

Long term monitoring of Total Solar Irradiance: Results and Challenges

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Wien, COPUOS, February 9, 2012

Overview

- **Introduction:**
 - The role of solar forcing is not yet understood
- **Results:**
 - 30 years of TSI space observations
 - Measurement of the absolute value of TSI
- **Challenge #1:**
 - Construct a TSI composite over 30 years
- **Challenge #2:**
 - Maintain TSI monitoring in the future !

Comparison irradiance forcing with ice ages

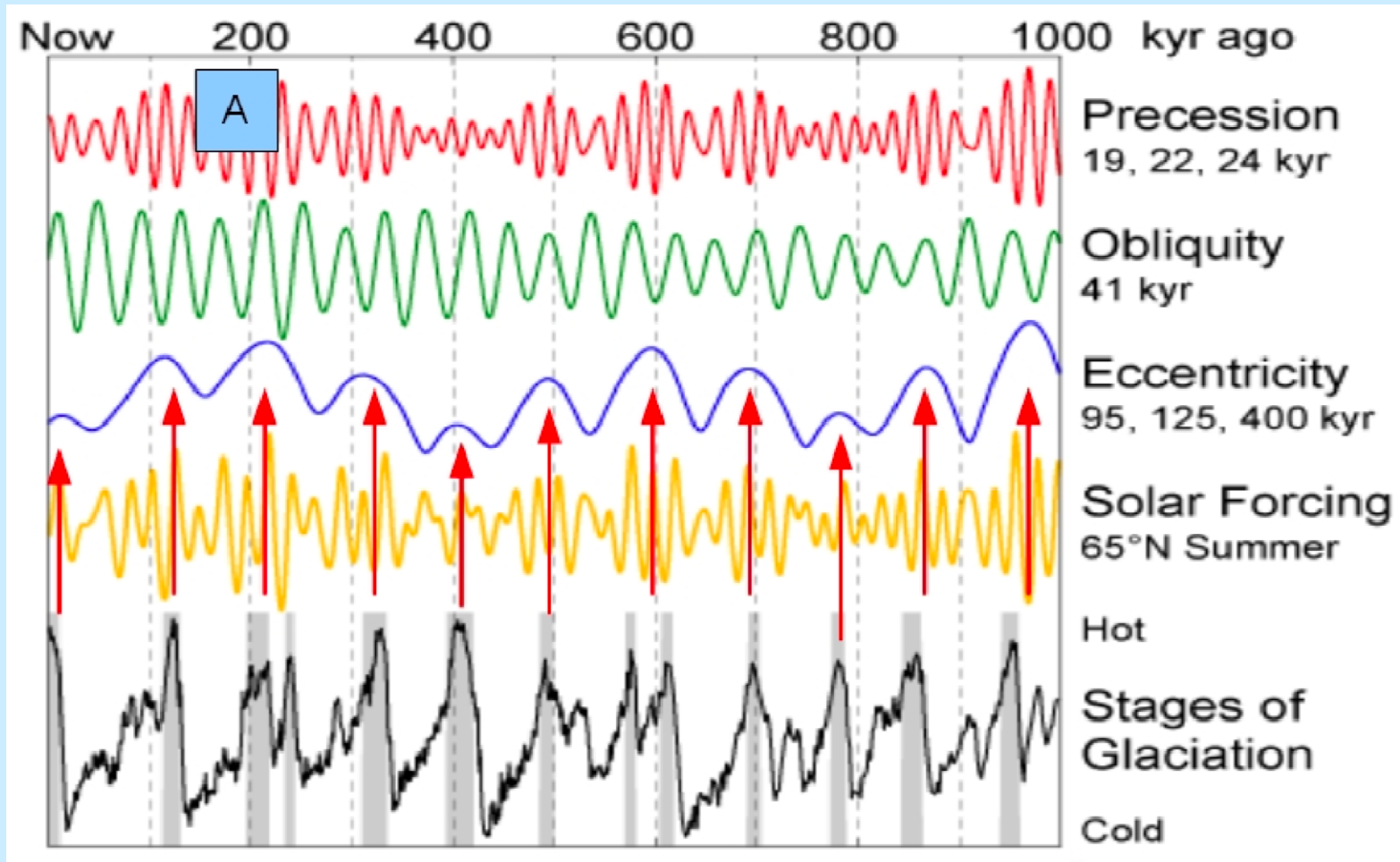
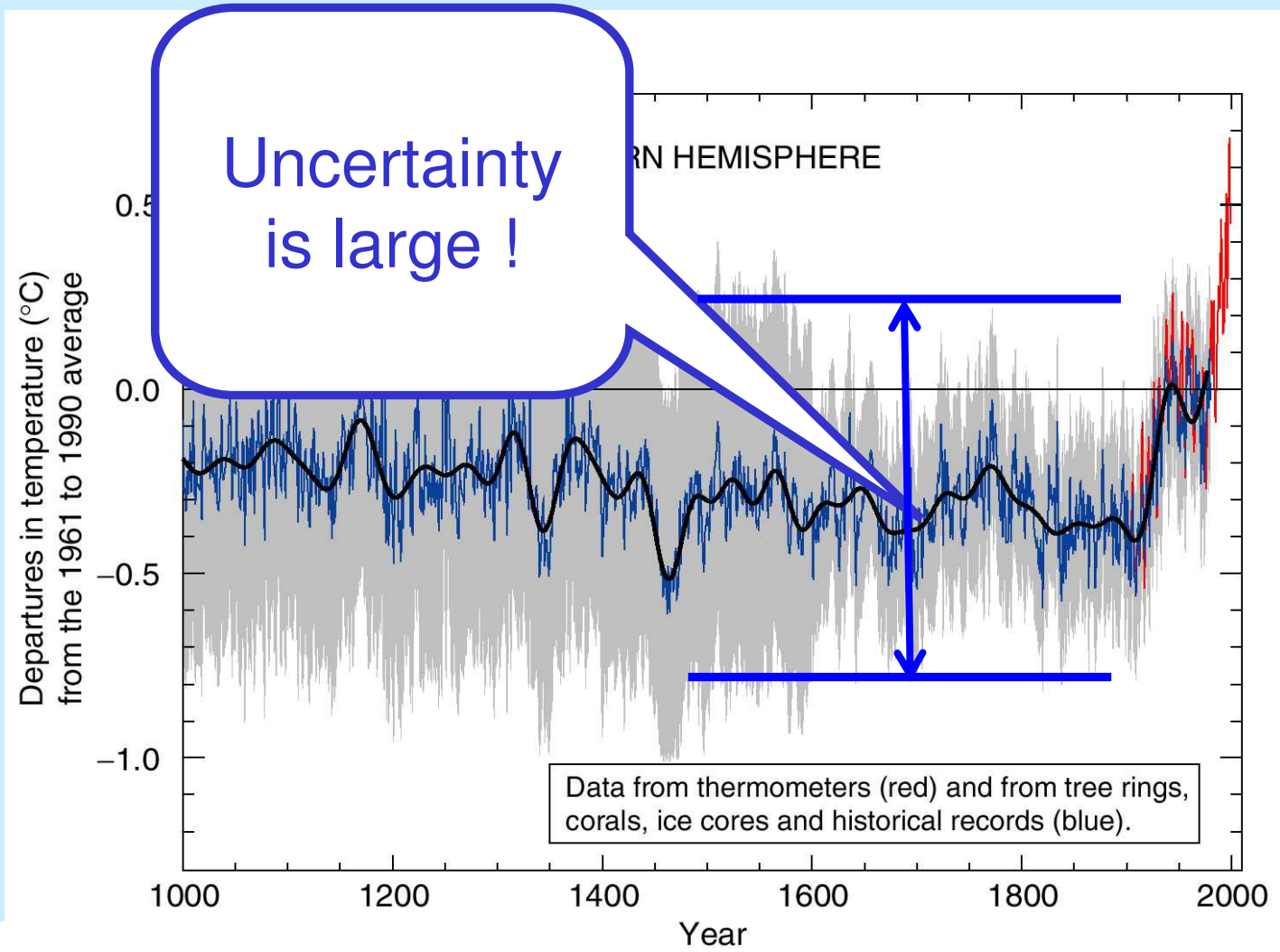


