

The NASA Astrophysics Program

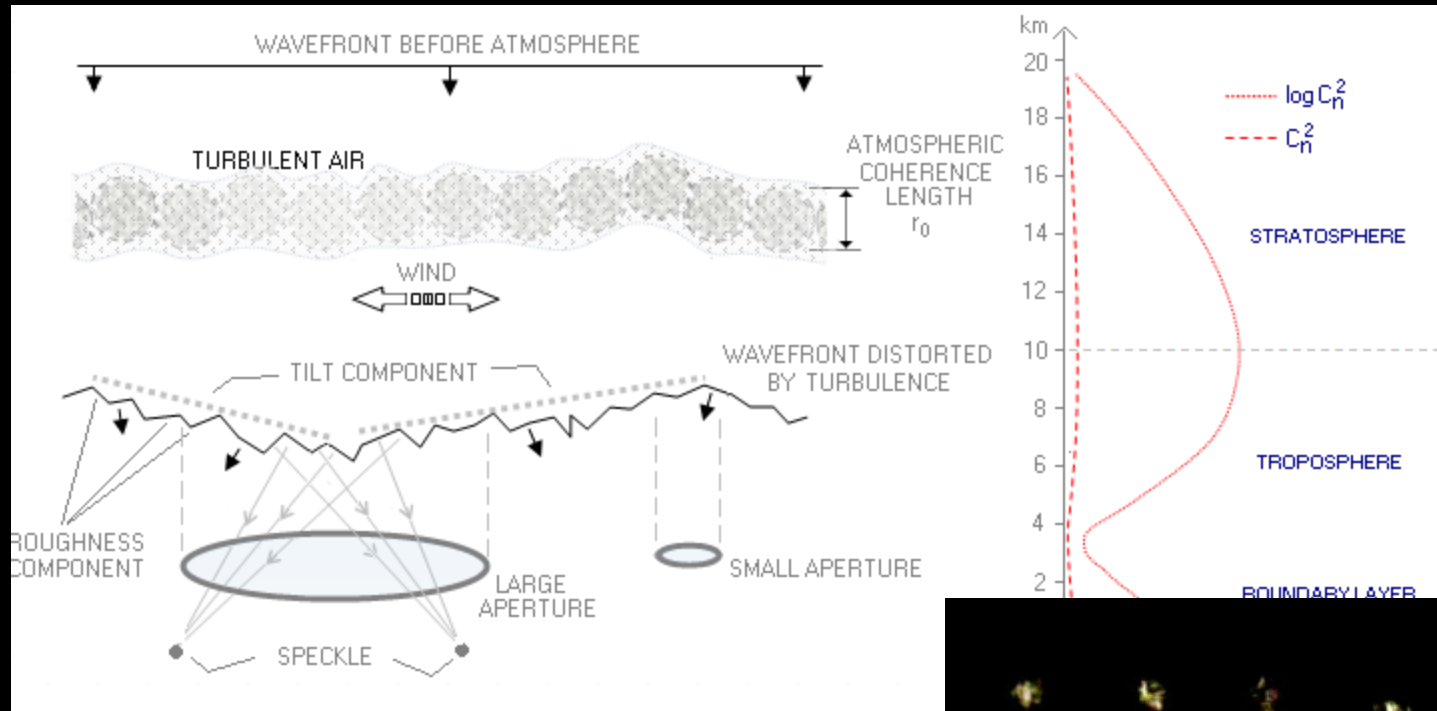
Cloudy Skies Ahead?

