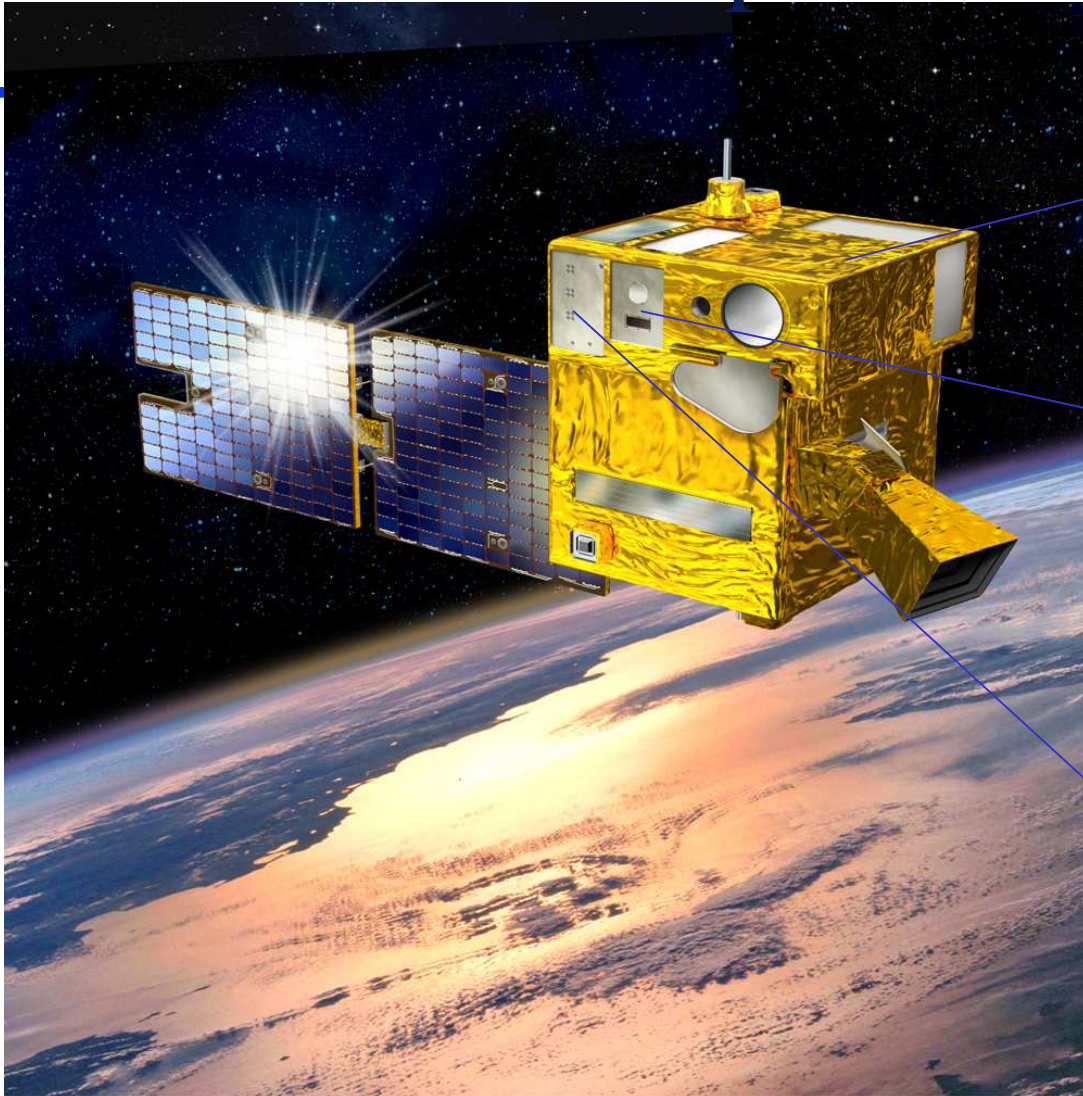# Instrument modes and calibration of the Sova-Picard TSI Instrument

