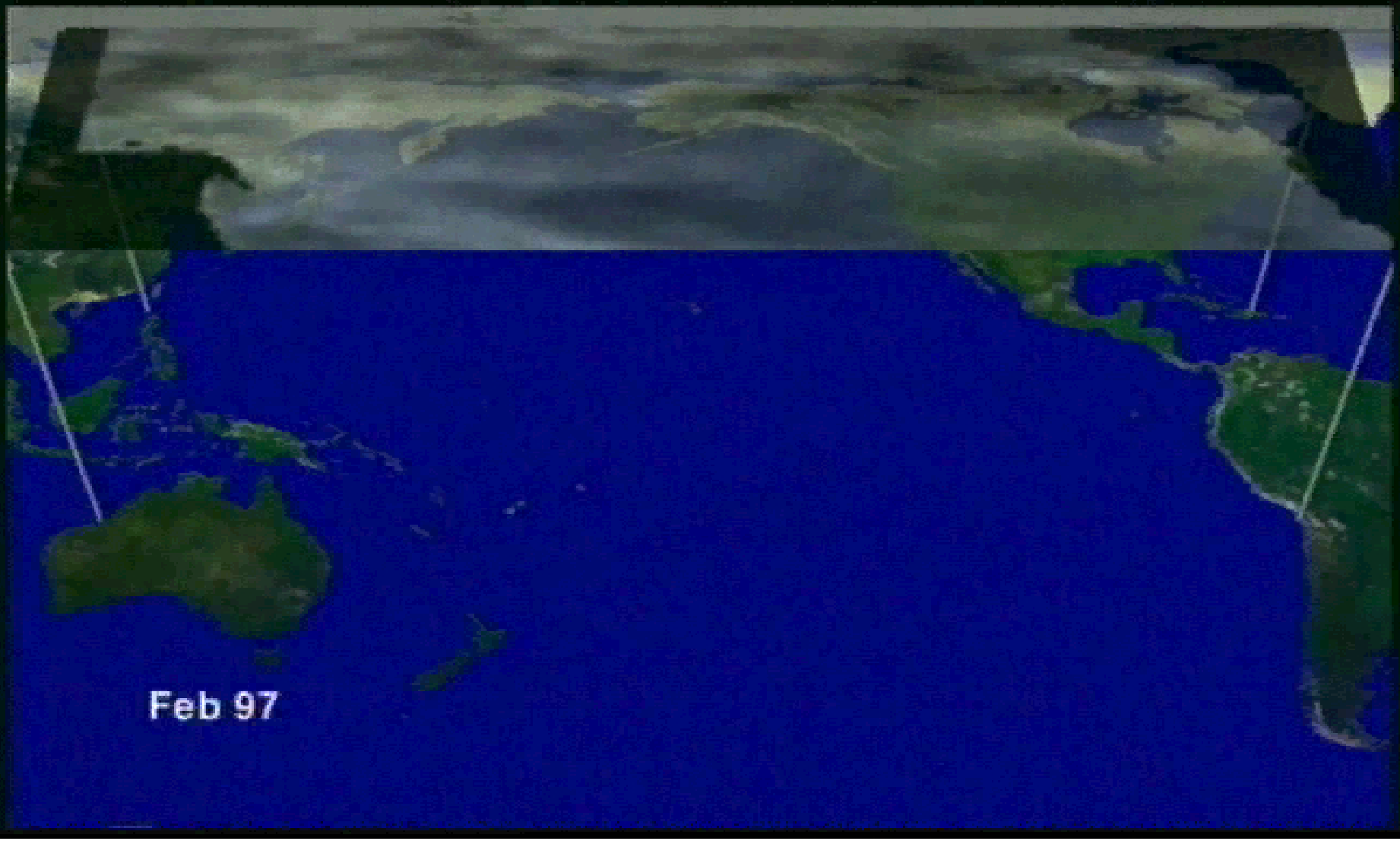


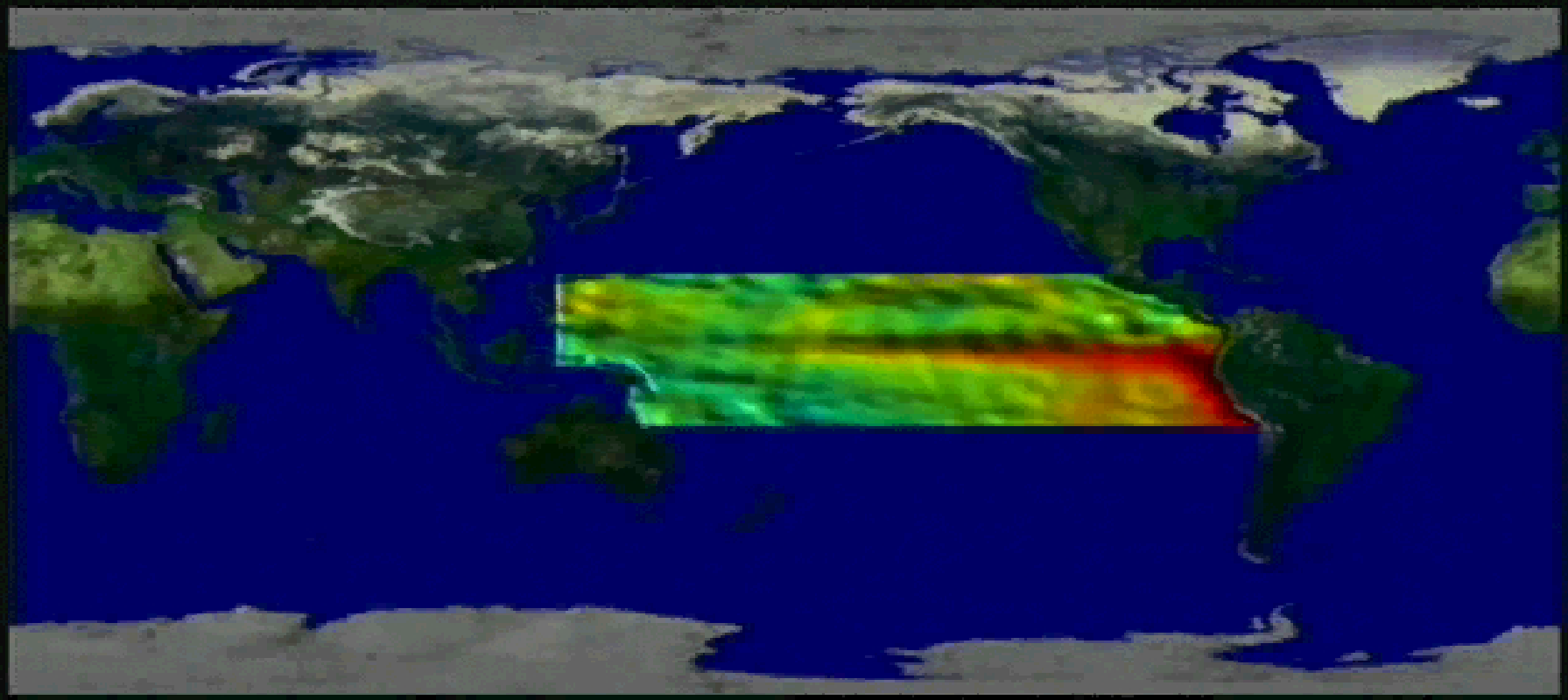
Simplified Sensorweb

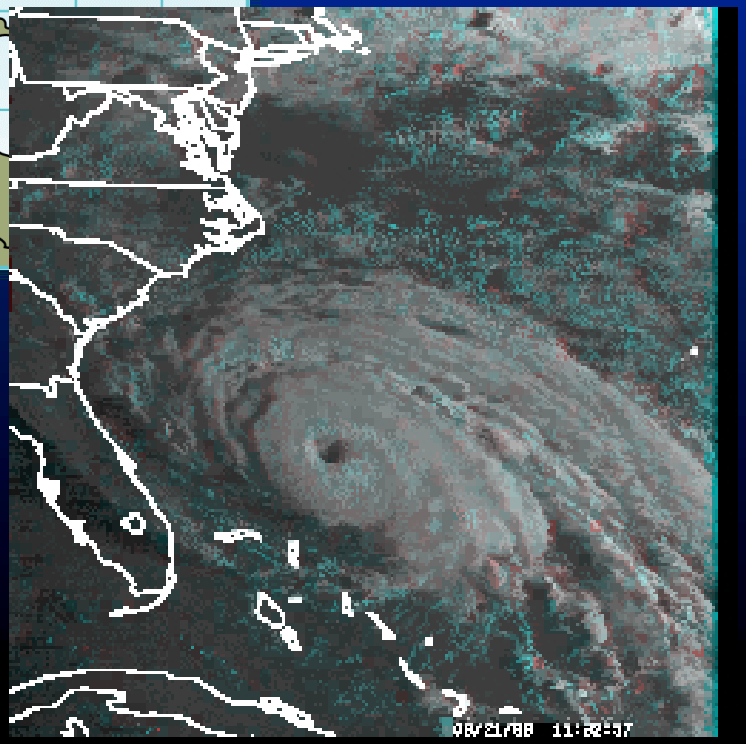


Highly Coupled Interactive Modeling

Data from 3 Satellites for a Simplified Sensor Web View of ENSO



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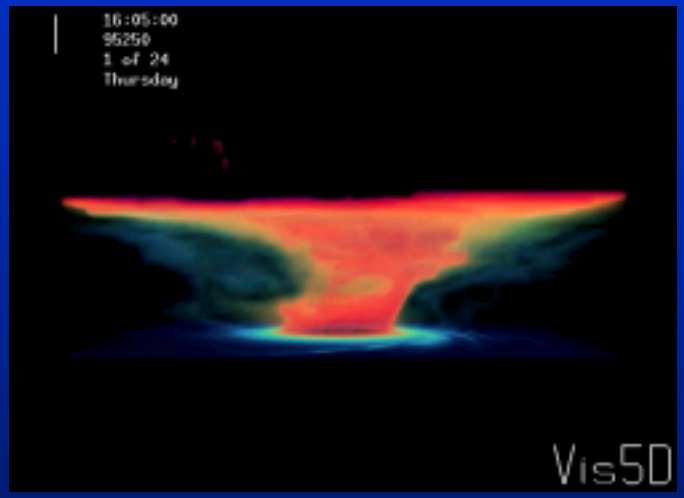
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1 of 24
