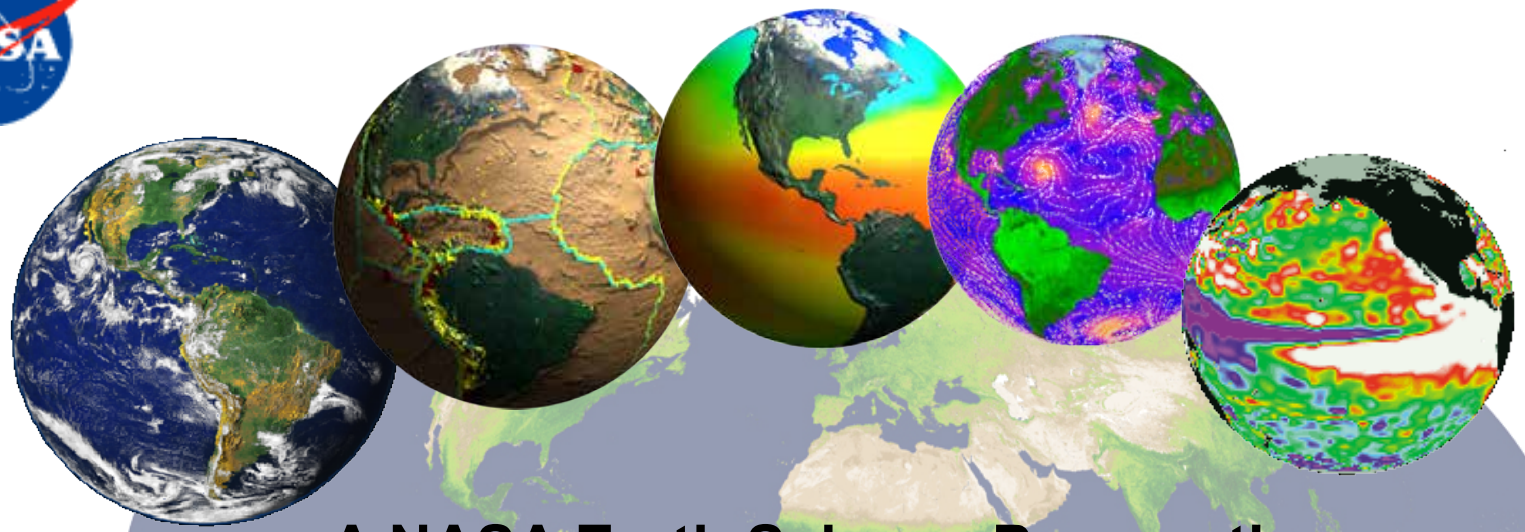
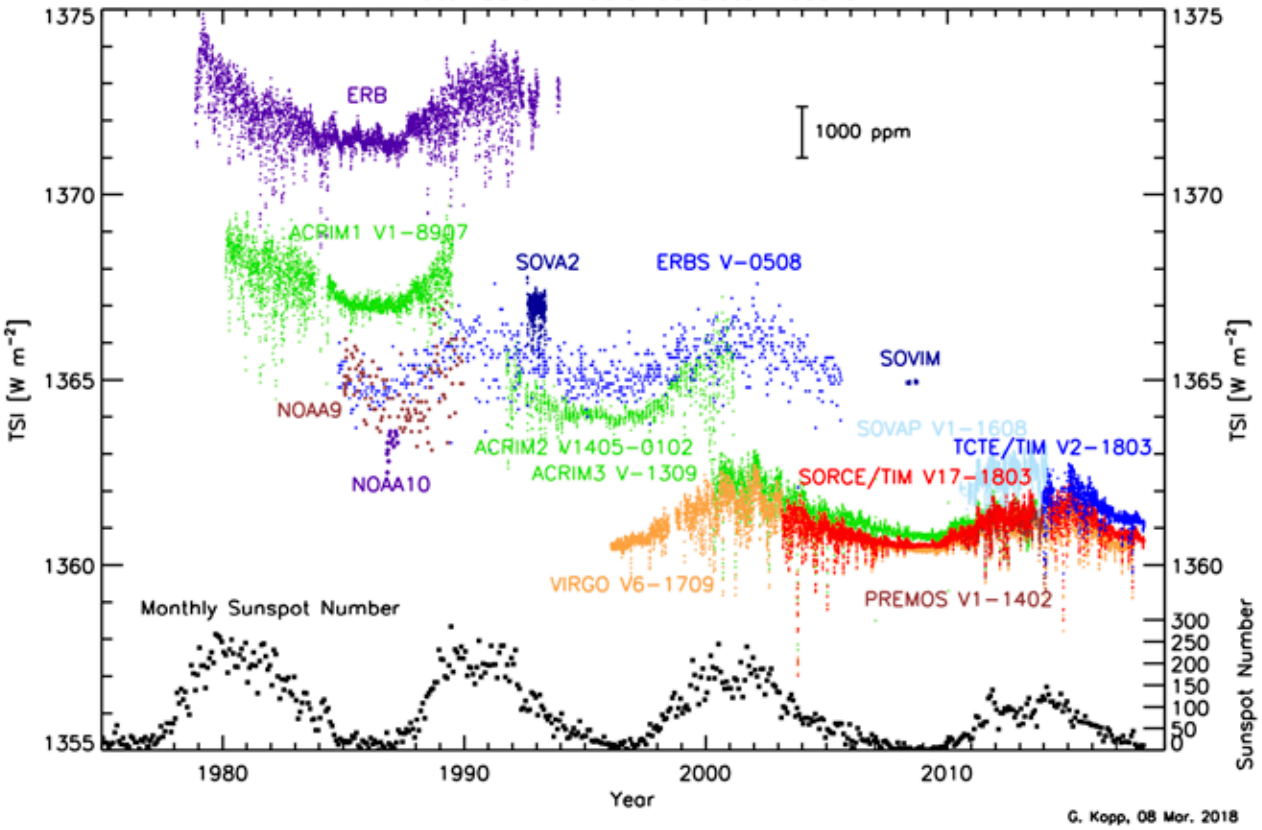


A NASA Earth Science Perspective on Solar Irradiance – aka, What is HQ thinking?