Steven Dewitte

RMIB

Picard WS, 10/04/2012

Picard: a new space mission

© CNES - Mars 2008 /Illustration D. Ducros

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◆ SODISM (CNRS – LATMOS)
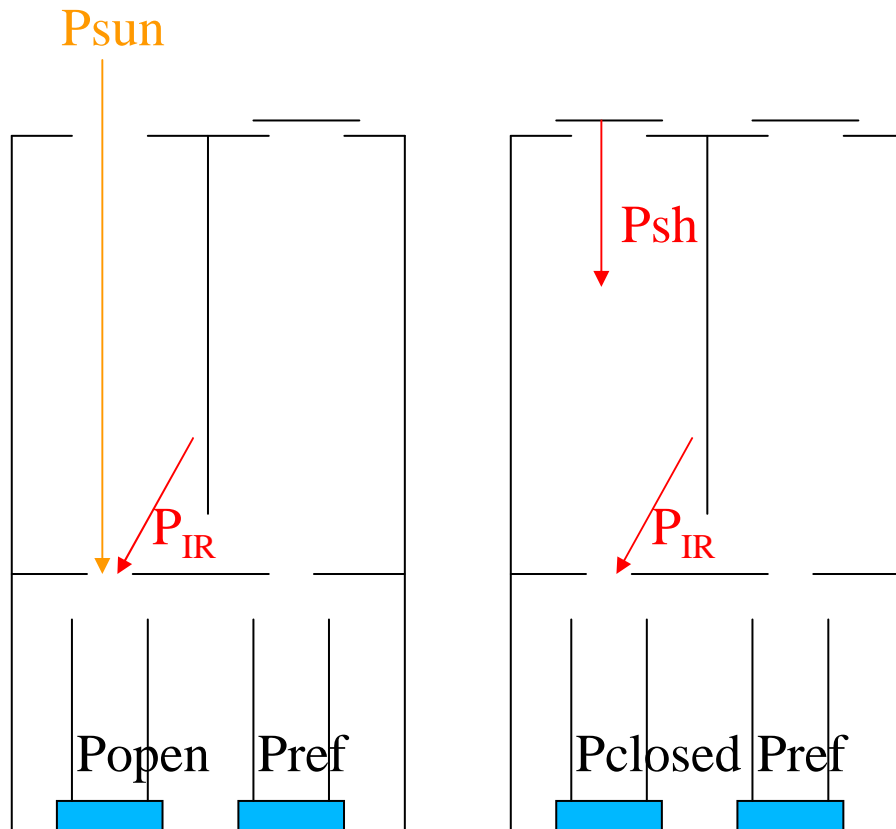 - Imaging telescope
◆ SOVAP (RMIB)
  - Radiometer
  - Bolometric sensor (ROB)
◆ PREMOS (PMOD)
  - Radiometer
  - Photometers
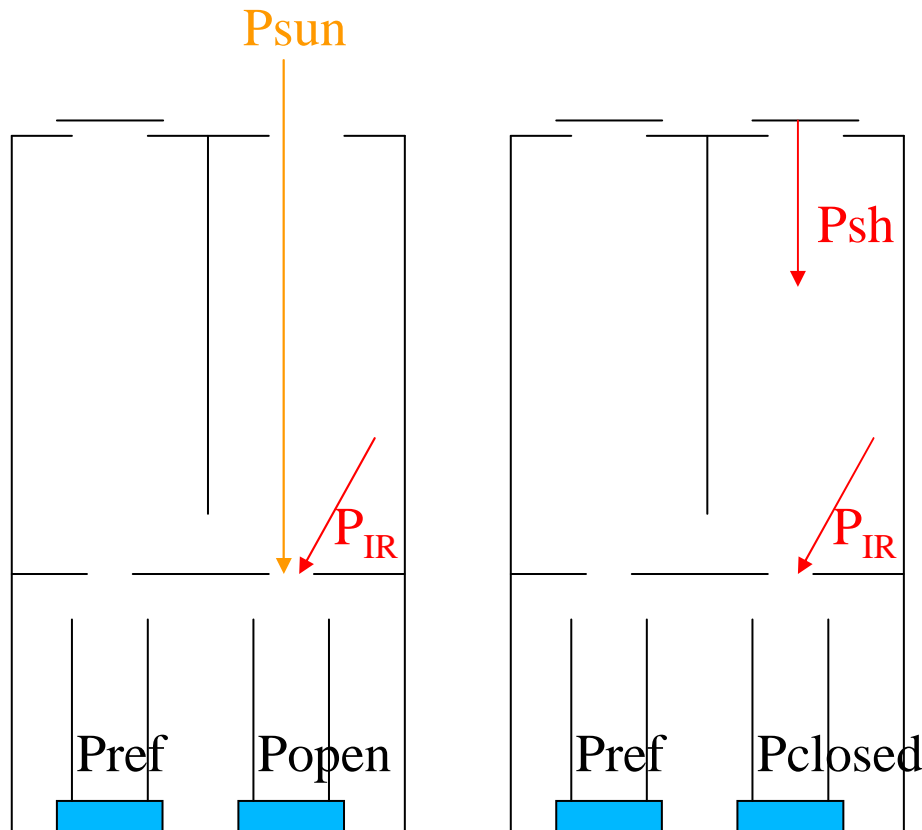
measurement (left side): Auto 2

Open at t_0:

$Pleft = Psun + P_{IR} + Popen$

$= Pref + \ldots$

Closed at $t_0 + 90$ s:

