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SORCE — Important Factors of Concept and Development

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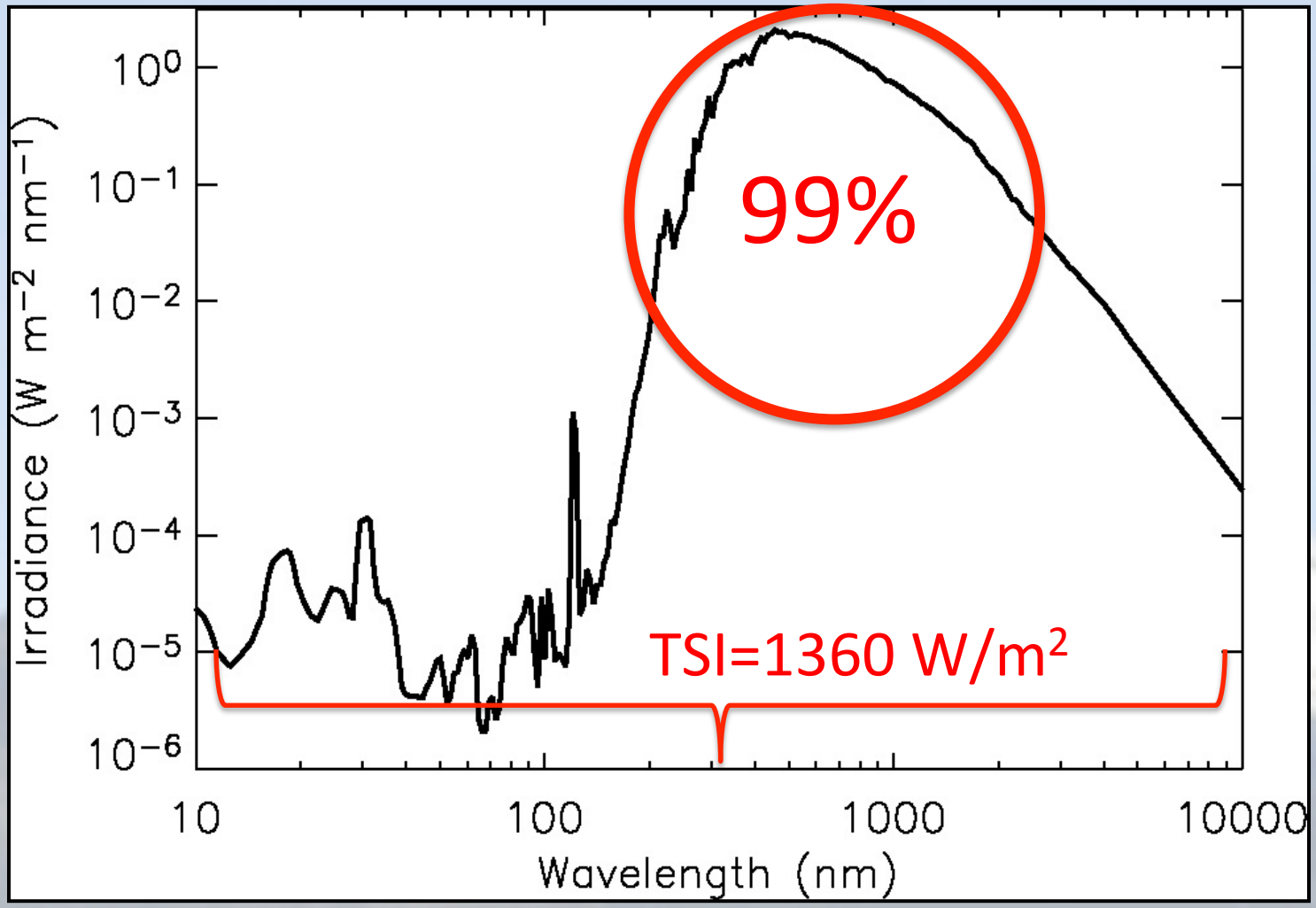
Full Solar Spectrum



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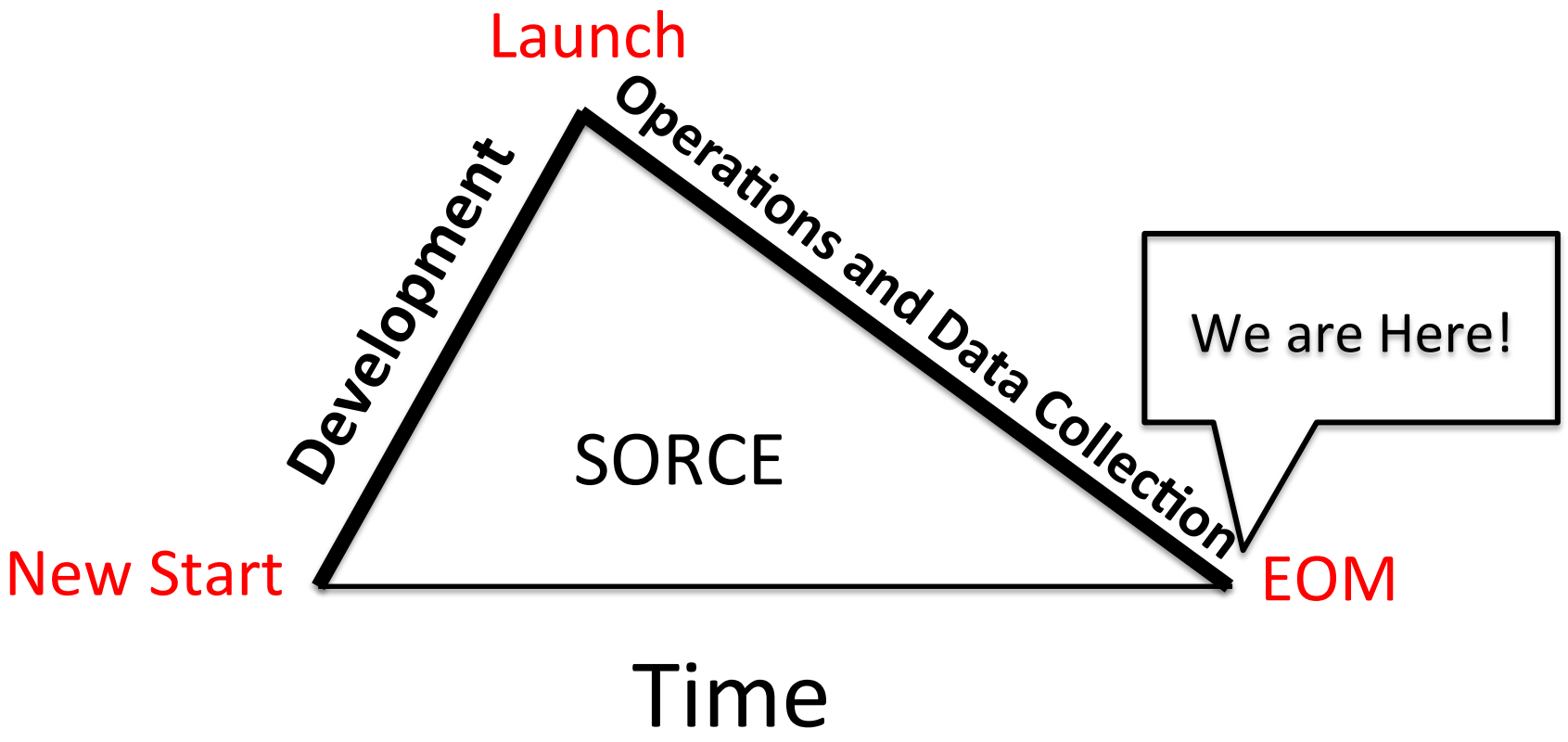
Typical NASA Flight Mission