David Considine
NASA Headquarters
Earth Science Division
March 21, 2018

Total Solar Irradiance Data Record



From Gregg Kopp, as of March 8, 2018

- NASA has been measuring total and spectral solar irradiance for many years.
- The responsibility for TSI and SSI measurements was moved from NOAA to NASA in the 2014 President's Budget.
- NASA completed and launched TSIS-1, and is planning on developing and launching a TSIS-2 mission to continue SSI and TSI measurements.
- NASA is thinking about how to continue the measurement reliably and economically in the future.

President's Budget Request, 2019

TOTAL SOLAR IRRADIANCE SENSOR-2 (TSIS-2)

- TSIS-2 will be the follow-on to the TSIS-1 mission.
- TSIS-2 will maintain and extend the measurements of TSI and SSI provided by TSIS-1.
- **NASA is planning to implement TSIS-2 as a CubeSat mission.**
  - The project will begin formulation in calendar year 2018.
  - NASA GSFC initiated the TSIS-2 pre-formulation work in April 2017,
    - TSIS-2 pre-formulation team issued two separate study contracts with LASP
    - Study different implementation approaches for TSIS-2.
    - NASA will use the results of the study reports to determine the path forward for TSIS-2.

FY 2019 President's Budget Request for TSIS-1, TSIS-2, and SORCE

	FY17 Act	CR 2018	Request 2019	2020	2021	2022	2023
SORCE	4.8	-	5.5	4.9			
TSIS-1	8.6	-	4.8	4.7	4.9	4.7	4.8
TSIS-2	3.6	0.574	8.3	10	10	10	10

Why CubeSats???

Thomas Zurbuchen, Chair
Committee on Achieving Science Goals With Cubesats –
Also, Current Associate Administrator for NASA Science Mission Directorate

From President's Budget Request, 2019

"**A Science-wide CubeSat/SmallSat initiative is implementing the recommendations from a recent study of the National Academies** that concluded that, with ongoing technological progress in both private sector and through Federal investments, these small satellites are on a path to address specific high-priority science goals. **A targeted investment strategy focuses technology development on CubeSats/SmallSats in all four SMD science themes** to exploit this value and will provide novel partnership opportunities between commercial partners and NASA."

Radiation Budget Instrument (RBI) Cancellation

- **Final CERES Instrument Successfully Launched on JPSS-1 in November, 2017!!!!**
- **Successor Instrument (RBI, planned for JPSS-2) CANCELLED January 2018 - cost overruns.**
- **Decision Memo included action to develop plan for a follow-on instrument.**
- **Follow-on instrument will be first NASA "Earth Venture Continuity" mission.**
- **Earth Venture is NASA's program for low-cost, competed missions -**
  - **EV-Suborbital, EV-Instrument, EV-Mission, EV-Continuity**

Decadal Survey 2017 Venture Continuity Element

Program Element	Description	Purpose
Venture Continuity	New strand of the Venture program targeted at incentivizing low-cost continuity of existing measurements	Provides opportunities for new and innovative ways to continue existing measurements, and seeks to address the tension between making new measurements vs. continuing existing measurements by bringing forward innovative approaches to sustain measurements at lower costs.

- **Can you have your cake and eat it too??**

Solar Irradiance Science Team

- NASA solicited a “Solar Irradiance Science Team in the ROSES 2014 and 2017 Solicitations.
- Funding level is about $1 M/year.
- Purpose is to support the development of consistent, multi-instrument/platform space based data sets of both total and spectrally resolved solar irradiance.
  - No solar physics, no Earth science.
- ROSES 14: Funded 7 of 12 responsive proposals.
- ROSES 17: Funded 8 of 10 responsive proposals.
  - Informal Notifications have been sent – formal notifications will be made soon.
  - Tom Woods selected as the team lead.

Summary

- NASA in general is trying to do more with cubesat approaches
- NASA ESD intends to implement TSIS-2 as a cubesat mission.
  - Plan is to get TSIS-2 into formulation this year.
- HQ Management understands this is a risky approach - “intentionally so.”
  - Optimistic stance – “Leaning forward.”
  - With launch of TSIS-1 and a mission of 5 (+2) years, HQ management feels there is time to try something new.
  - TSIS-2 is seen as being appropriate for cubesat –
    - Flexible orbit.
    - CSIM and CTIM could fly independently.
    - Multiple instruments flown concurrently reduces continuity issue.
  - Low cost launch services soon (now?) available.
  - **Much depends on what happens with CSIM and CTIM demonstrations currently being readied for launch (CSIM) or under development (CTIM).**
  - **If this works, TSIS 2 -> “TSIS Forever” (That is, continuous sequence of CTIM & CSIM).**