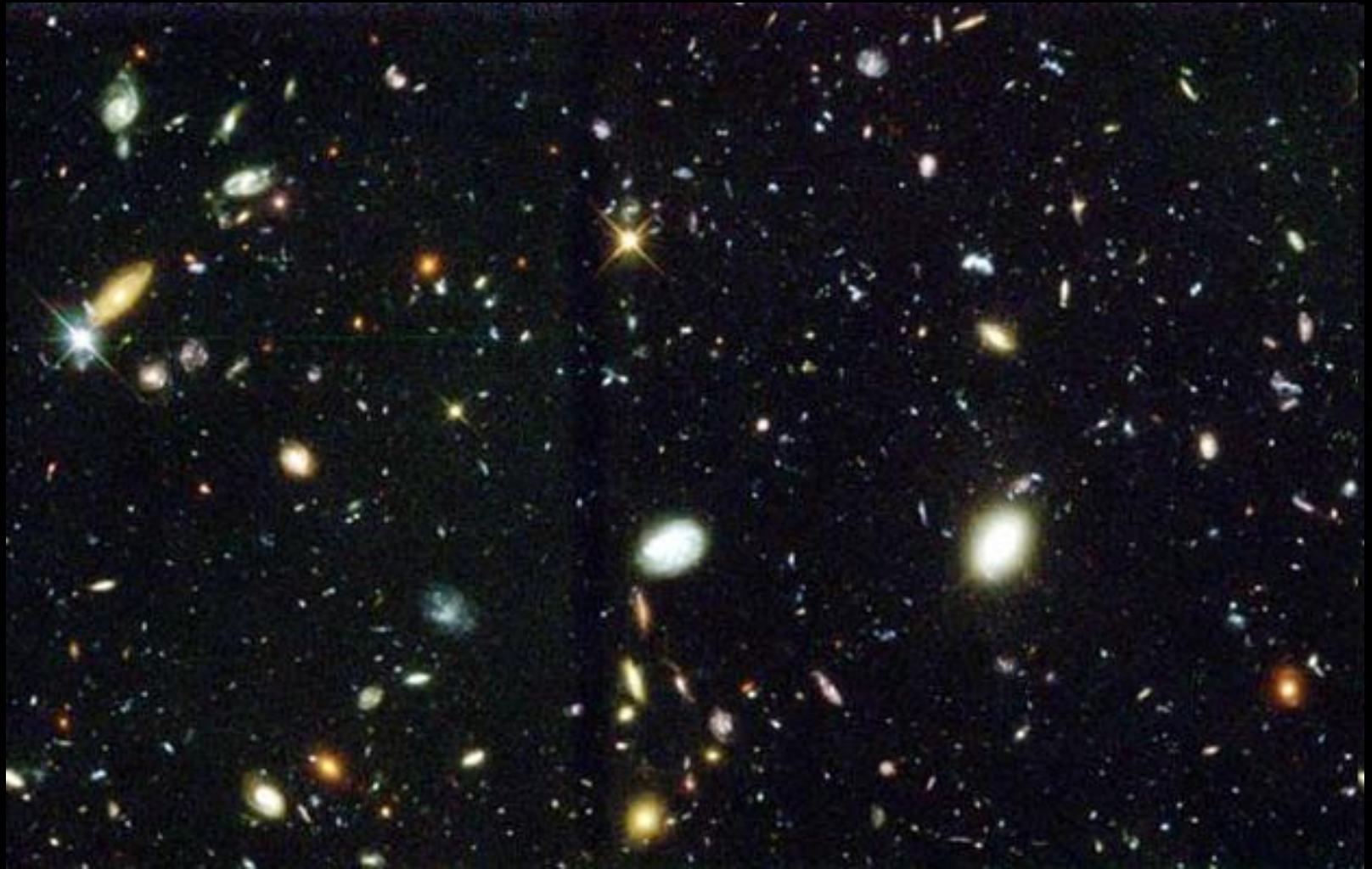


Why does Astrophysics need NASA? (or why do astronomy from space?)

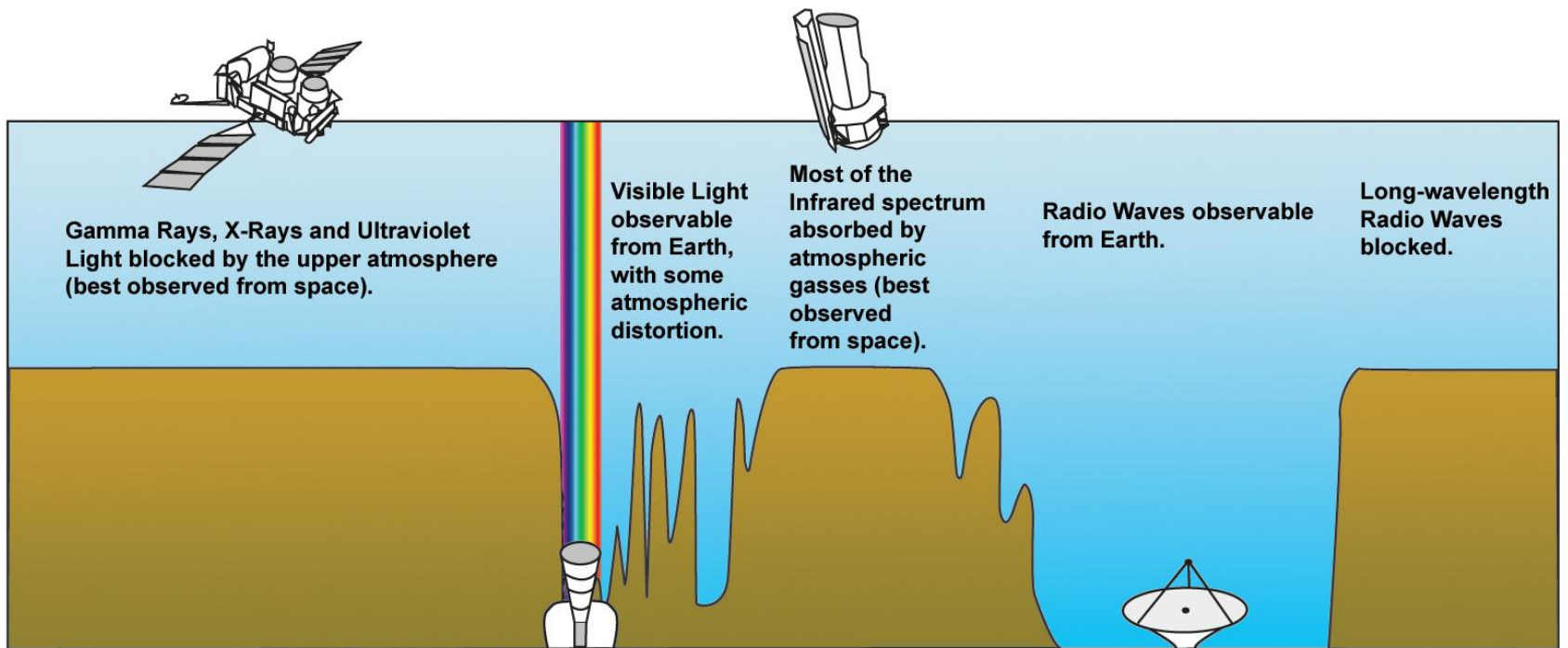
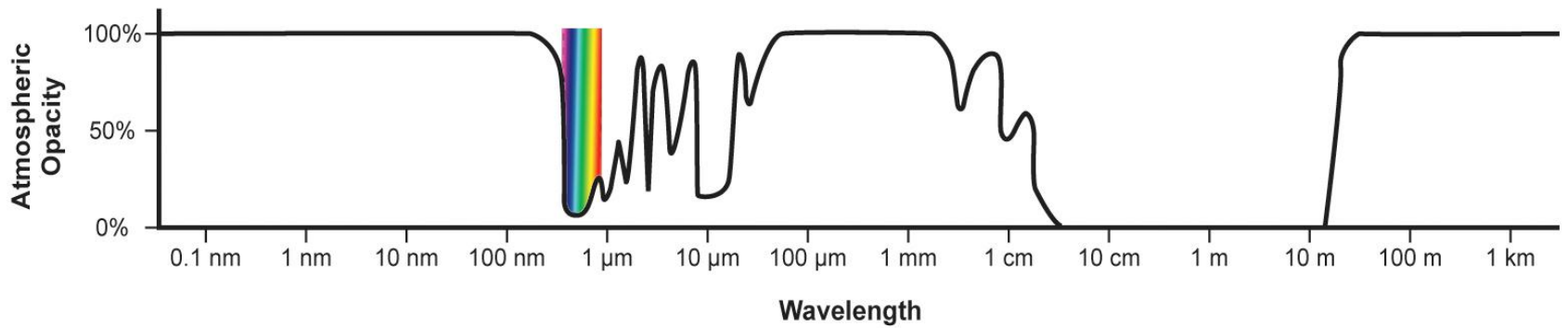
- Need to get above the **atmosphere**
 - Avoids the **'twinkling'** effects, so get better image quality
 - Opens up different **wavelength regimes** (and therefore different **physics**)