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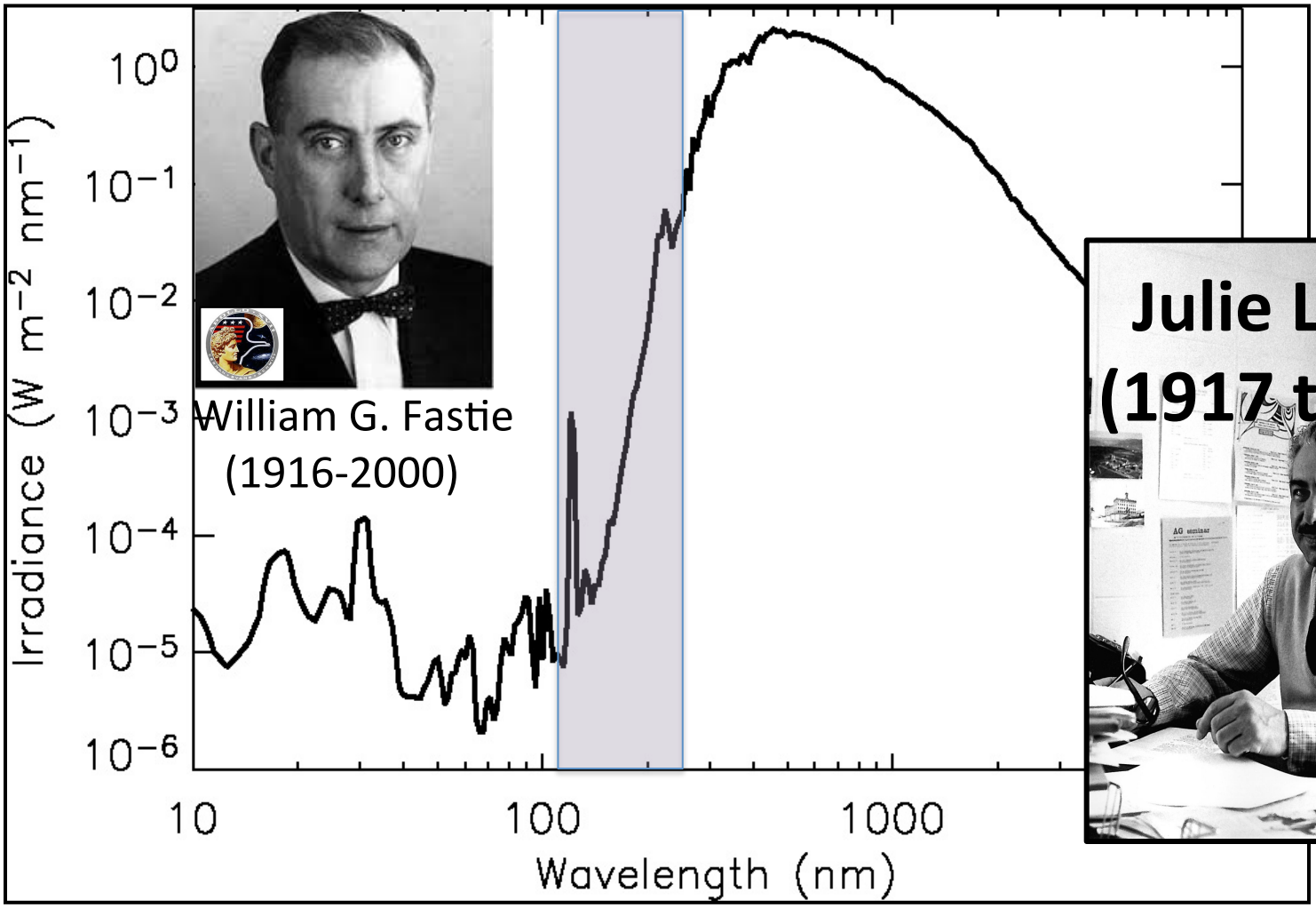
First Adventure Solar Irradiance Adventure

December 13, 1972



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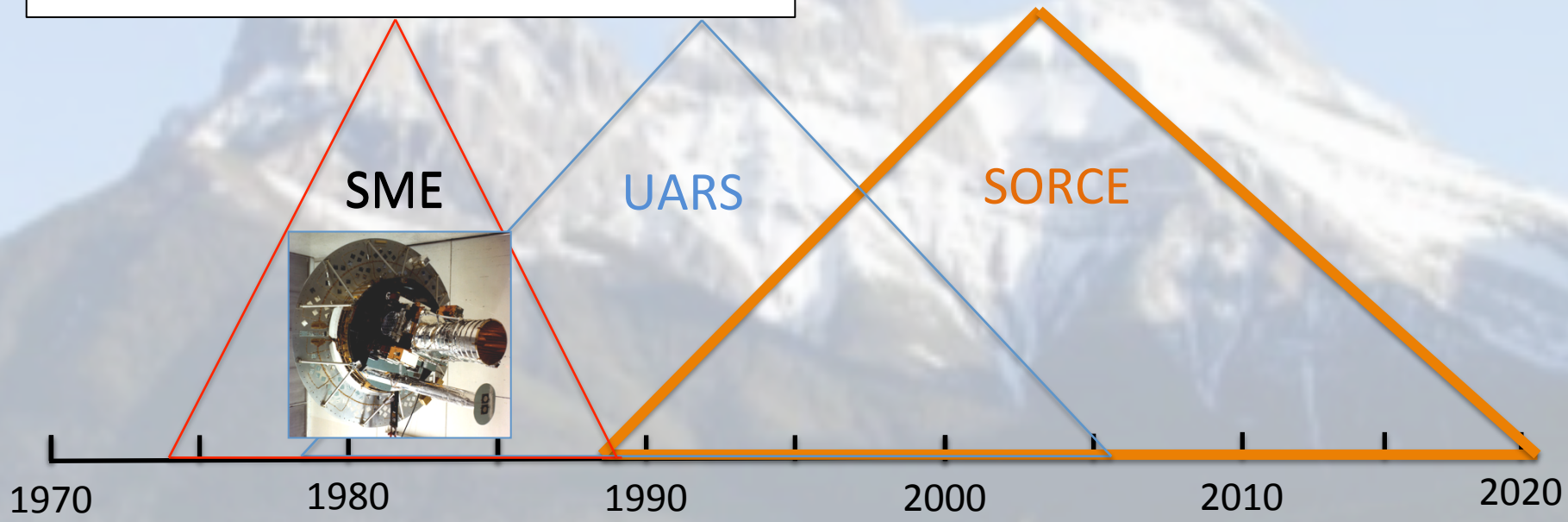
SME (1974 to 1989)

- Principal Investigator Mission (Charles Barth - PI)
- Science Team at LASP
- Soft touch Project Management by JPL
- Spacecraft development at BBRC
- Instruments built at LASP
- S/C testing at LASP and BBRC
- Operations and Control at LASP
- Data Processing
- Became core to LASP's DNA

Julius London, CoI
George Mount, Instrument Scientist
George Lawrence, Instrument Scientist
Tom Sparn, Operations and Control



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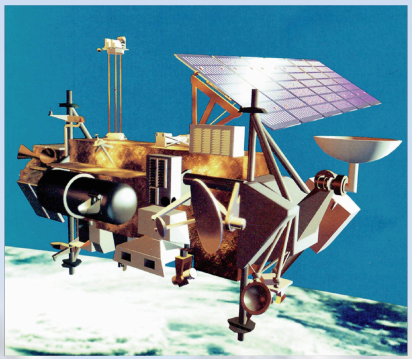