Illustration from Wikipedia

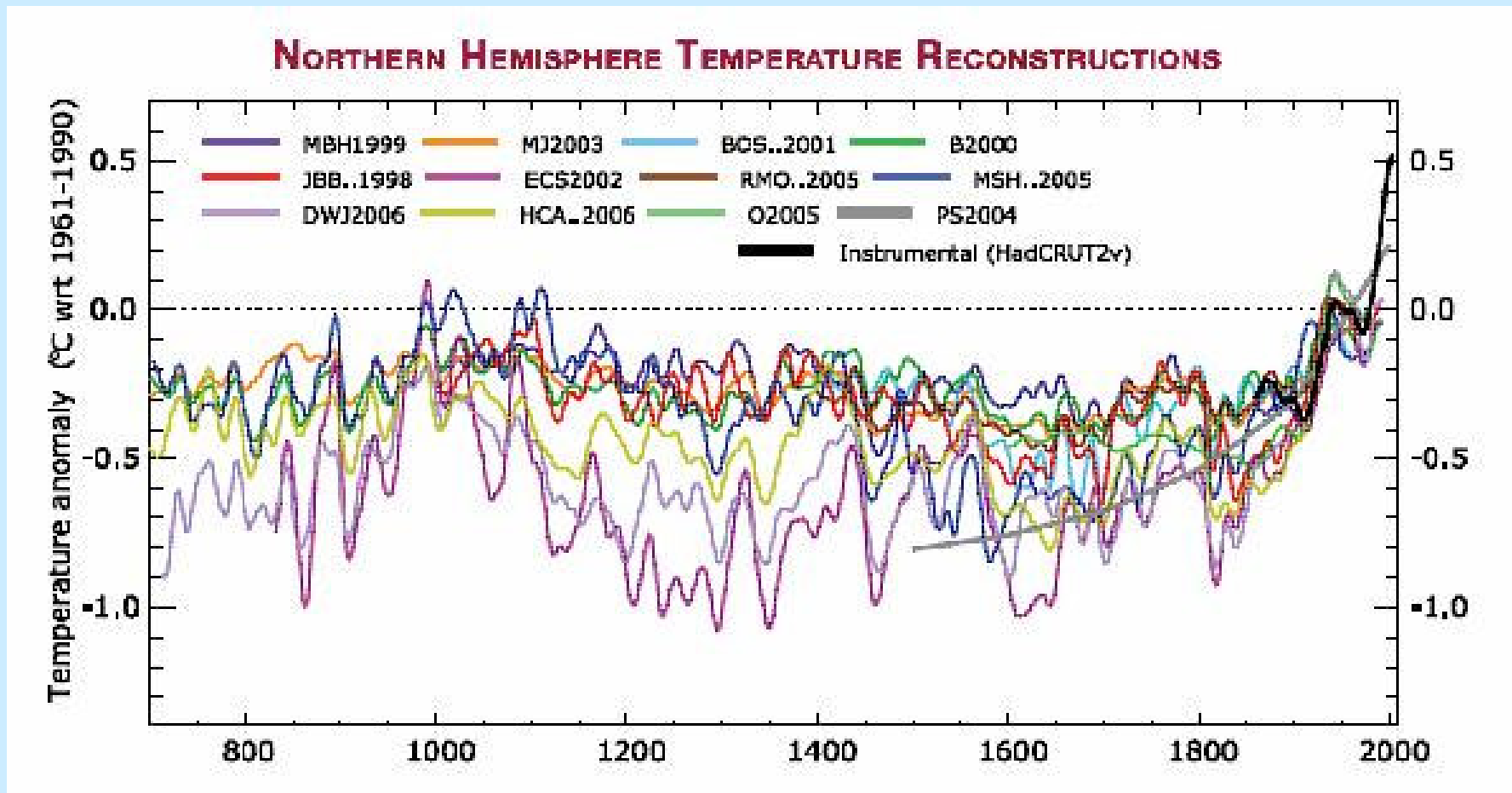
Climate anomalies



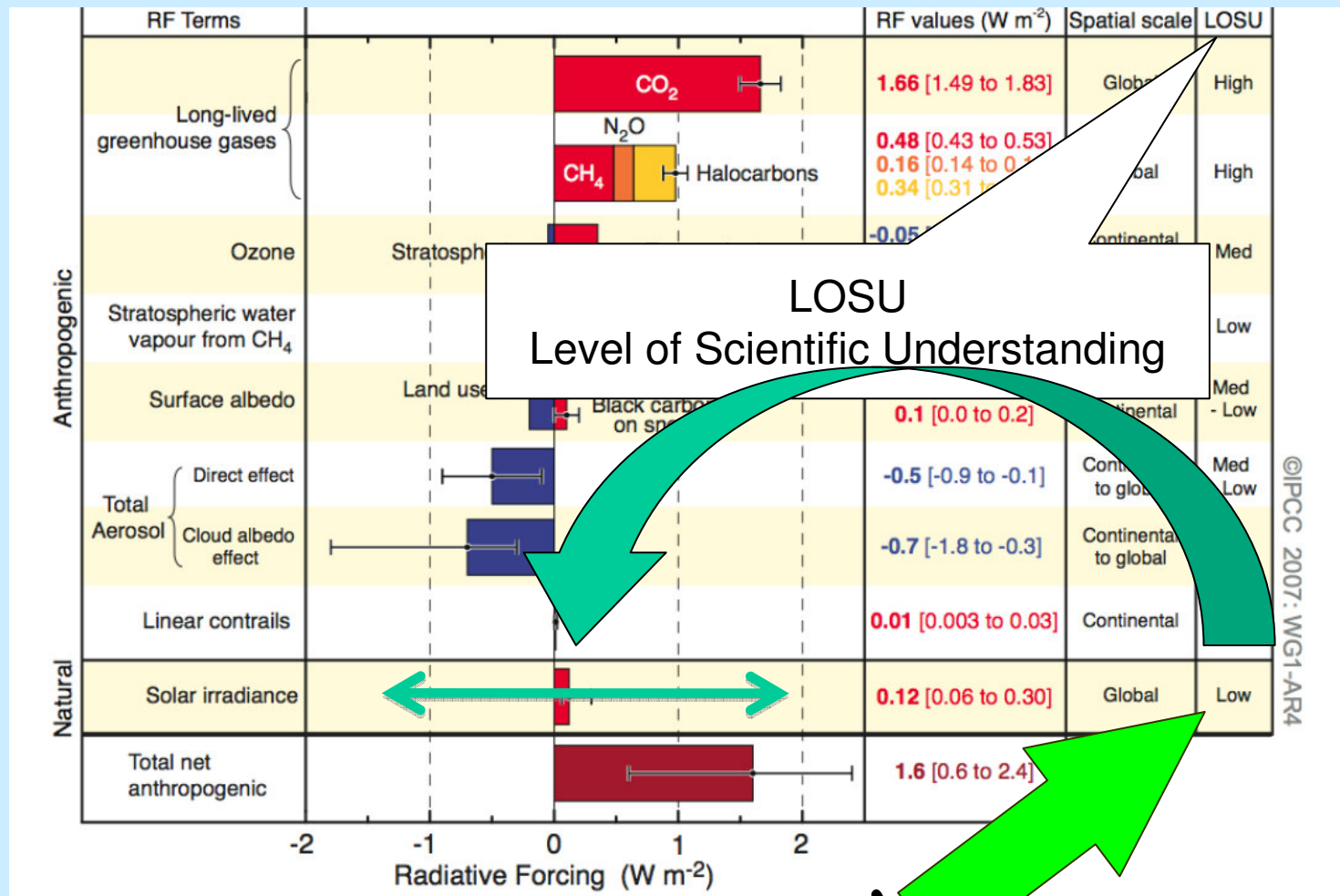
Temperature reconstruction



Temperature reconstructions

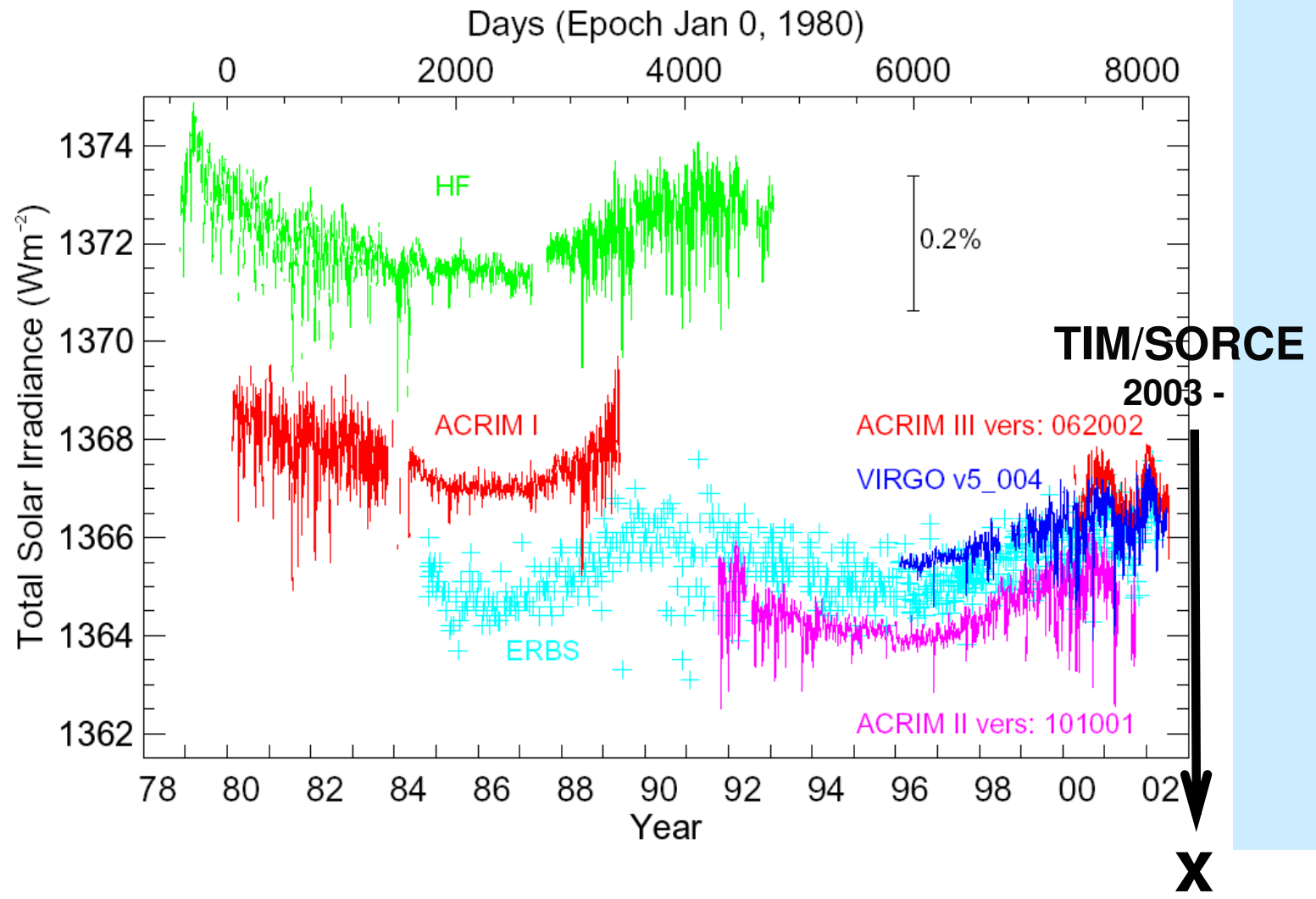