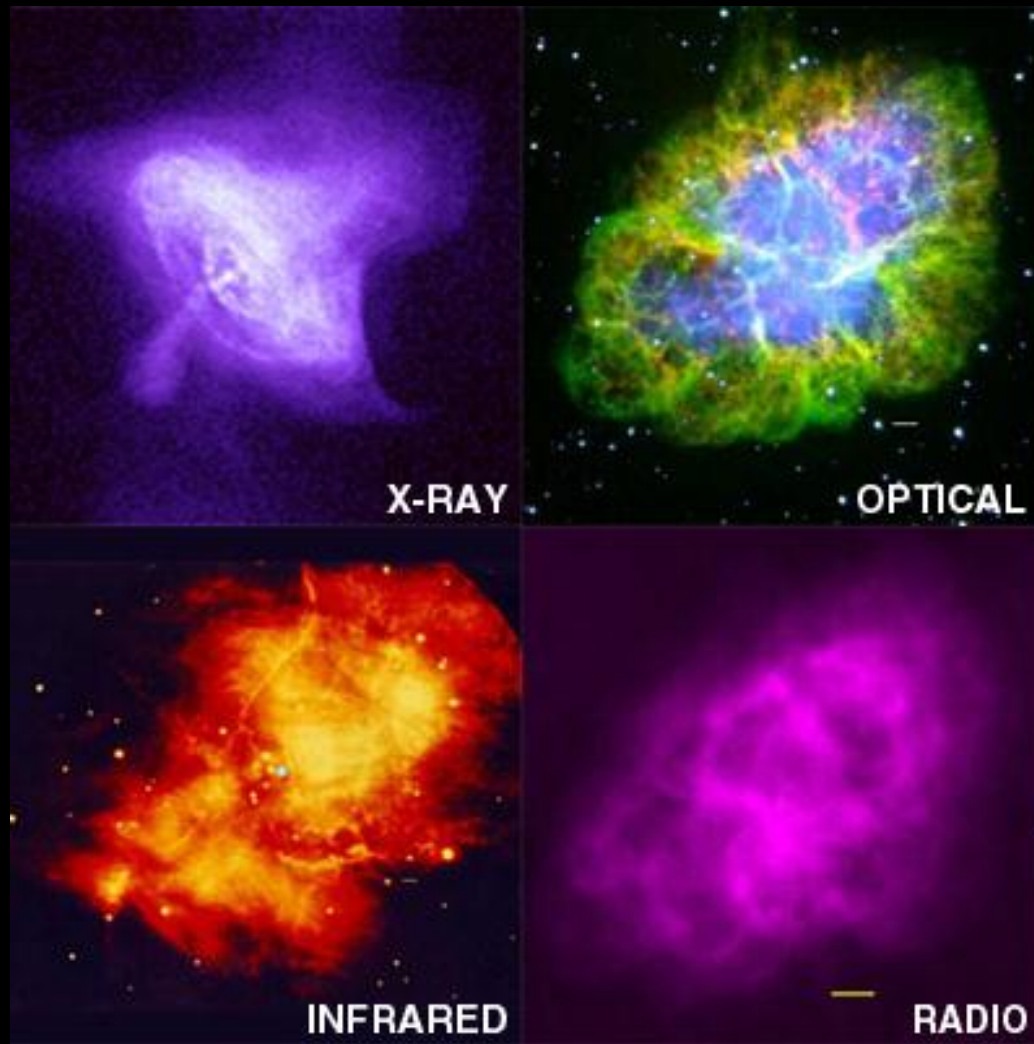
Atmospheric Turbulence Degrades Image Quality: "Seeing"