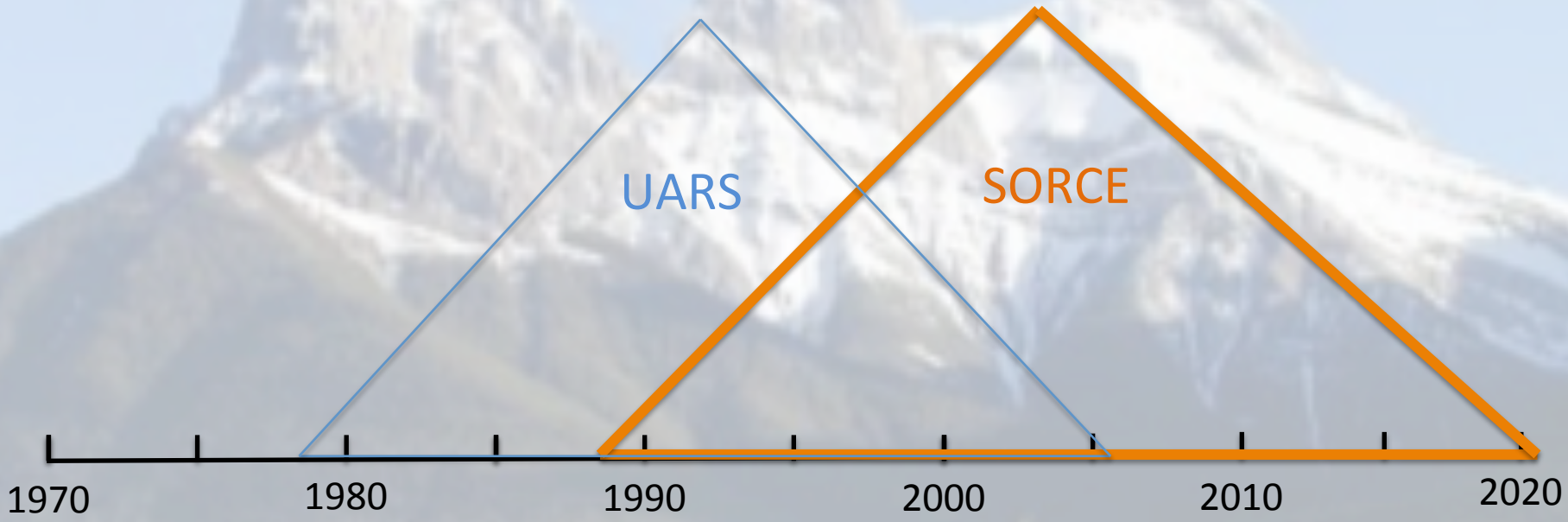

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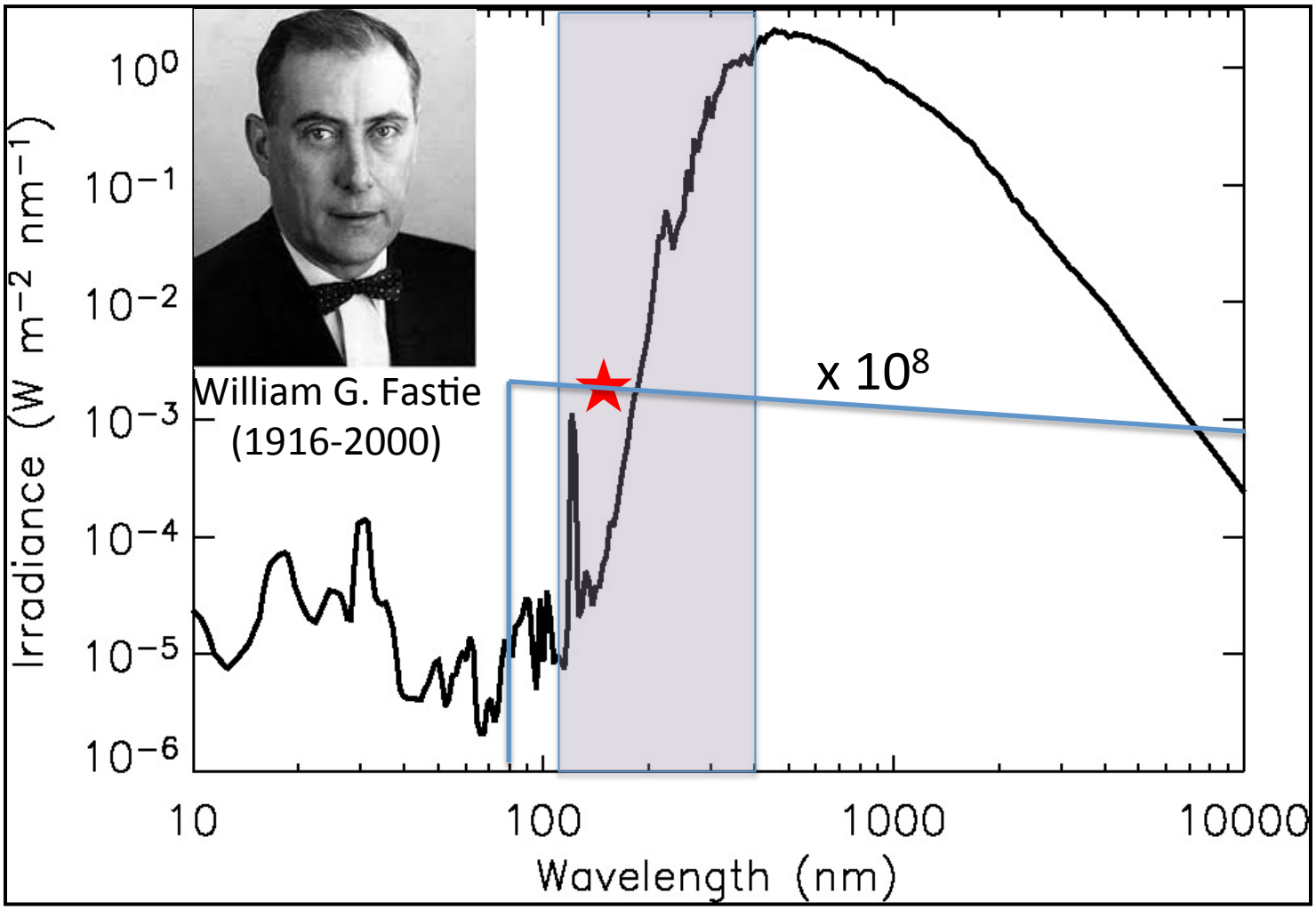
UARS SOLSTICE



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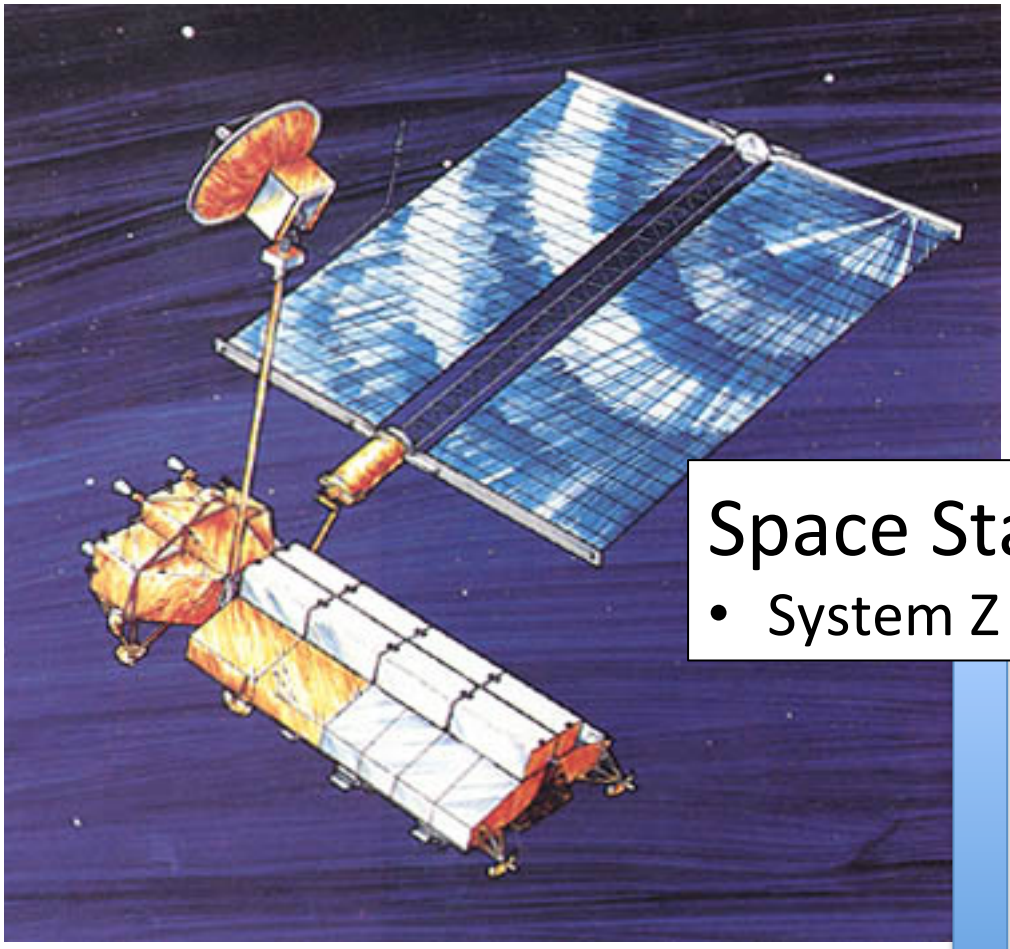
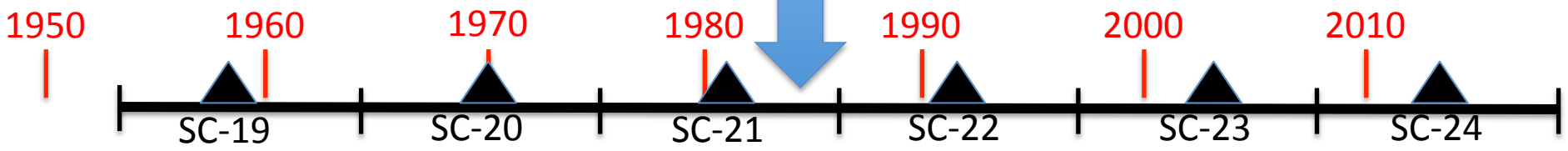
NASA's Preparation for EOS



Space Station Freedom (new Start)

- System Z

EOS AO 1988 (458 Proposals)
Selection 1989 (30 Instruments)



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Environmental Data Records

EOS Instruments were designed to measure the following environmental variables:

- Cloud Properties
- Surface Temperature
- Energy exchange between Earth and space
- Accumulation and ablation of snow
- Circulation of the oceans
- Structure and motion of sea ice; growth melting, and flow of glaciers
- Mineral composition of exposed soils and rocks
- Structure, composition and dynamics of the atmosphere — winds lightning and precipitation
- Changes in stress and surface elevation around geological faults
- Exchange of energy, momentum and gases between the Earth's surface and atmosphere
- Biological activity on land and in near-surface waters
- Input of solar radiation and energetic particles to the Earth