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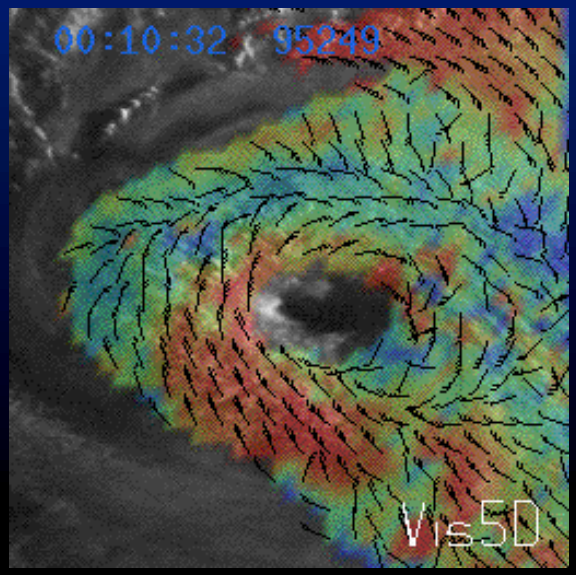
Vis5D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Vis5D

Real-Time Nowcast/Forecast

What crops should I grow next summer?

Managing the End-to-End Information Flow

Petabytes

Multi-platform, multi-parameter, high spatial and temporal resolution, remote & in-situ sensing

Autonomous, In-space Calibration and Data Reduction