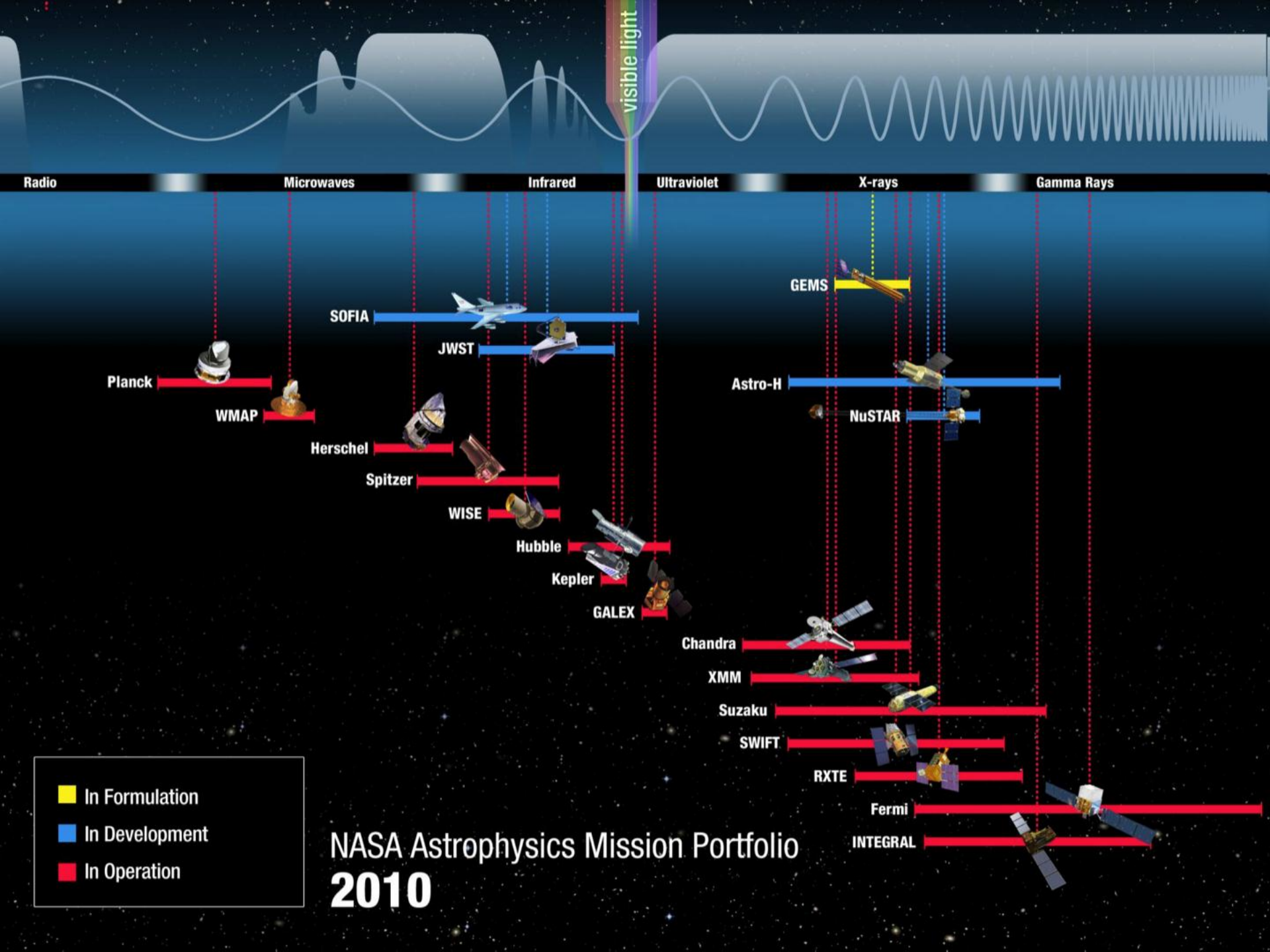


The Hubble Space Telescope, although it has a small mirror by ground-based observatory standards, doesn't suffer from any of these atmospheric effects.