IPCC radiative forcing

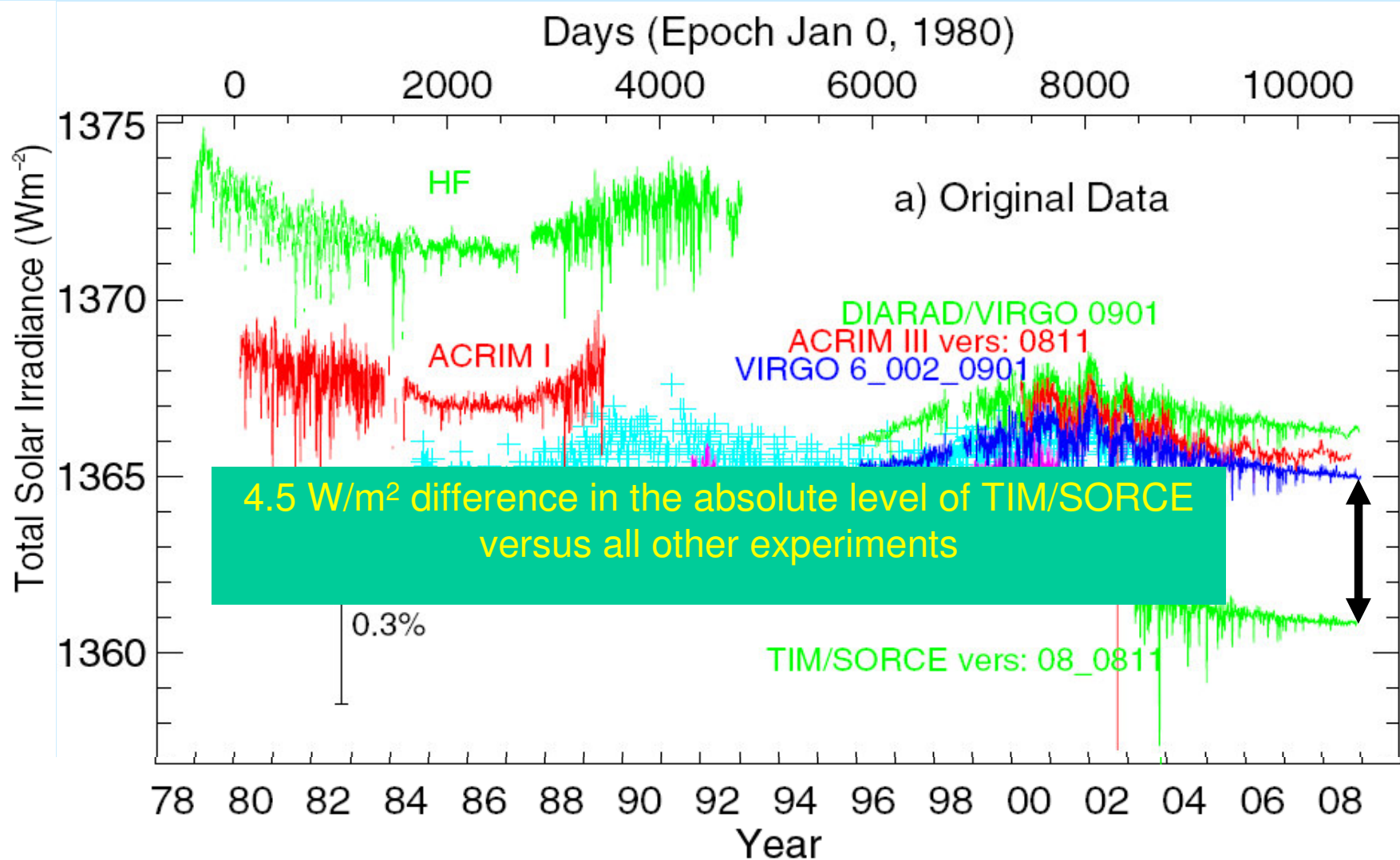


Since 1979 Total Solar
Irradiance is measured
from space

TSI from space experiments

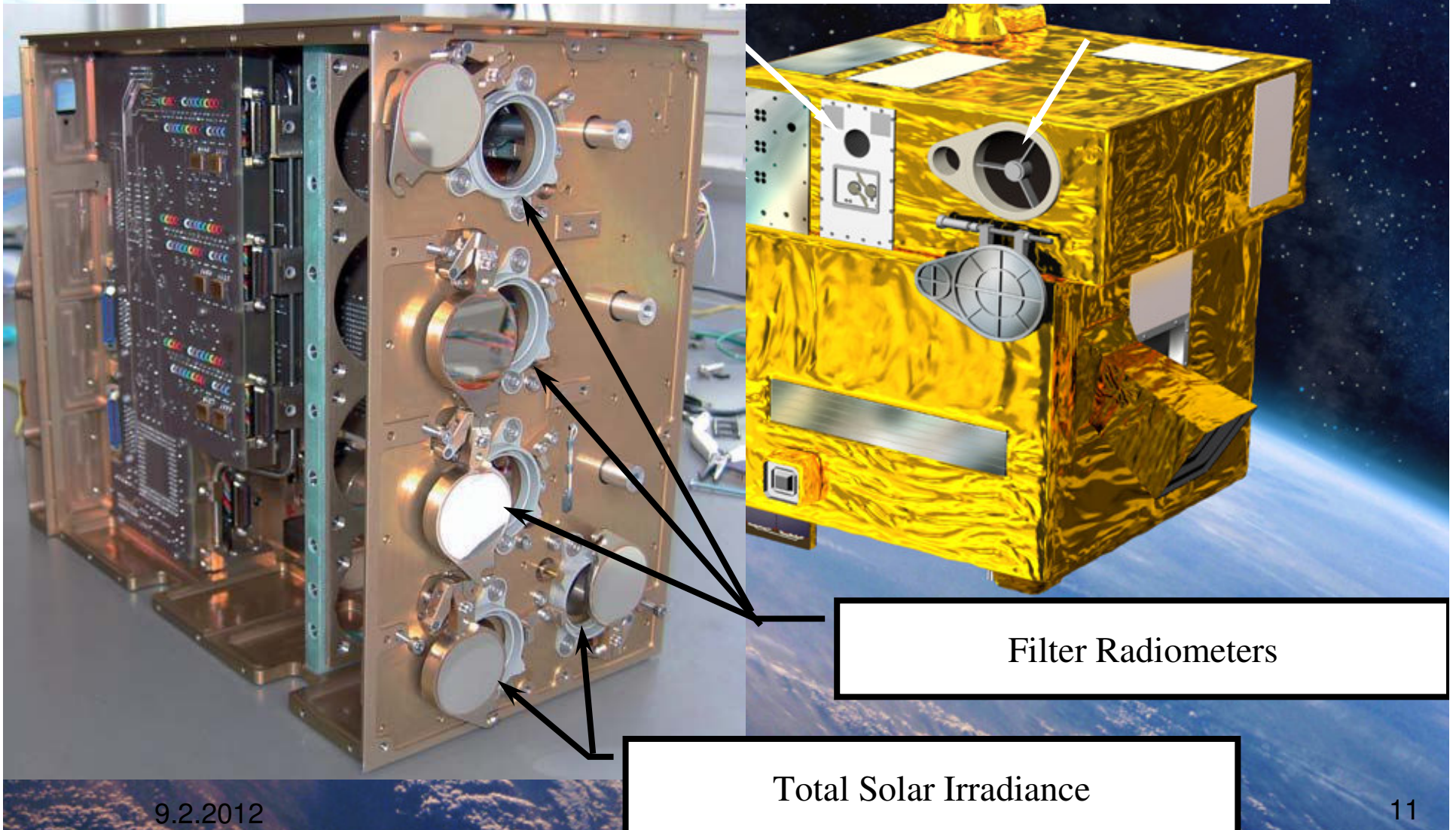


TSI from space experiments