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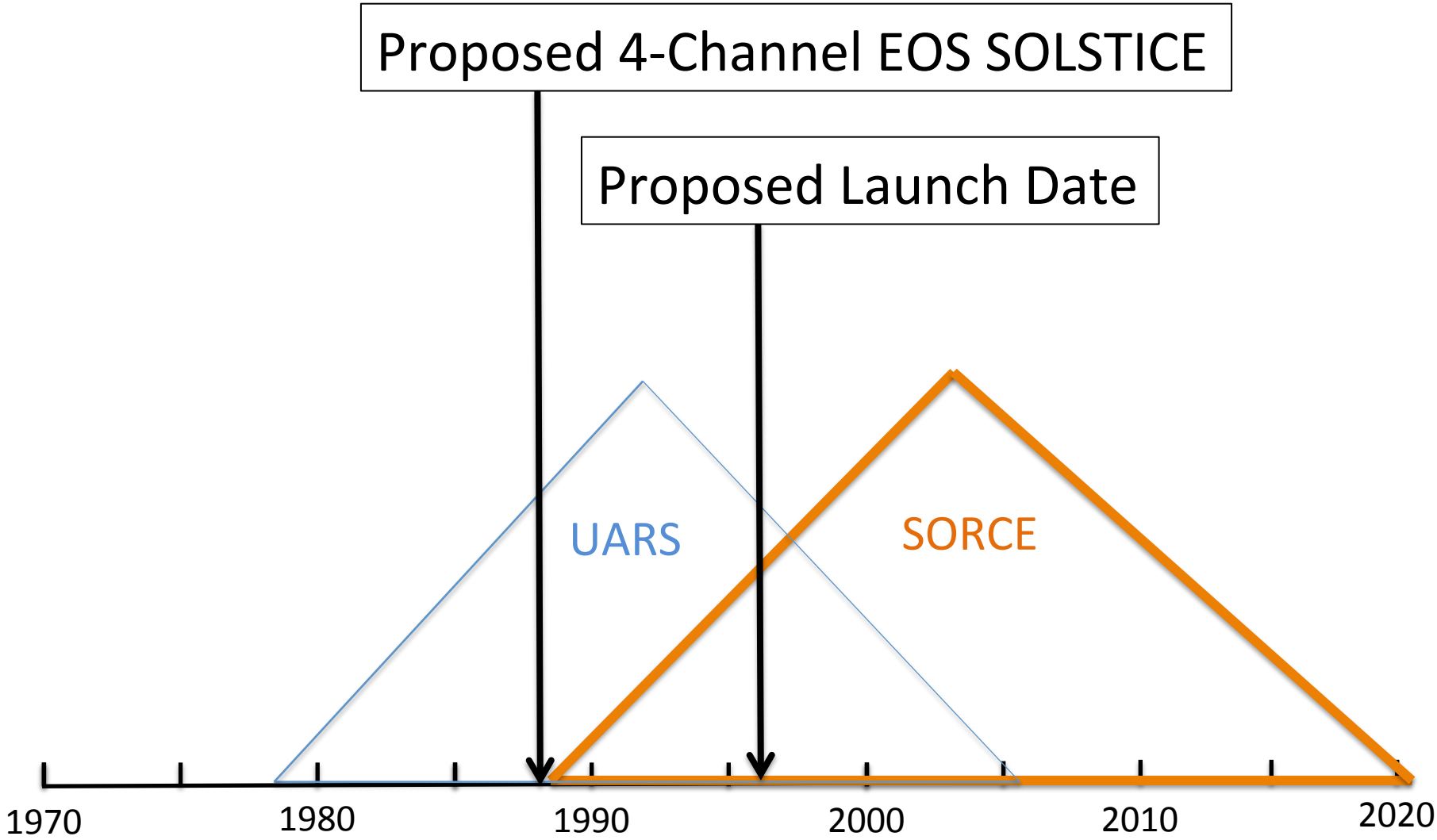
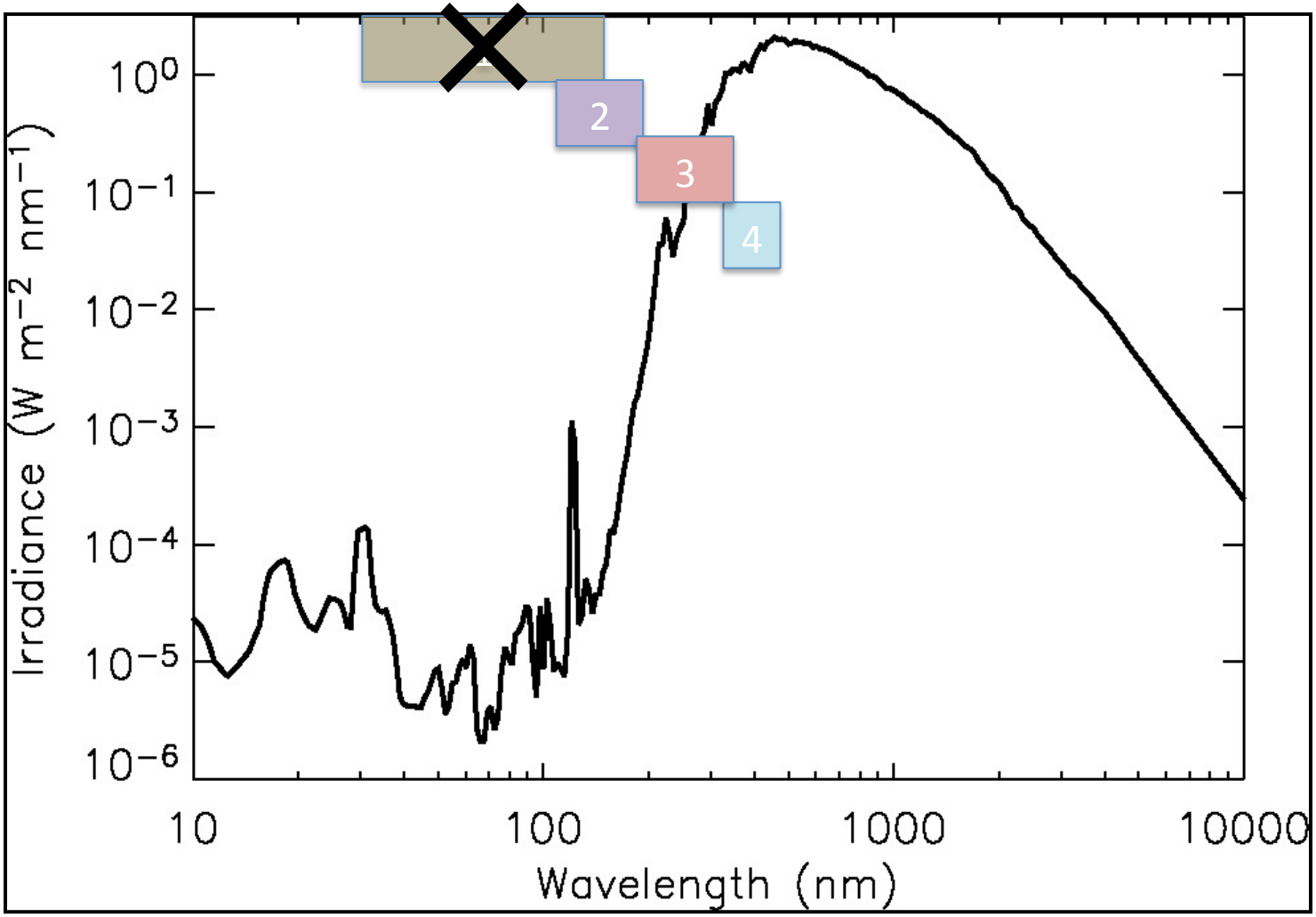

Proposed 4-Channel EOS SOLSTICE
Proposed Launch Date
UARS
SORCE
1970
1980
1990
2000
2010
2020

EOS SOLSTICE Proposal, 1988



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EOS Beginning in 1989

Letter of acceptance in February 1989

- EOS budget of $17B
- The Polar Platforms would carry 30 instruments
- Platform and instruments will be designed for a 15 year mission
- Data rates of 100 to 300 MBps +++++
- Stored on 9 track tapes — constant building construction
- EOS SOLSTICE is a Flight of Opportunity (FOO)

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New EOS Vocabulary (Re-……..)