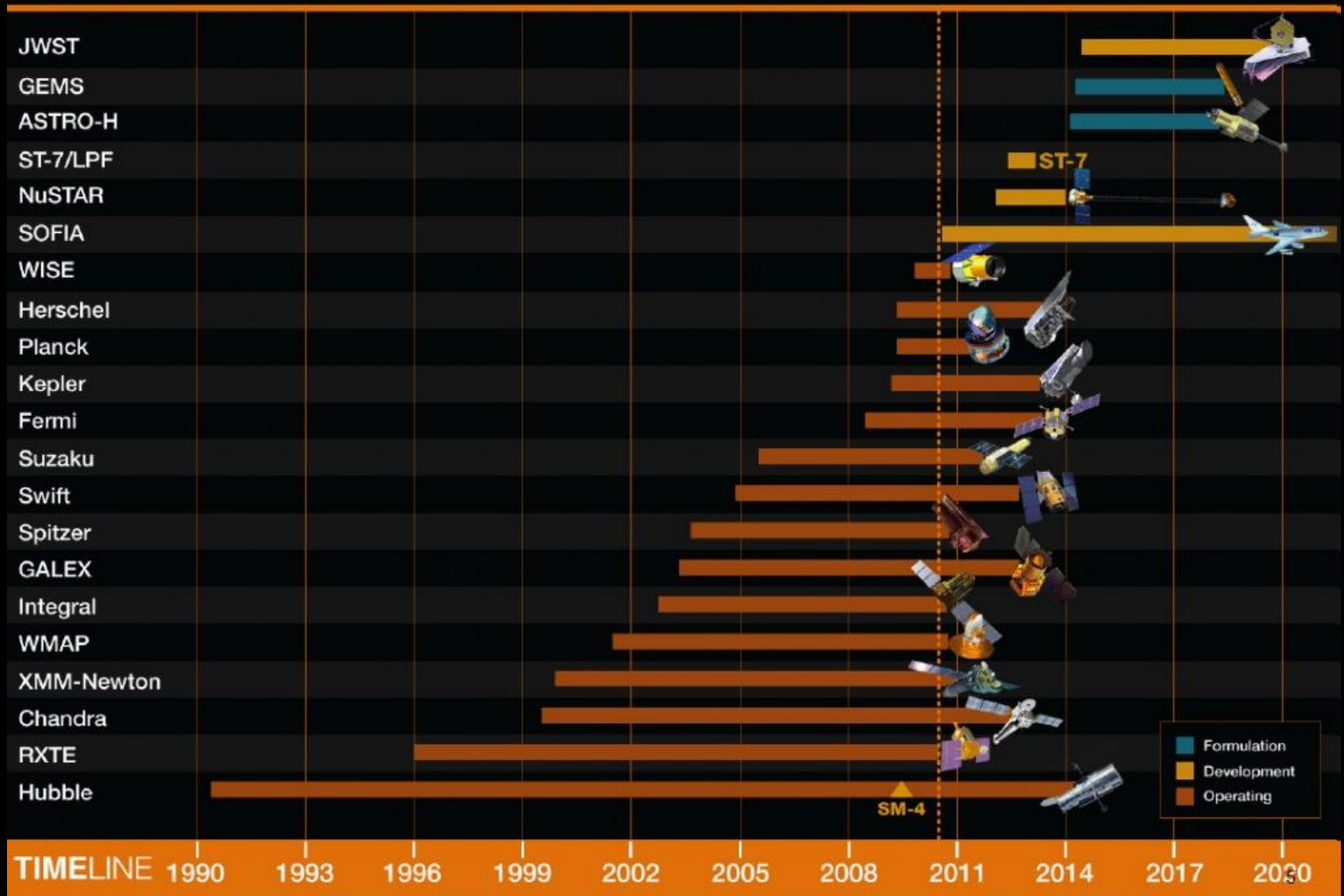
Studying phenomena in a multi-wavelength perspective allows the best understanding of the physics involved.