PICARD – a French Micro-satellite

PREMOS – Swiss radiometer on PICARD

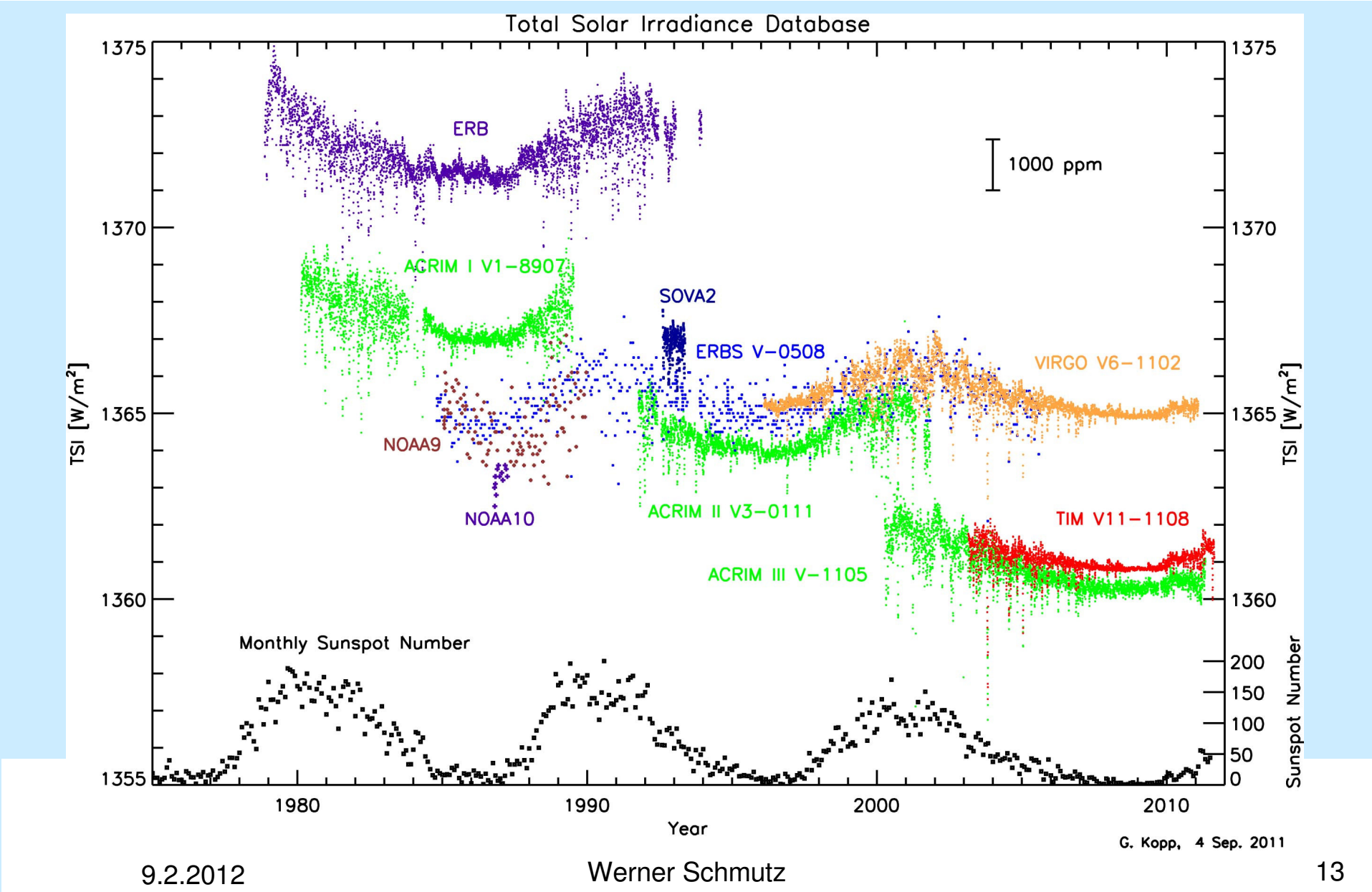


PREMOS A is the *first and so far only* radiometer in space with a SI-traceable irradiance calibration in vacuum

