The Historical Development of SORCE (looking back to the future)

Historical Fiction:

- Setting is drawn from history, it contains historical persons, pays attention to historical detail
- Artistic license is permitted in regard to presentation and subject matter, so long as it doesn’t deviate from established history (Alternate History)

G. Rottman and T. Woods

LASP — University of Colorado, Boulder
First Space Observations of the Sun

Solar spectrum photographed from a V-2 rocket.  
(R. Tousey, U.S. Naval Research Laboratory)
Graduate Work at JHU

• 1966 to 1972 at Johns Hopkins
• Rocket observation of planet Venus
• Large precision pointed telescope with small **prism UV spectrometer**
  – High throughput
  – Low scattered light
  – No overlapping spectral orders
  – Highly stable
• Analyses required solar irradiance
  – (apparently factor of 2 uncertainty)
My Arrival in 1972 at CU Boulder — LASP

George Lawrence

Dick White

January 31, 2014

SORCE Science Team
UARS (SOLSTICE)
Proposal and Selection

William G. Fastie
(1916-2000)

Solar Stellar Irradiance Comparison Experiment
• Directly compare the Sun to bright blue stars
• <1% accuracy
• 110 to 180 nm, 180 to 300nm, 300 to 400 nm
Tom Woods joins UARS and Initiates the EUV Program
Lead-in to EOS

Space Station Freedom (new Start)
• System Z

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

• Letter of acceptance in February 1989
• All-Hands Meeting of IWG in March 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
Environmental Data Records (EDR’s)

EOS Instruments are designed to measure the following environmental variables:

- Cloud properties
- Energy exchange between Earth and space
- Surface temperature
- Structure, composition, and dynamics of the atmosphere, winds, light, and energy
- Accumulation and alteration of surface waters
- Biological activity
- Circulation of the ocean
- Erosion of coastal regions and gases between the ocean and atmosphere
- Erosion and composition of exposed soils and rocks
- Changes in stress and surface elevation around geologic faults
- Input of solar radiation and energetic particles to the Earth.

Take today’s data today
It will not be available tomorrow.

January 31, 2014
SORCE Science Team
Finding a Flight of Opportunity (FOO)

Figure 4. Restructured EOS Launch Profile (March 1992)

Notes:
- CERES and LIS are funded for TRMM-1 in 1997
- ACRIM, SOLSTICE, EOSP, and descoped MLS or SAFIRE are available for missions-of-opportunity
  - Launch cycle repeats until each flight (except COLOR) has flown three times
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
✓ UARS SOLSTICE (300 to 400 nm) channel provided 1% accuracy >> solar variations
✓ Needed instrument with a reliable, stable detector — G. Lawrence developed the miniaturized ESR
✓ Desired an instrument (300 nm to 2μm) with a single, figured prism — G. Mount helped develop the SIM
✓ Instrument should be self calibrating
TSIM Announcement of Opportunity (1997)

- Science Objective: to continue TSI measurement
- (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
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
Recommendation for the Future

• Continue to improve TSI and SSI techniques
• Continue overlapping observations
• Procure dedicated and quality spacecraft
  – Lifetime of > 5 years
  – Pointing of < 1 arc min
  – $\Delta$ temperature of < 1 °C
• Reliable launch to LEO ~ 600 km
• Hot spare (integrated spacecraft and instruments) to launch within 6 months