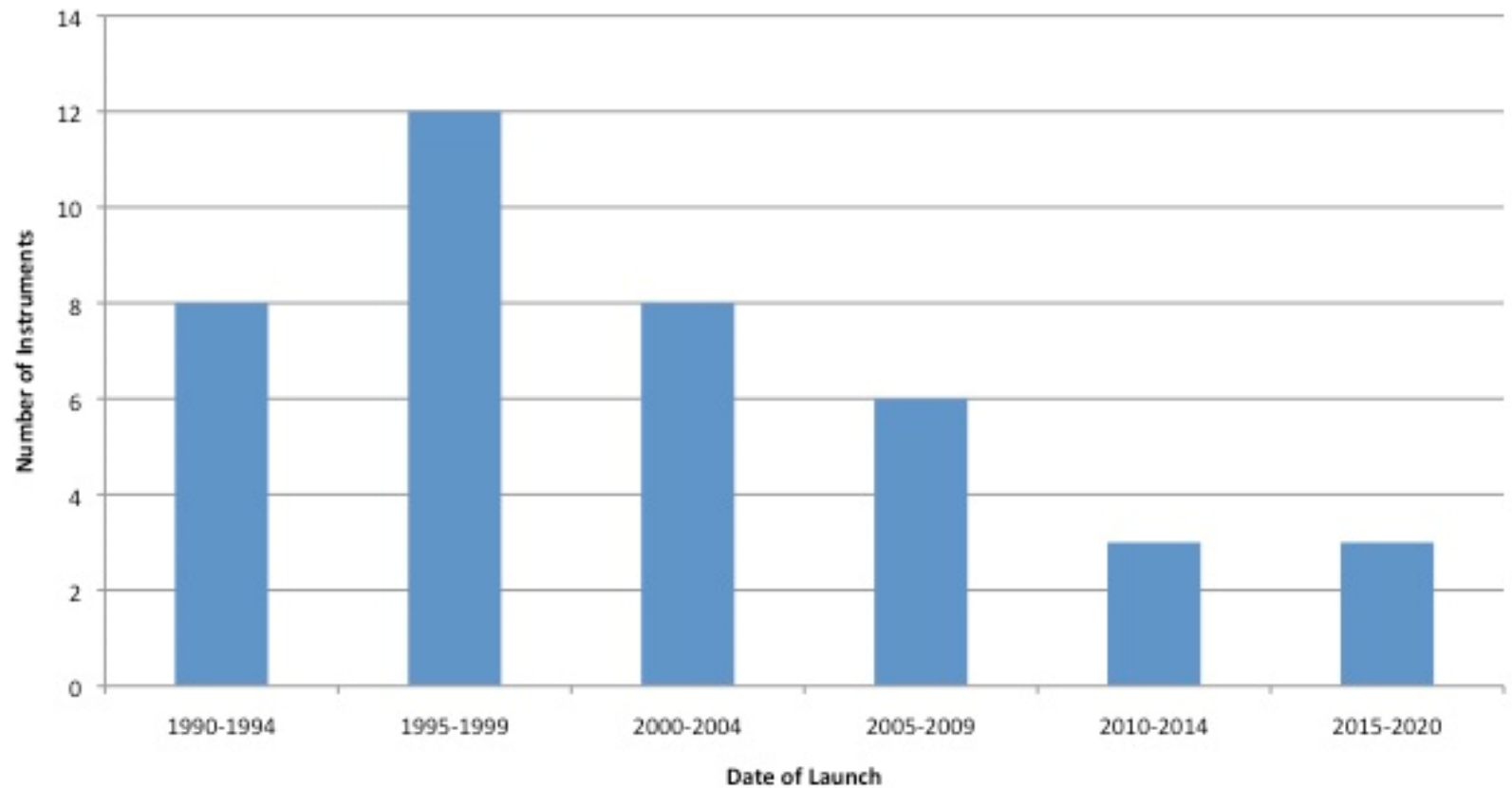
■ In Formulation
■ In Development
■ In Operation