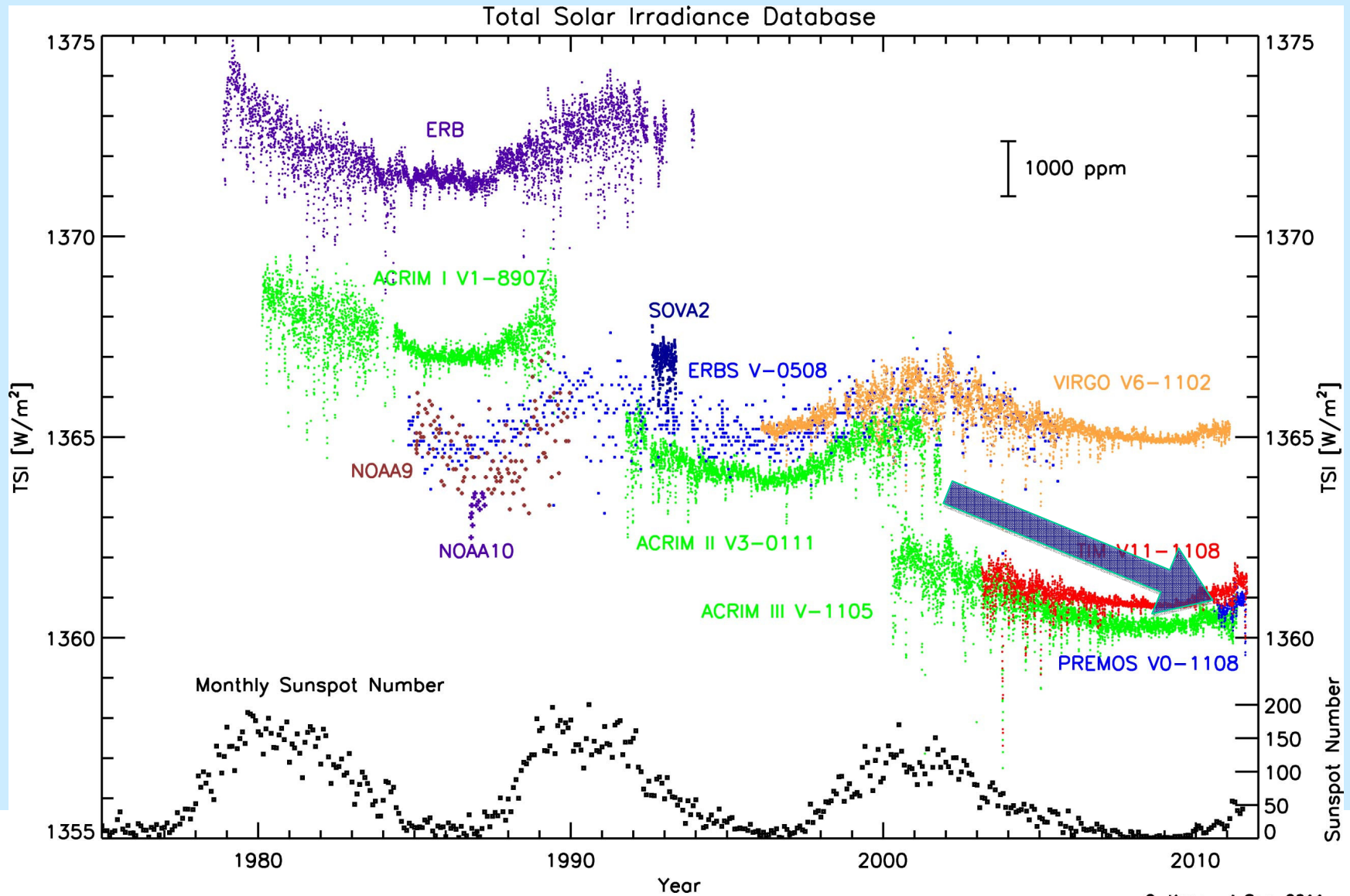
Traceable to the irradiance calibration facility at LASP in Boulder (TRF)

- PICARD was launched June 15, 2010
- PREMOS first light was July 27th, 2010

The absolute value of the solar constant



... and the new PREMOS data



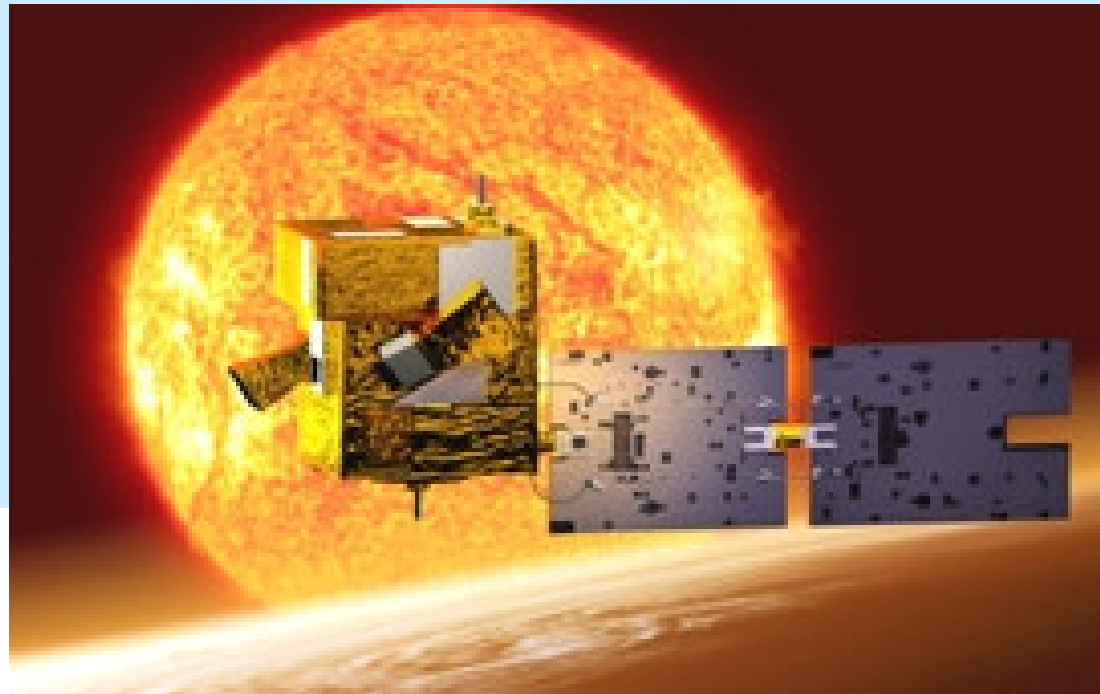
G. Kopp, 4 Sep. 2011

The Solar Constant

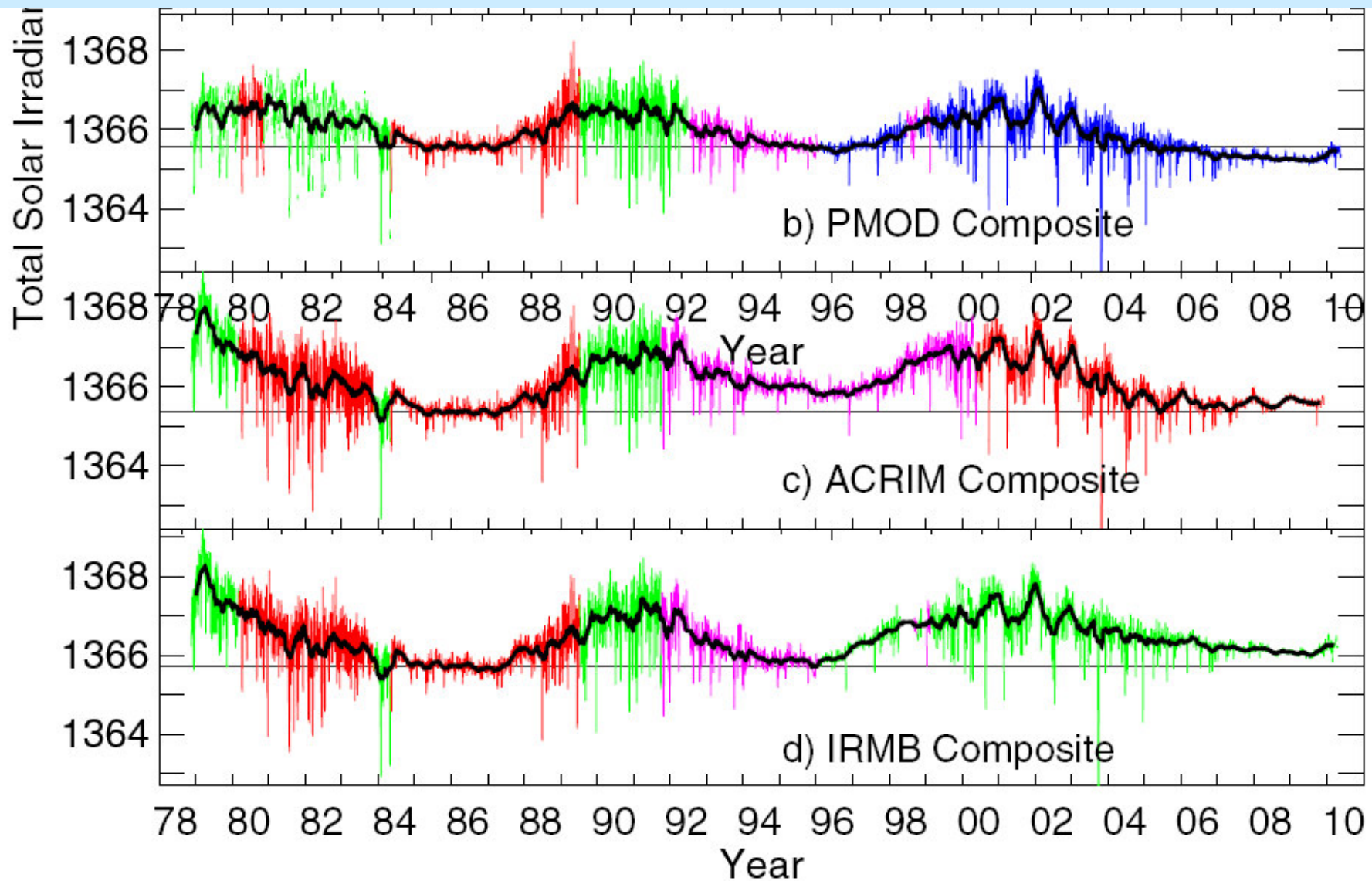
PREMOS/PICARD → The Solar Constant is
1361 W/m²