- Restructuring in March 1991, budget ↓$11B and 17 instruments
- Rescoping in 1992, budget ↓$8B
- Rebaselining in 1994, budget ↓$7.2B
- Reshaping in 1995

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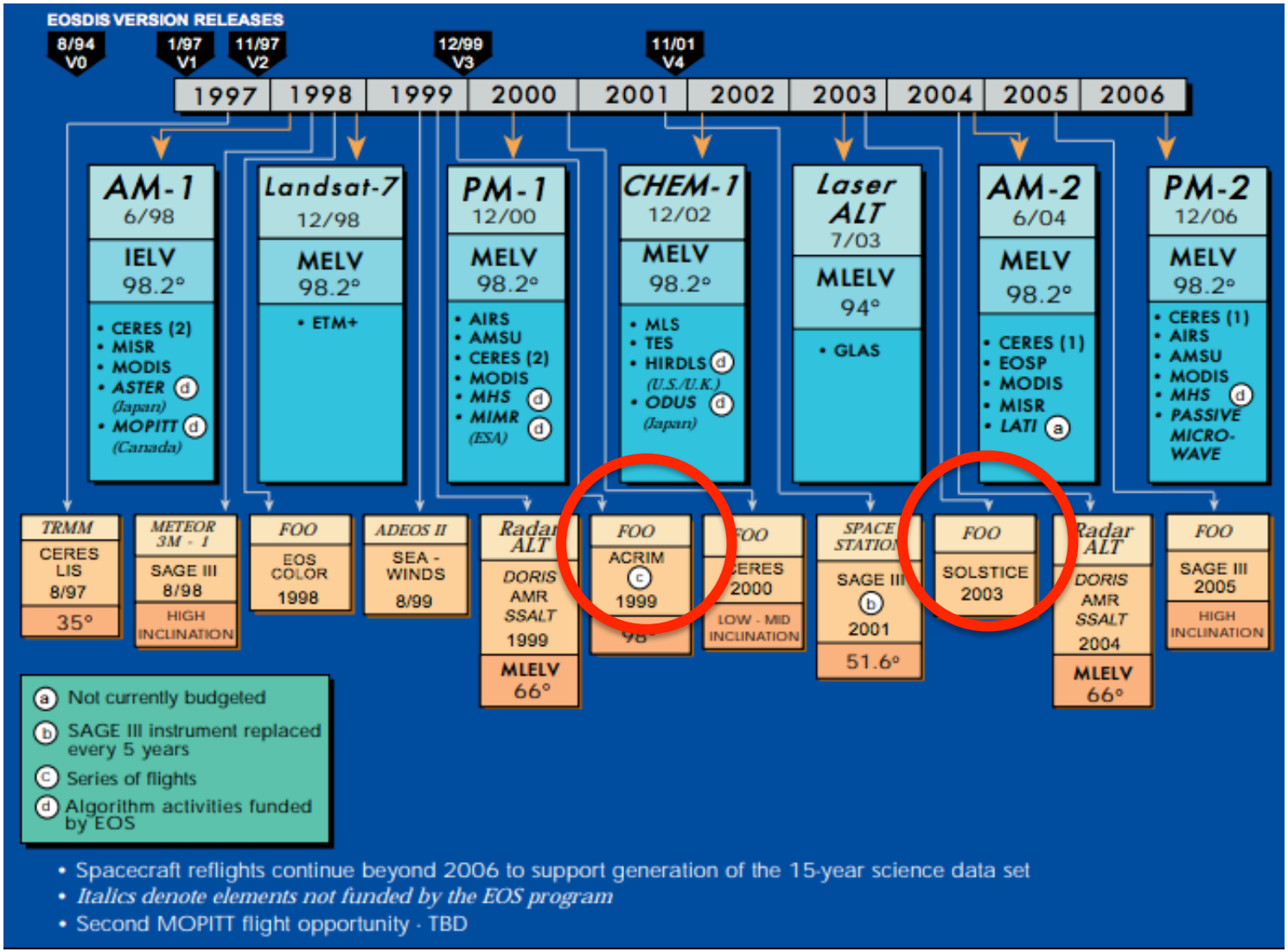
MTPE EOS – 1995

Finding a Flight of Opportunity (FOO)



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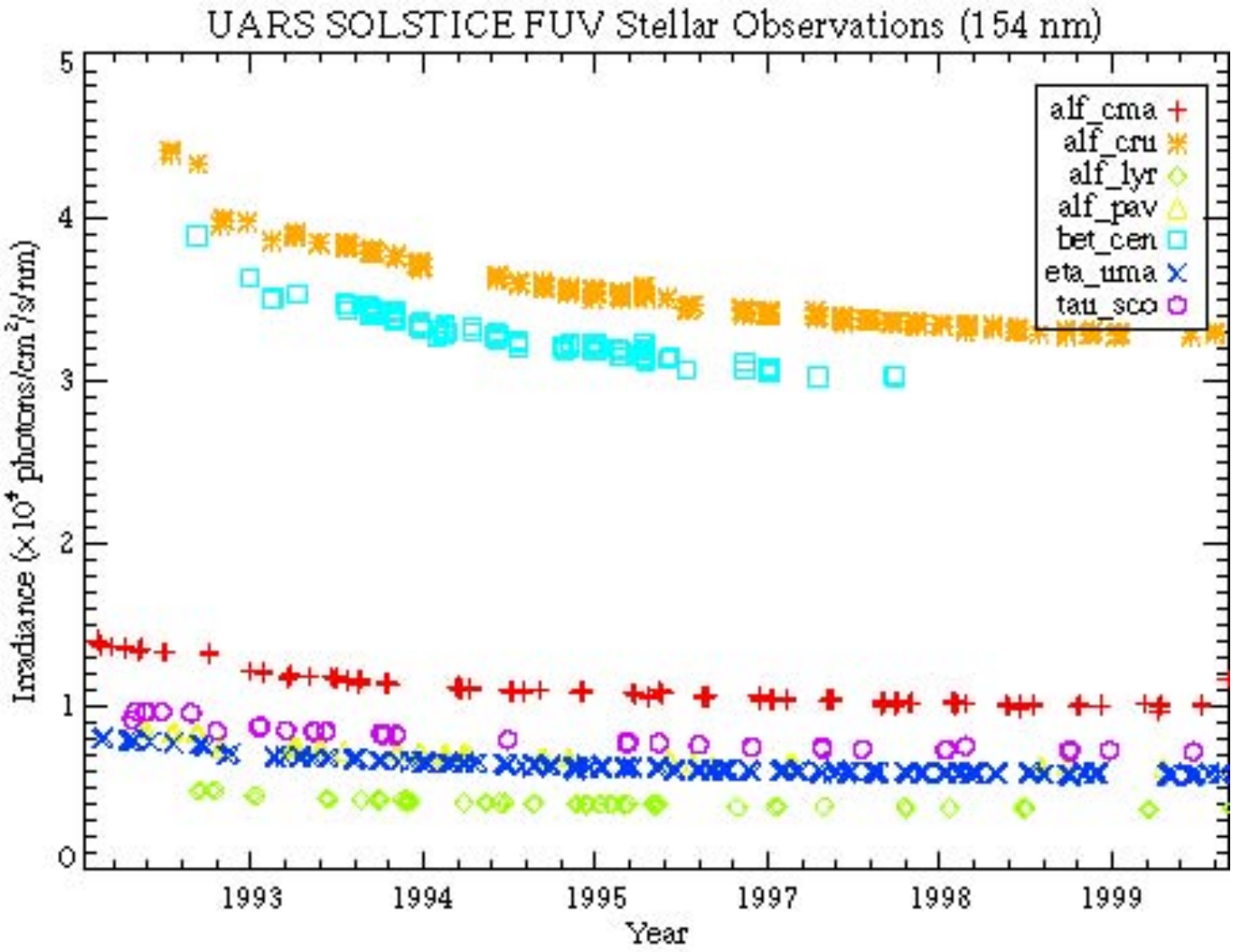
UARS Stellar Observations