NASA Astrophysics Mission Portfolio 2010

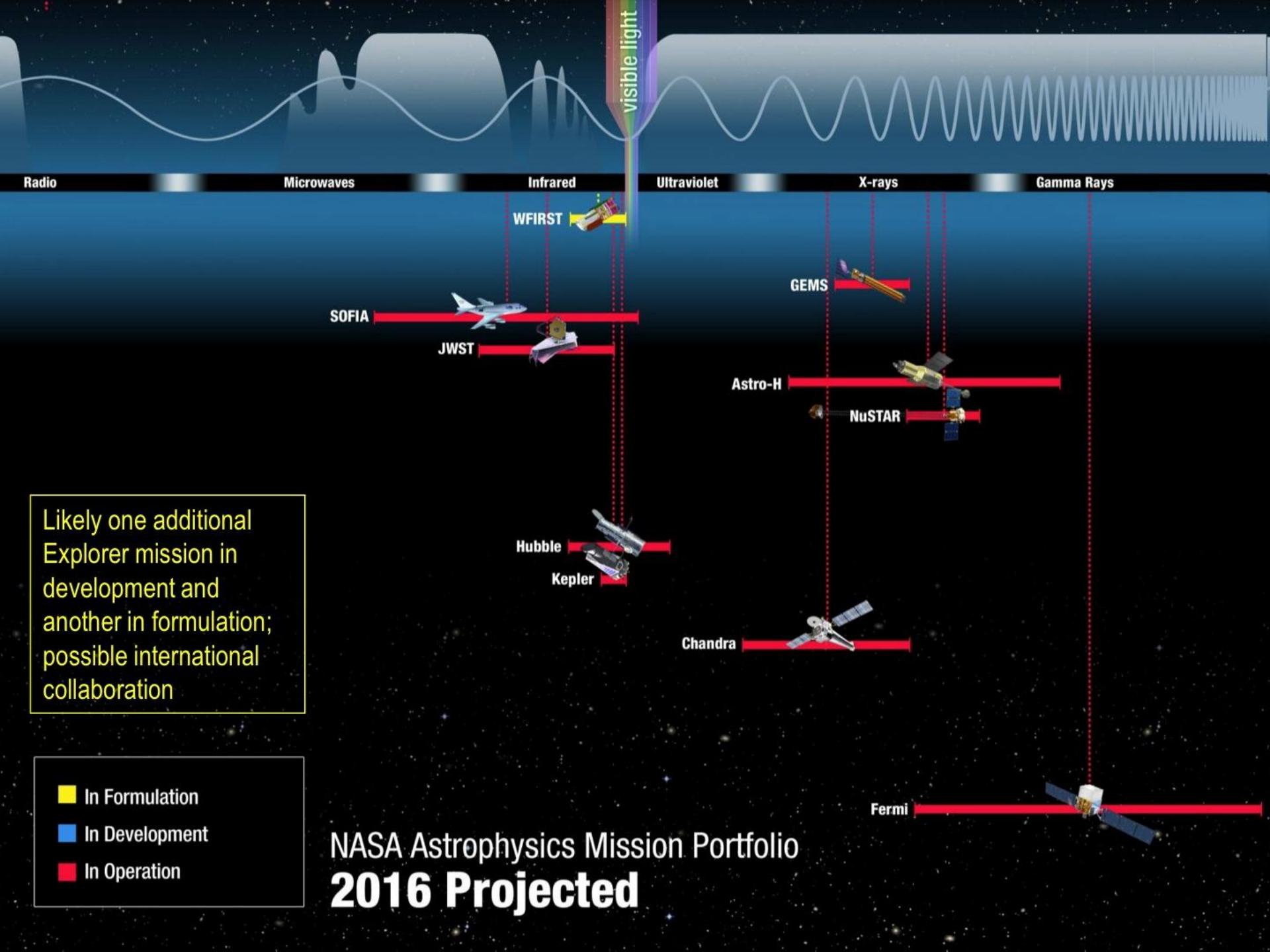
Astrophysics Missions timeline



Number of NASA Instruments By Launch Date



From the AAS Public Policy blog: “In FY2010 the budget for the NASA Astrophysics Program was \$1,103.9 million. JWST takes up 40% of the total budget at \$440.3 million. Many new projects cannot get off the ground (literally) until the launch of JWST. The current launch date for JWST is set for 2014.”