in agreement to the value from TIM/SORCE and (re-characterized) ACRIM3,
which both were not SI-traceable calibrated

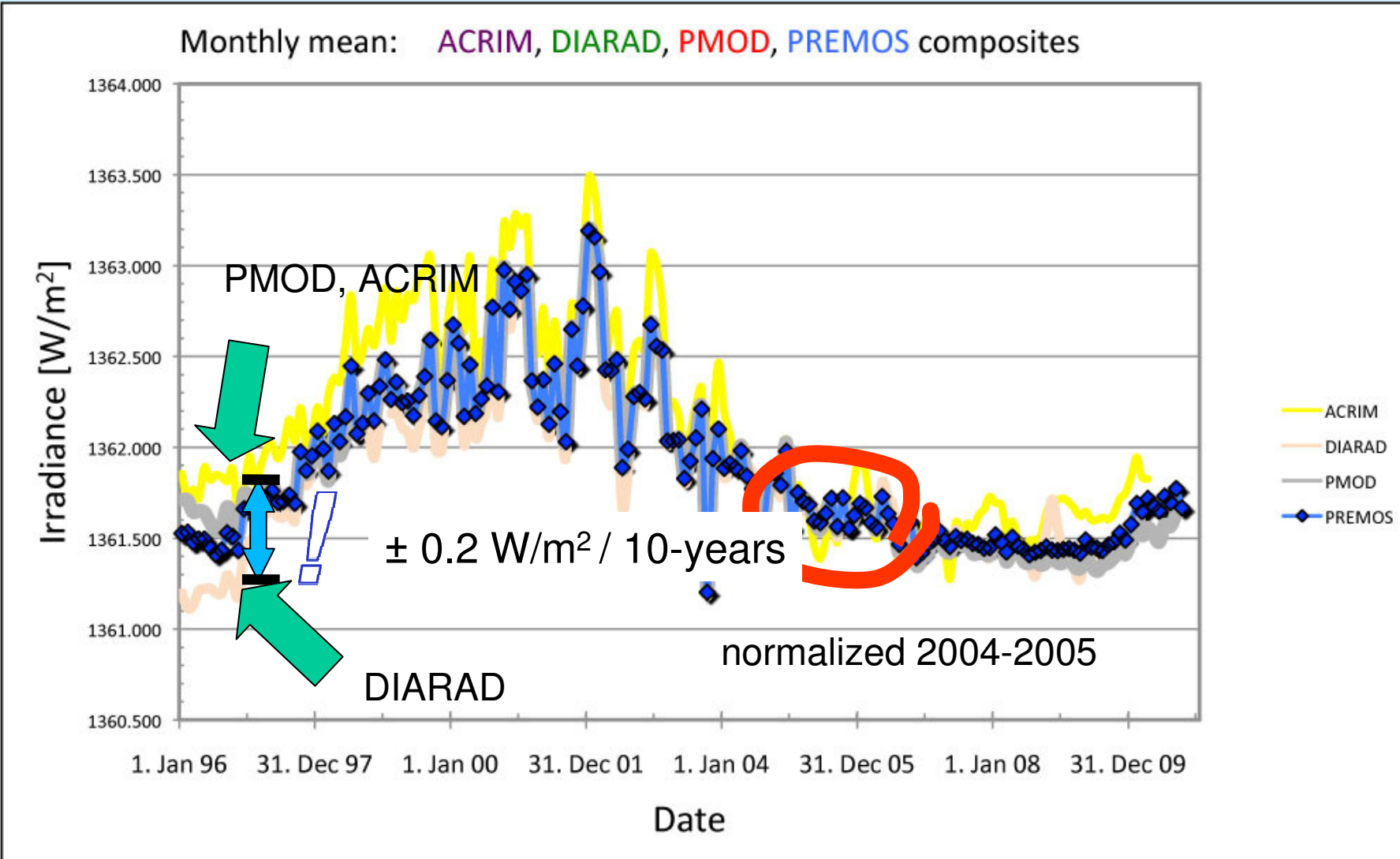
PICARD: French Micro-Satellite



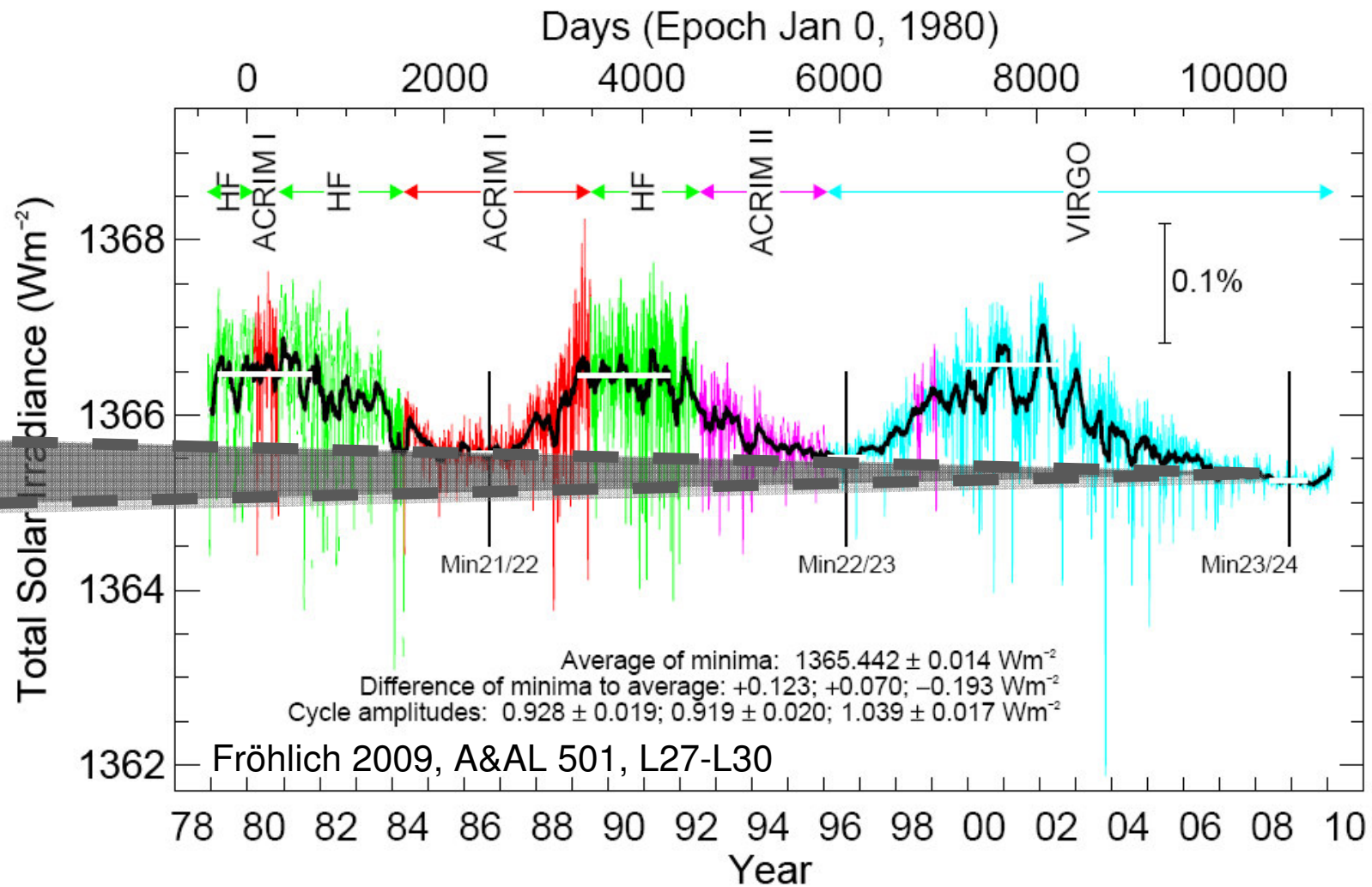