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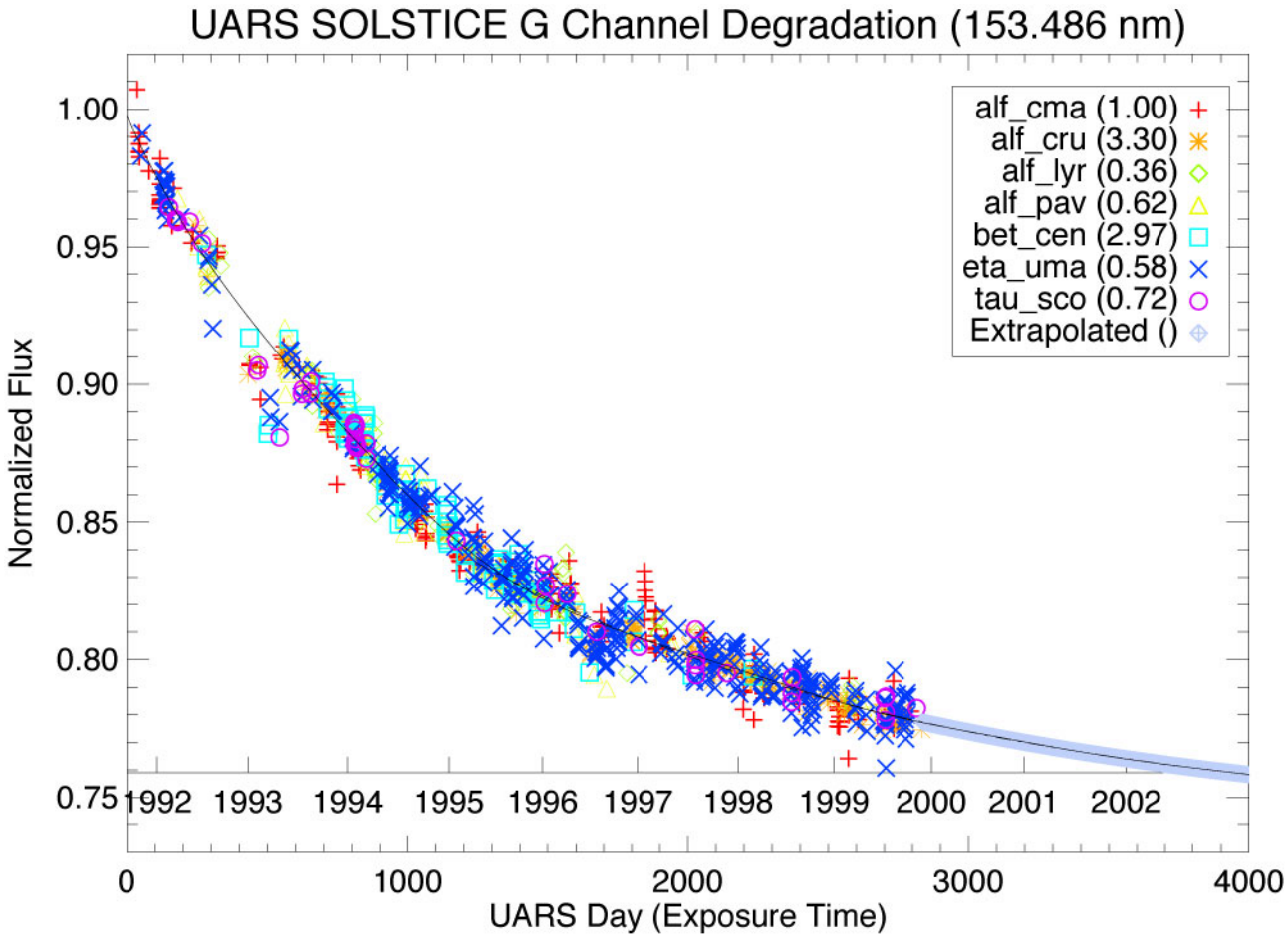
Stars at 148 nm



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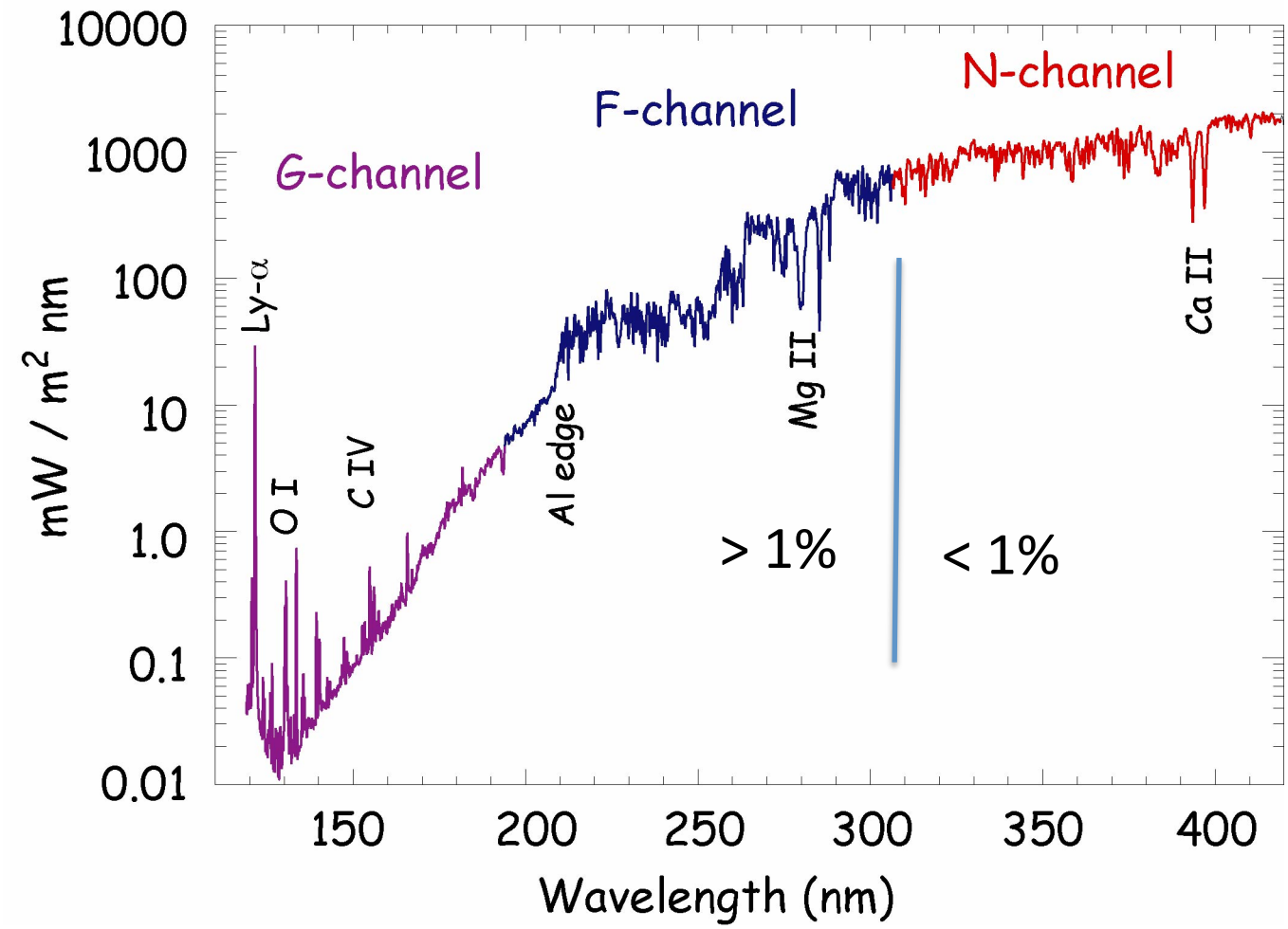
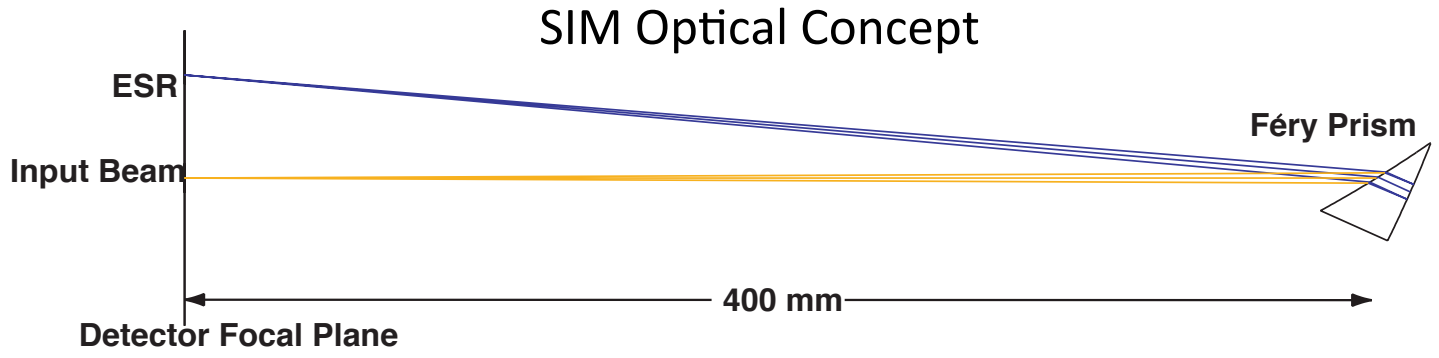
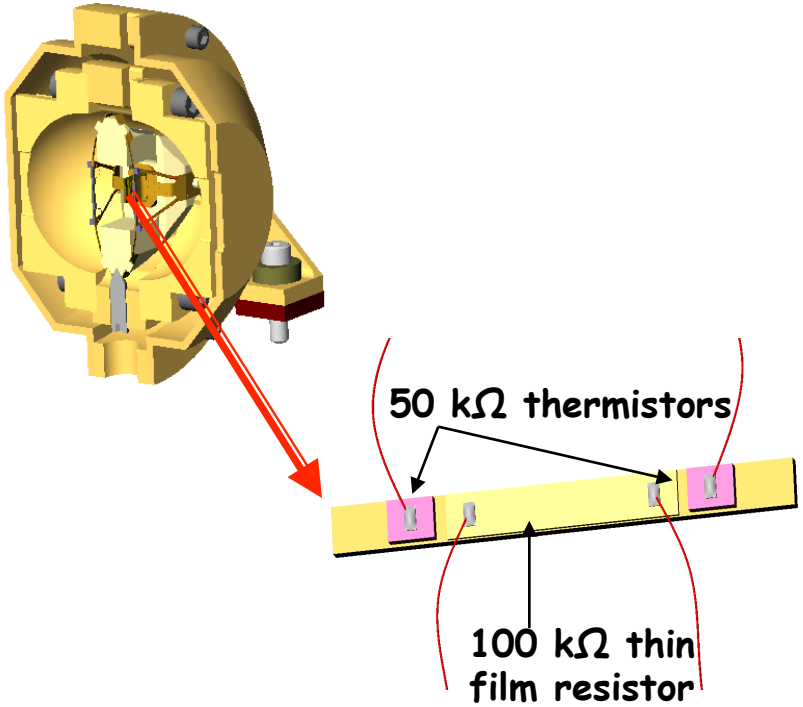
UARS FUV, MUV, and NUV Solar Spectra