Terabytes

Interaction Between Modeling/Forecasting and Observation Systems

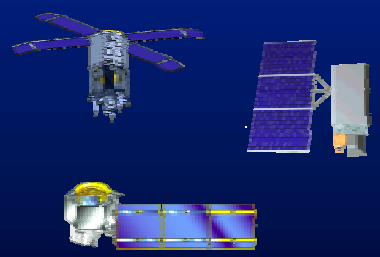
Gigabytes

Interactive Dissemination

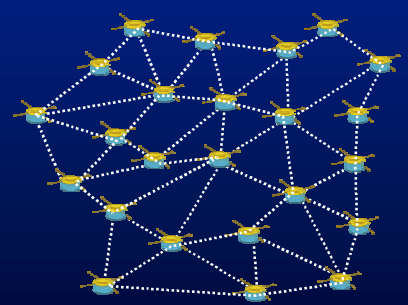
Predictions

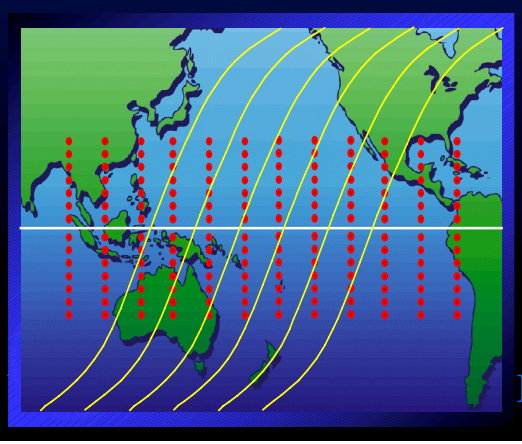
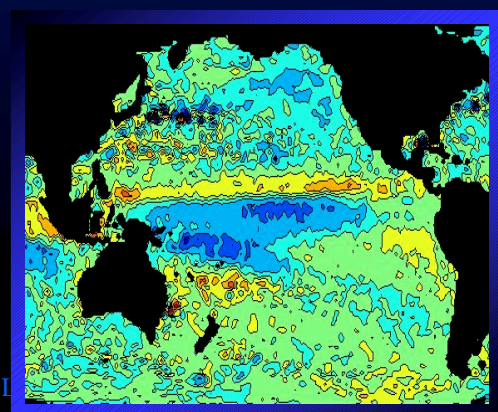
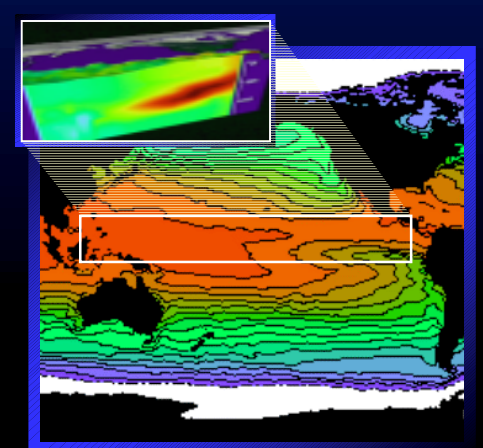
Megabytes

Advanced Sensors



Sensorwebs



Information Synthesis

Access to Knowledge