There are three TSI composites



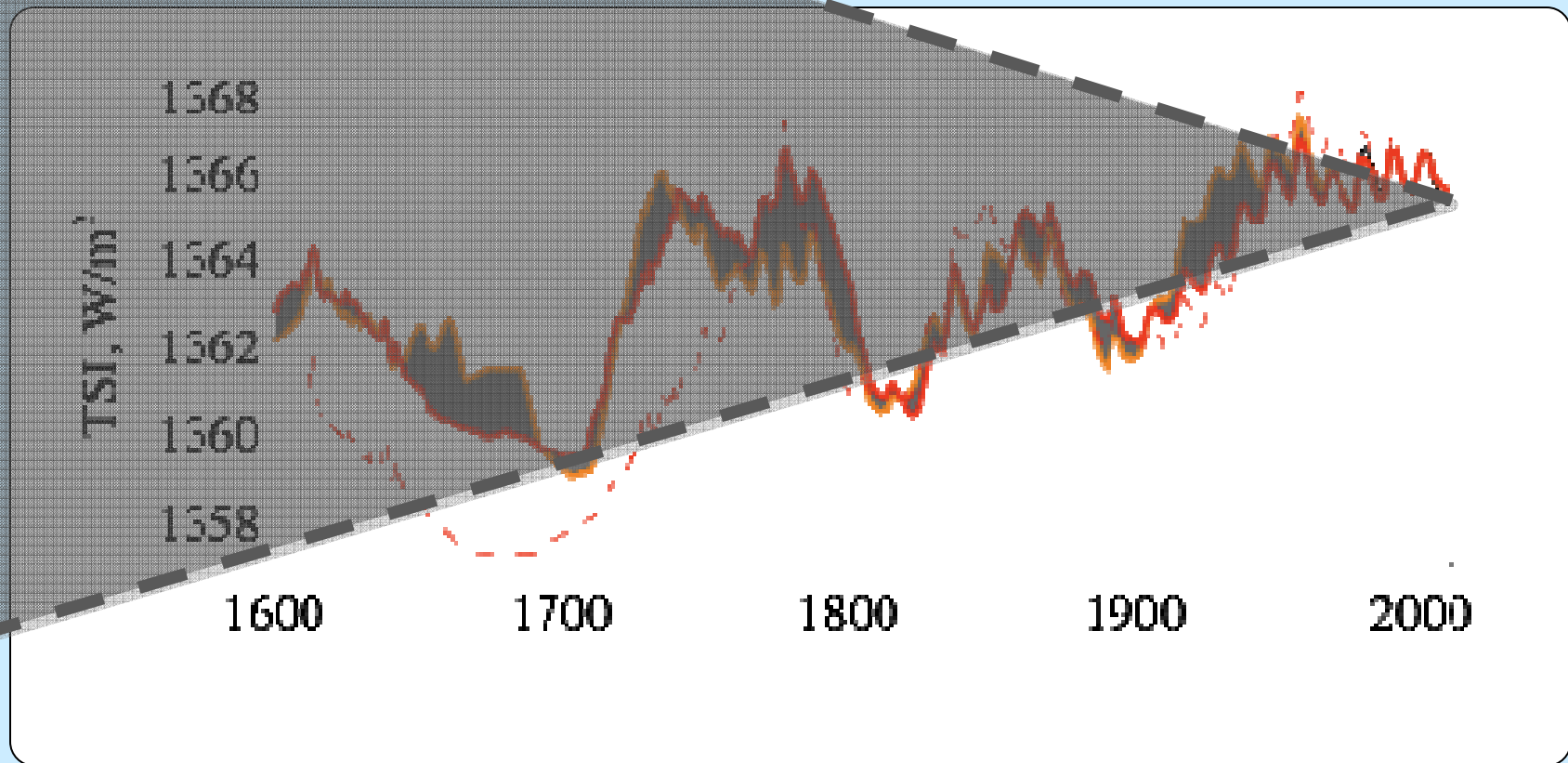
TSI-composites normalized



Is there a long-term trend?



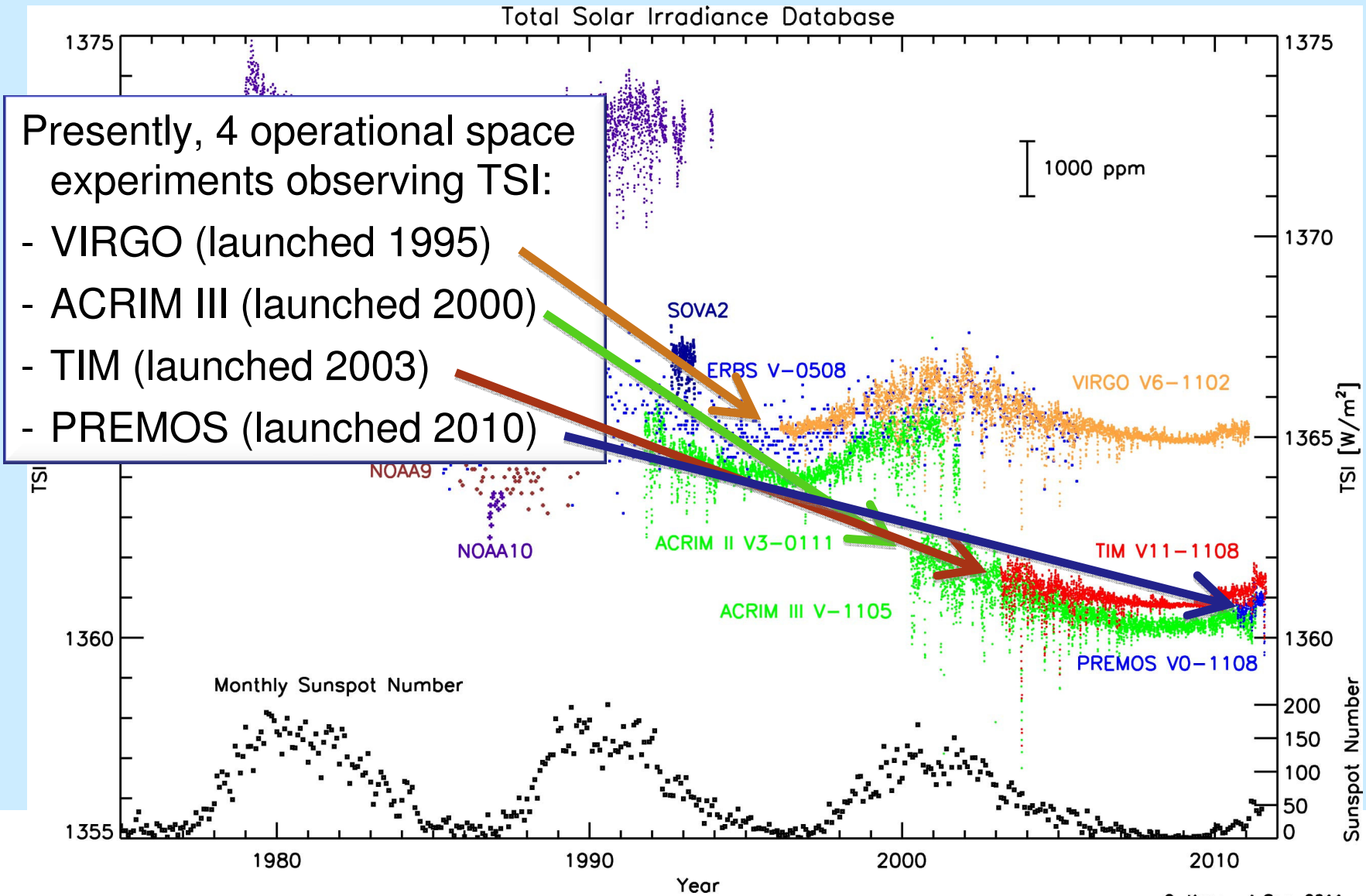
Could we detect a trend with a composite?