The ESR for the SIM Instrument

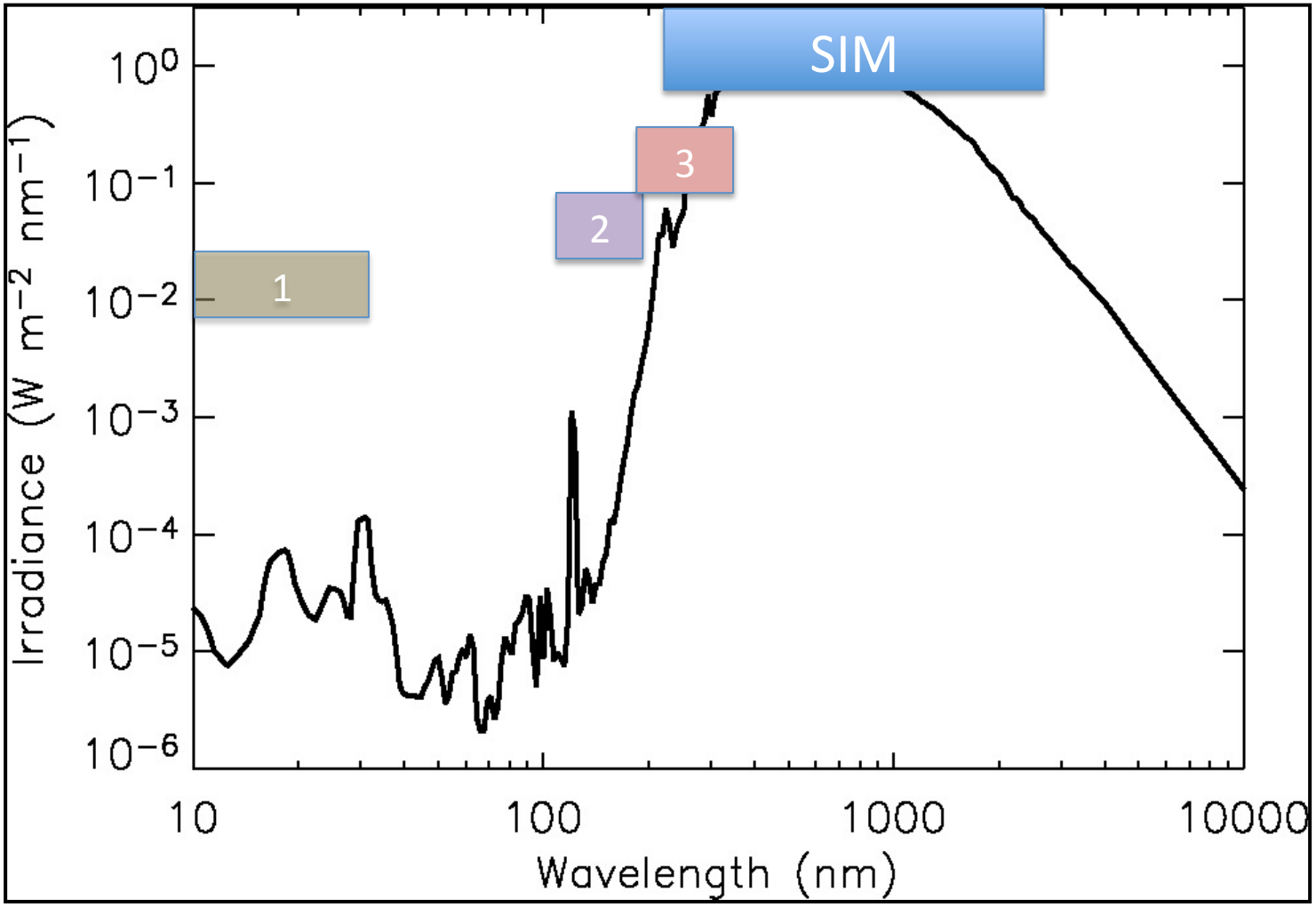




Two bolometers — each a 1 x 10 mm CVD diamond strip, blackened with NiP

Supported by a Kapton suspension and centered in an aluminum sphere to increase blackness and provide thermal isolation

EOS SOLSTICE with SIM



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Revision #1

SOLSTICE Re-design (1996)

- UARS SOLSTICE (300 to 400 nm) stellar calibration provided ~1% accuracy >> solar variations
- Desired an instrument (300 nm to 2µm) with a single, figured prism —G. Mount helped develop the SIM
- Needed instrument with a reliable, stable detector — G. Lawrence developed the miniaturized ESR
- Instrument should be self calibrating

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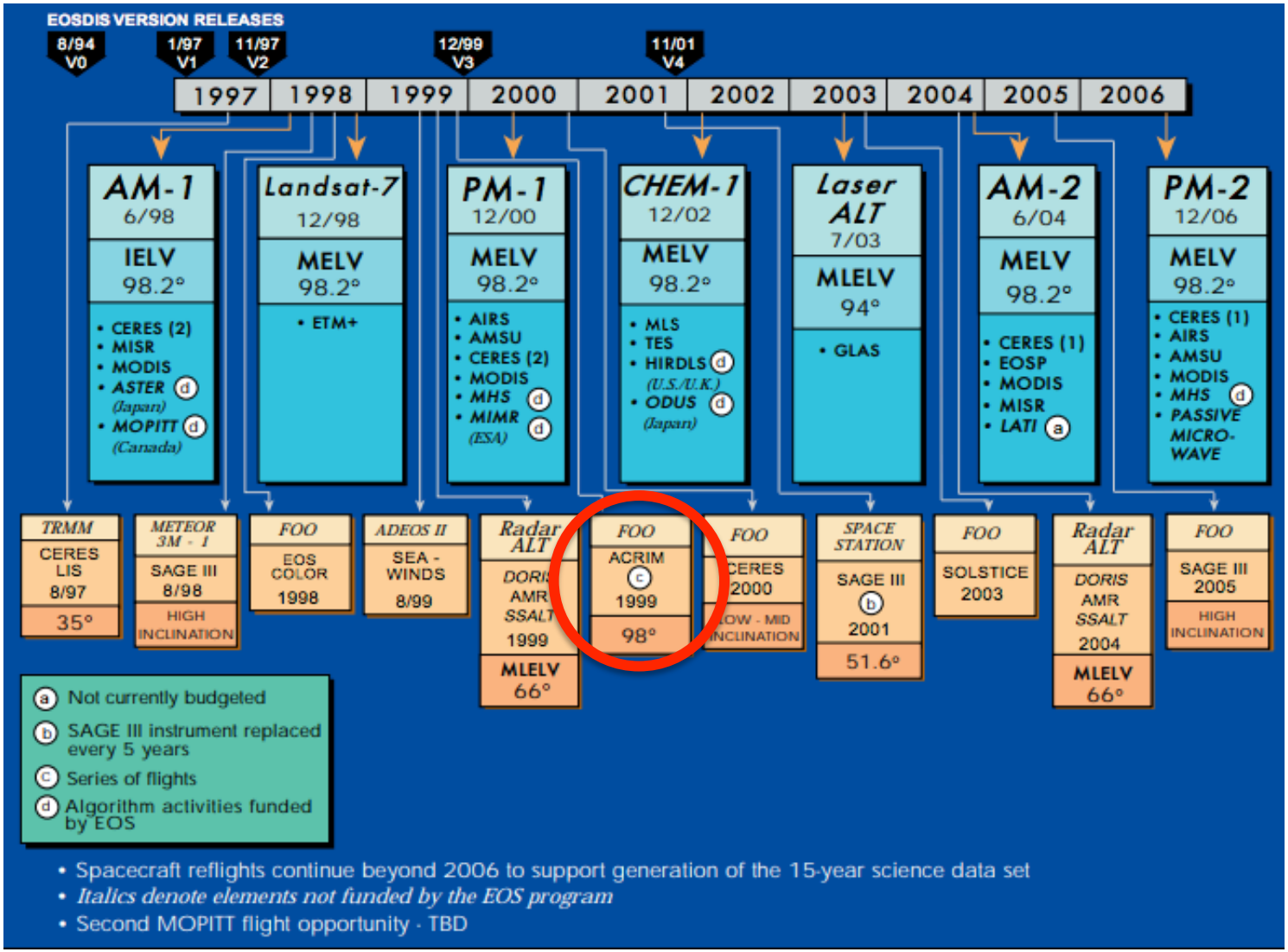
MTPE EOS – 1995