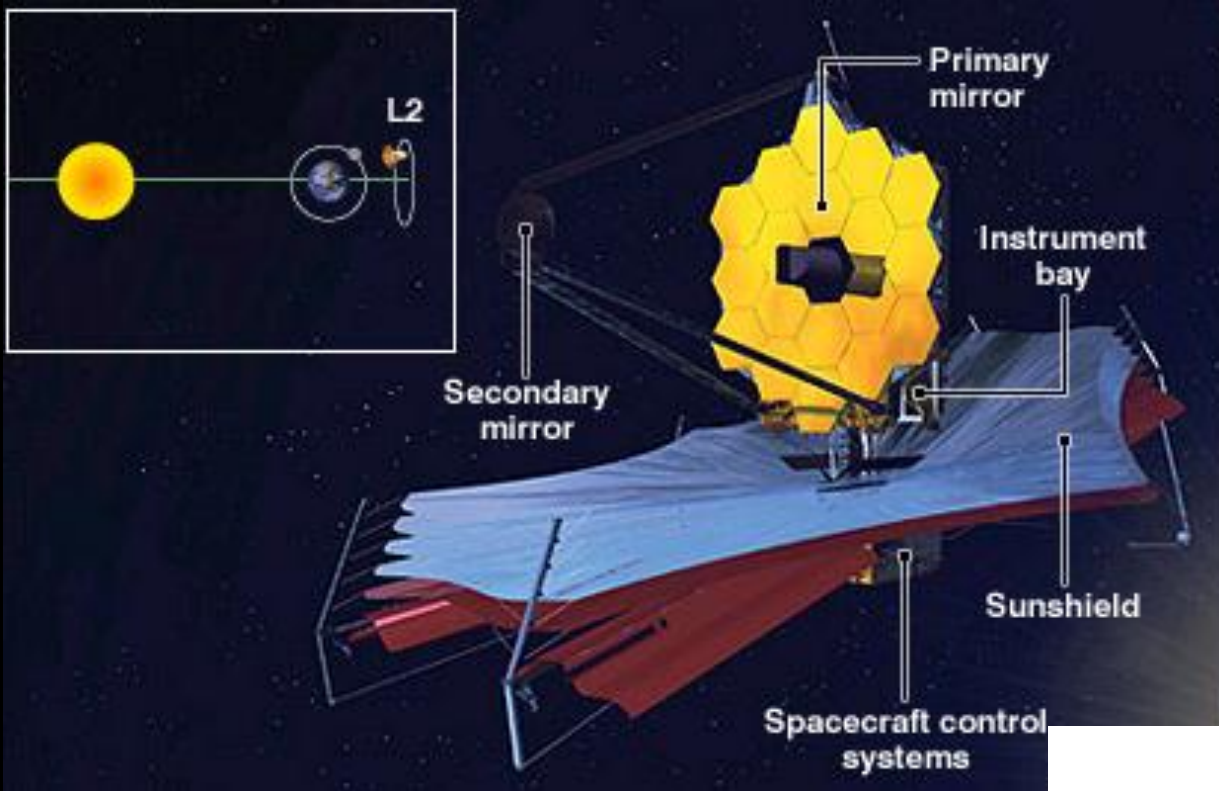


Radio Microwaves Infrared **visible light** Ultraviolet X-rays Gamma Rays

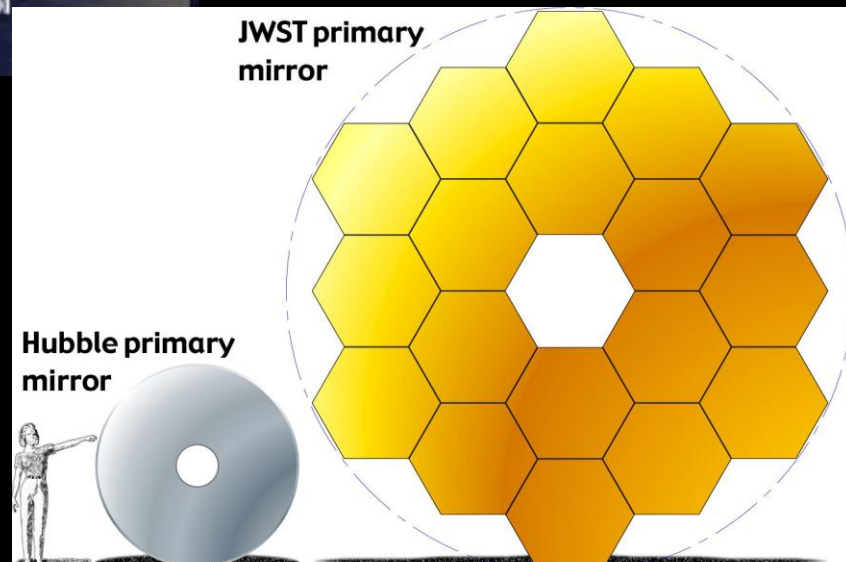
Likely one additional Explorer mission in development and another in formulation; possible international collaboration

- In Formulation
- In Development
- In Operation

NASA Astrophysics Mission Portfolio 2016 Projected



The James Webb Space Telescope





Six of the 18 James Webb Space Telescope mirror segments

James Webb Space Telescope (JWST)
Independent Comprehensive Review Panel (ICRP)

FINAL REPORT

Panel Members

William F. Ballhaus, Jr.	The Aerospace Corporation (Ret.)
John Casani, Chair	Jet Propulsion Laboratory
Steven Dorfman	Hughes Electronics (Ret.)
David Gallagher	Jet Propulsion Laboratory
Garth Illingworth	University of California Observatories
John Klineberg	Swales Aerospace (Ret.)
David Schurr	National Aeronautics and Space Administration

Industry Consultant

Rosalind Lewis	The Aerospace Corporation
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Executive Secretary

Marcus Lobbia	The Aerospace Corporation
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October 29, 2010

Unaware of how badly understated the JWST Budget² was, NASA management thought there was a 70% probability of launching in June 2014 at a total lifecycle cost of nearly \$5 billion with the Confirmation budget profile. In fact, the Project had no chance of meeting either the schedule or the budget profile.

Minimum Cost-to-Launch

The earliest launch date possible—and hence the minimum cost to complete—is September 2015 and would require an additional ~\$250 million above the current FY 2011 President’s Budget profile in both 2011 and 2012. In addition, the critical management change noted above, along with the restructuring of the JWST Project office, supplemented by additional changes outlined in the report, must go “hand-in-hand” with additional funding.

In the time available, it was not possible to do an independent estimate of the cost-to-complete. As such, the Panel approached the question from several different points of view as described later in this report, leading to a judgment that the total LCC will be in the range of \$6.2 billion to \$6.8 billion. The Panel adopted an LCC of \$6.5 billion on which to base its profile. Going forward, a bottoms-up estimate validated by an independent analysis and at least two independent cost estimates (ICEs) is required. Although not explicitly accounted for in the Panel numbers, there may be a number of low probability threats whose occurrence could cause an additional year delay in launch and a correspondingly higher cost.

From the AAS Public Policy blog:

“The successor to the Hubble Space Telescope will cost an extra \$1.5 billion and is now predicted to launch in September 2015, over a year later than the original date of June 2014. An extra \$250 million per year in 2011 and 2012 is needed in order to make the 2015 launch date.

The management of JWST has moved to NASA Headquarters. Richard Howard, NASA’s deputy chief technologist, will head the new division for JWST. Howard’s first order of business will be making a new budget for JWST by Feb. 2011.

The NASA Advisory Committee for Astrophysics Subcommittee (NAC APS) met on December 22 to discuss JWST. All top management for JWST has been replaced. JWST has been completely taken off the books in the Astrophysics (APS) Division and is now directly reporting to the Science Mission Directorate (SMD) and NASA Administration. The APS budget will be smaller without JWST.”

From NASA FY12 Budget...

Mission Directorate: Science

Astrophysics

New Initiatives:

No new initiatives are included.

Major Changes:

The budget for the James Webb Space Telescope (JWST) is now carried under its own Theme. This is consistent with management changes implemented in FY 2011 to improve management oversight and control over the project, following release of the Independent Comprehensive Review Panel's (ICRP) report in November 2010.

The budget reflects the scientific priorities of the National Academies' decadal survey for astronomy and astrophysics. Specifically, early technology funding for missions beyond JWST is included, while work on the Space Interferometry Mission (SIM) and Joint Dark Energy Mission (JDEM) has been terminated. The budget includes additional funding for the Explorer mission selection planned for 2012, and increased investments in research and technology as recommended by the decadal survey.

The Future

- Limited to JWST and, after that, WFIRST, (if at all)?
- Explorer missions are the best alternative
- Is it the end of big 'observatory-class' missions?
- Lessons from JWST must be learnt
- Post shuttle age is very confused. The role of NASA is changing, but, to what?