„Any plan to rely on an unbroken chain of measurements is broken“

- Not only because of a potential gap;
 - But mainly because of the continuously increasing uncertainty.
- ➔ Accurate absolute measurements are required !

Presence ...



... and future

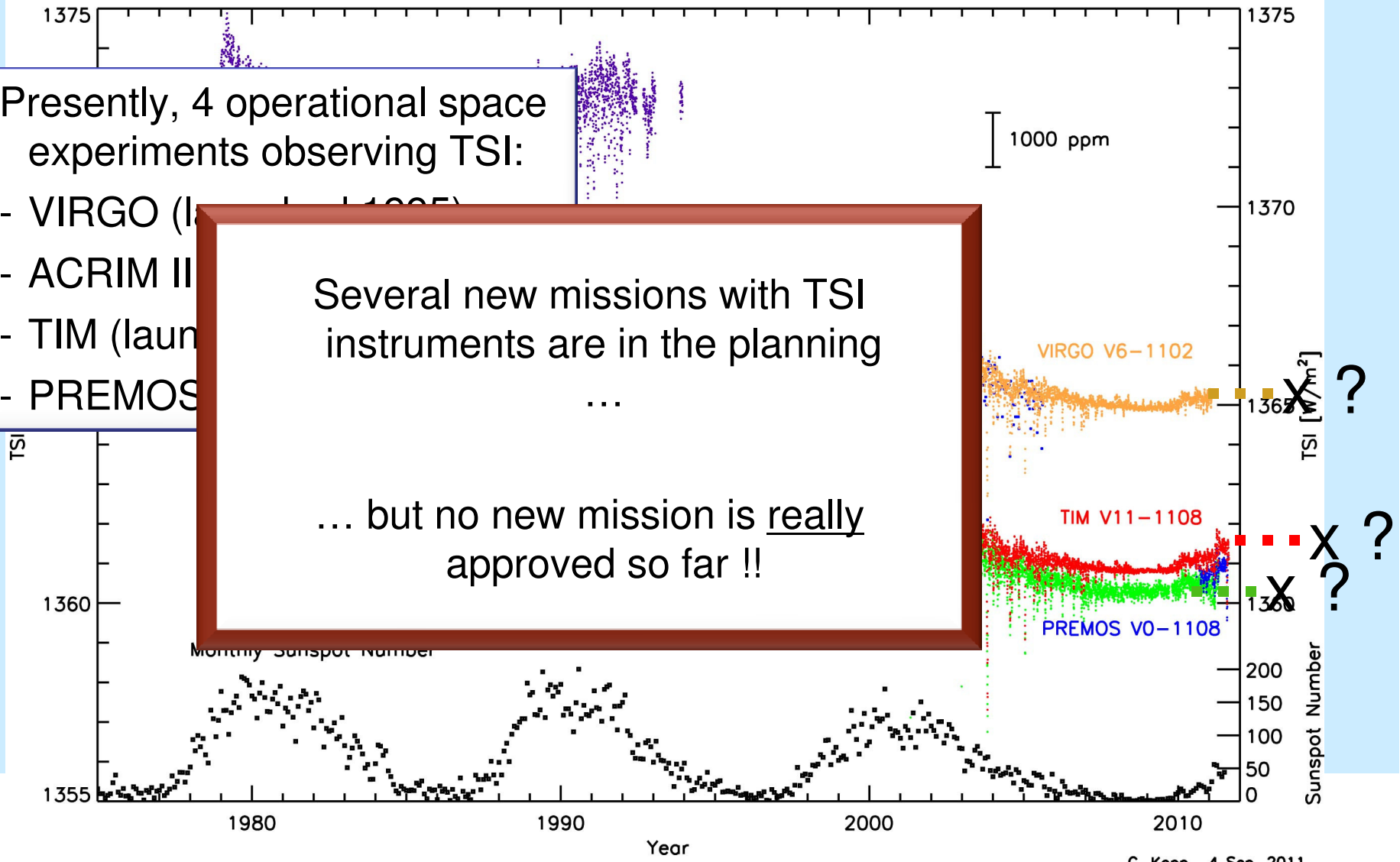
Total Solar Irradiance Database

Presently, 4 operational space experiments observing TSI:

- VIRGO (launched 2003)
- ACRIM II (1998-2003)
- TIM (launched 2007)
- PREMOS (2009-2012)

Several new missions with TSI instruments are in the planning ...

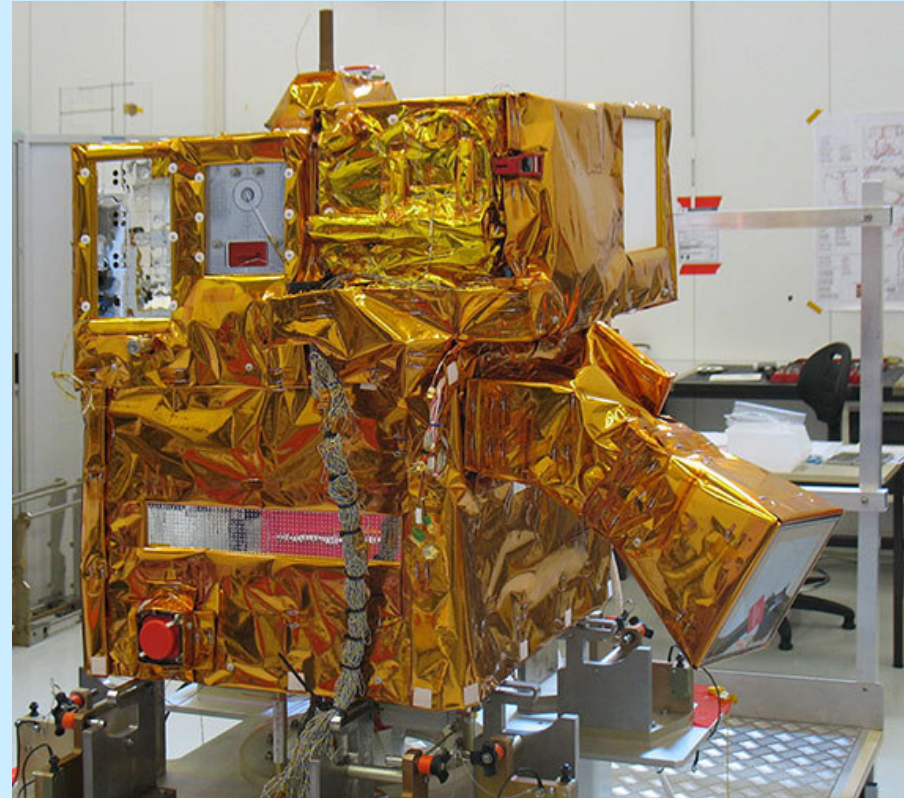
... but no new mission is really approved so far !!



Thank you for your attention



PREMOS



PICARD