Finding a Flight of Opportunity (FOO)



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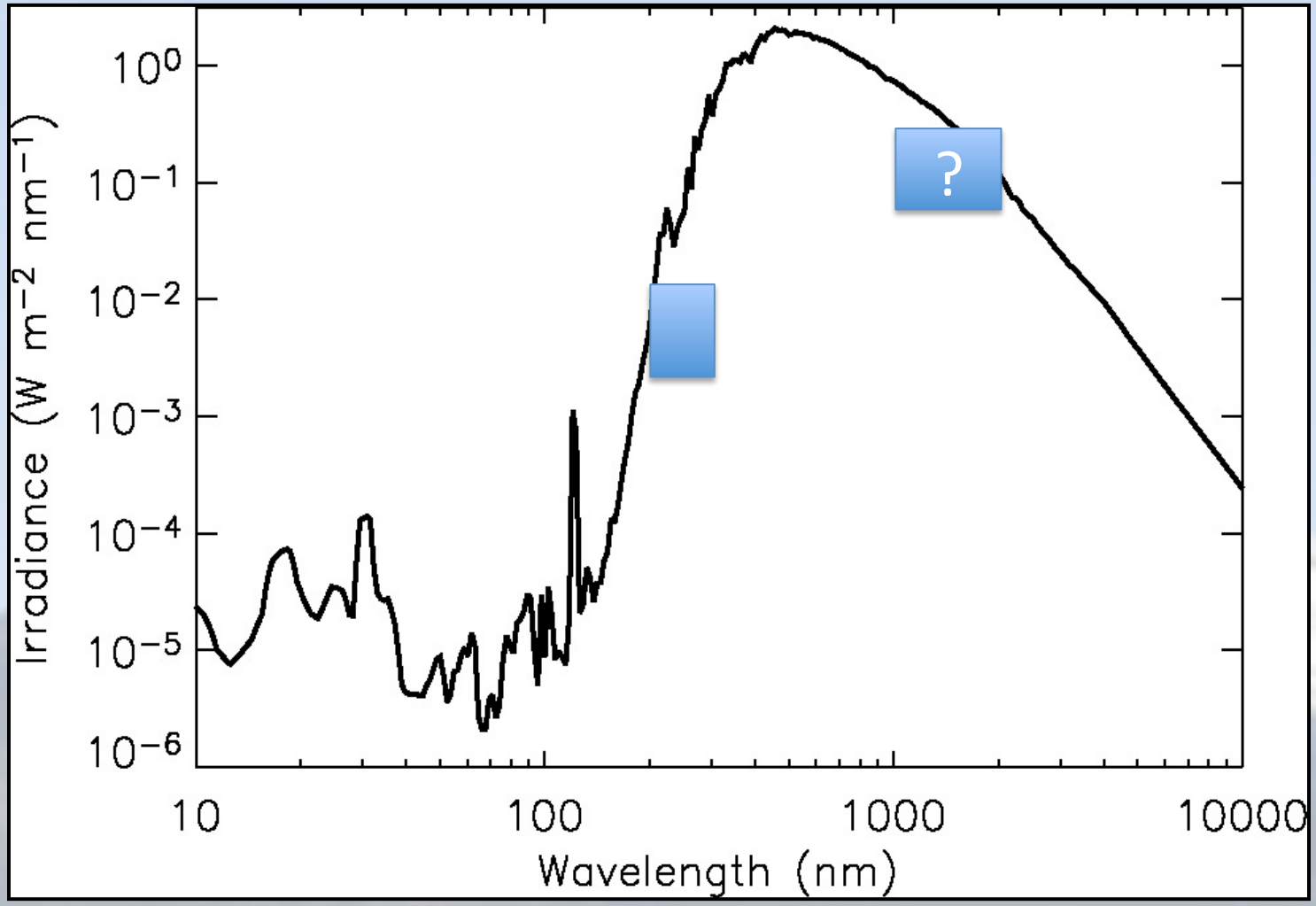
Revision #2

TSIM Announcement of Opportunity (1997)

- Science Objective: to continue TSI measurement
- TSIM instruments will likely be used by NPOESS
- **(Optionally) provide two spectral measurements ~ 200 – 300 nm, and 1500nm**
- MTPE PI-mode of Mission Management
  - End-to-end mission design (5-year)
  - Instrument development
  - Spacecraft acquisition
  - Command and control of spacecraft
  - Algorithm development

NPOESS Spectral Range



SORCE Responding to NASA AO-97-MTPE-01

Challenges

1. TSIM was to be the second 5-year flight of ACRIM — and NPOESS candidate
2. Could have “No-Bid”, but the AO called for optional spectral channels
3. EOS SOLSTICE would be in jeopardy if a the successful bid included UV/SIM spectral measurements.
4. Required a quick development of a TSI device. LASP developed a working prototype in only a few months.
5. LASP proposal was one of two evaluated “Category 1” and funded for a Phase A study — Finally prevailed.

The SORCE Mission

- LASP was selected to provide *TSIM* in 1999
- LASP was already well on its way to provide *EOS SOLSTICE* as a PI mode investigation
- NASA agreed to combine the two into a single *SORCE* Mission
- Bob Cahalan at GSFC was appointed as *SORCE* Mission Scientist
- LASP selected Orbital Sciences Corp to provide the *SORCE* spacecraft
- *SORCE* was launched January 25, 2003

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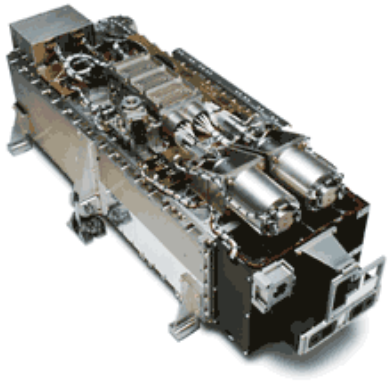
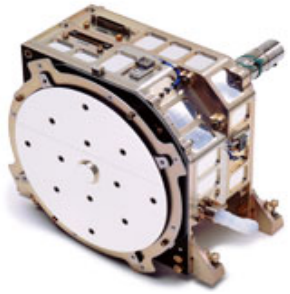
Total Irradiance Monitor (TIM)

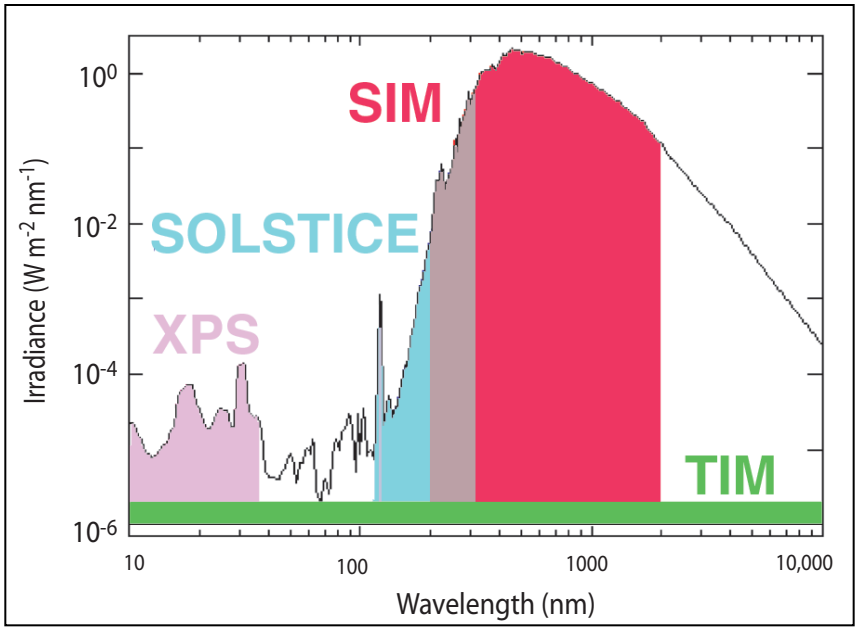
Spectral Irradiance Monitor (SIM) 200 – 2000 nm



SOLAR STellar Irradiance Comparison Experiment (SOLSTICE) 120 – 300 nm

XUV Photometer System (XPS) 1 – 31 nm





SORCE Satellite