$Pleft = Psh + P_{IR} + Pclosed$

$= Pref + \ldots$

$Psun =$

$Pclosed - Popen + Psh$

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Psun

Psh

P_{IR}

P_{IR}

Pref   Popen

Pref   Pclosed

Open at t_0:
Pleft = Psun+P_{IR}+Popen
   = Pref + …

Closed at t_0+90 s:
Pleft = Psh+P_{IR}+Pclosed
   = Pref + …

Psun=
   Pclosed – Popen +Psh

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Non-equivalence optical-electrical power

Popt

$(1-\alpha_{th,opt})$
Popt

$(1-\alpha_{th,el})$Pel

Pel
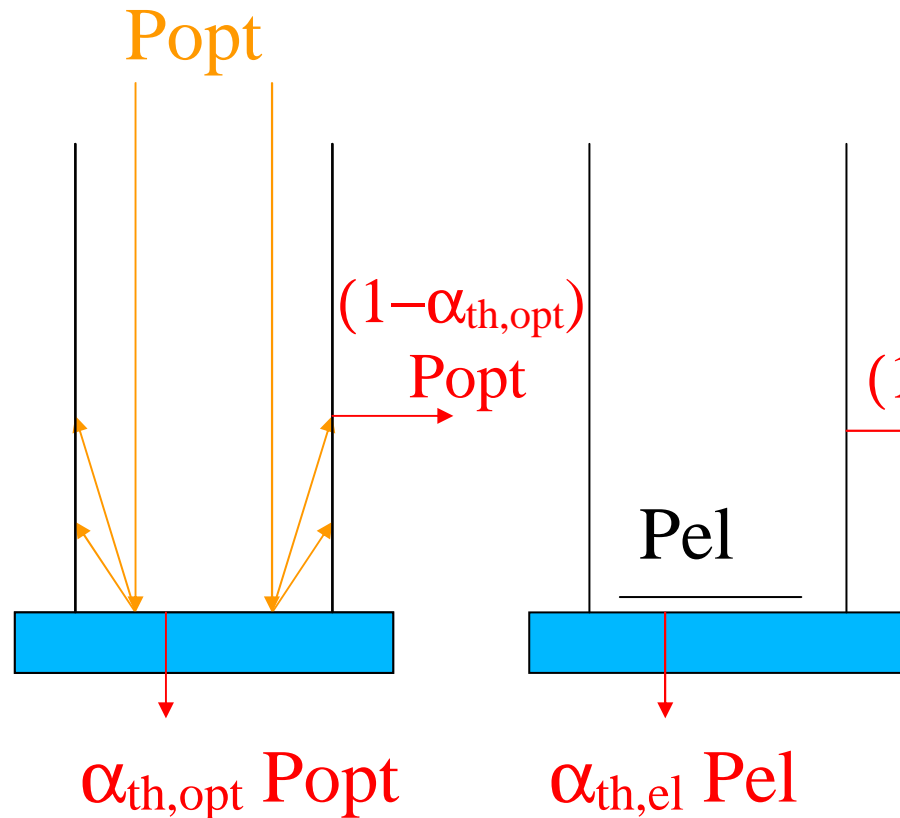
$\alpha_{th,opt}$ Popt

$\alpha_{th,el}$ Pel

$\alpha_{th,opt}$ Popt= $\alpha_{th,el}$ Pel

Popt=$(\alpha_{th,el}$ / $\alpha_{th,opt})$ Pel
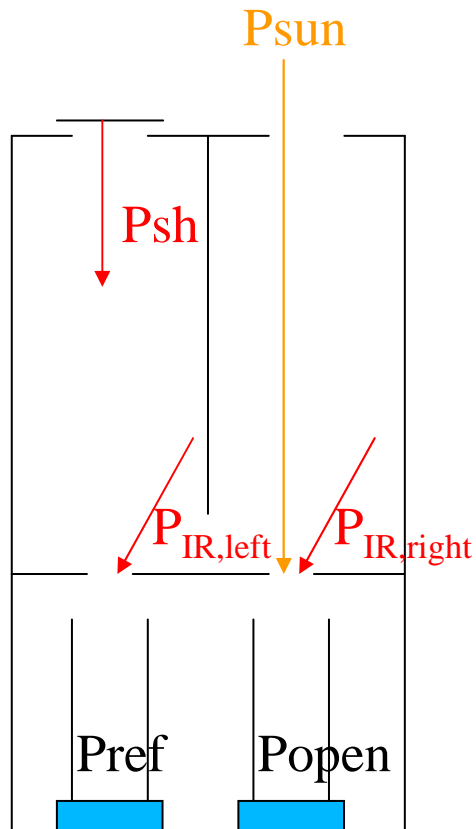
Old assumption:
   $\alpha_{th,el}$ =1

New assumption:
   $(\alpha_{th,el}$ / $\alpha_{th,opt})$ =1

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Long term Total Solar Irradiance measurement time series
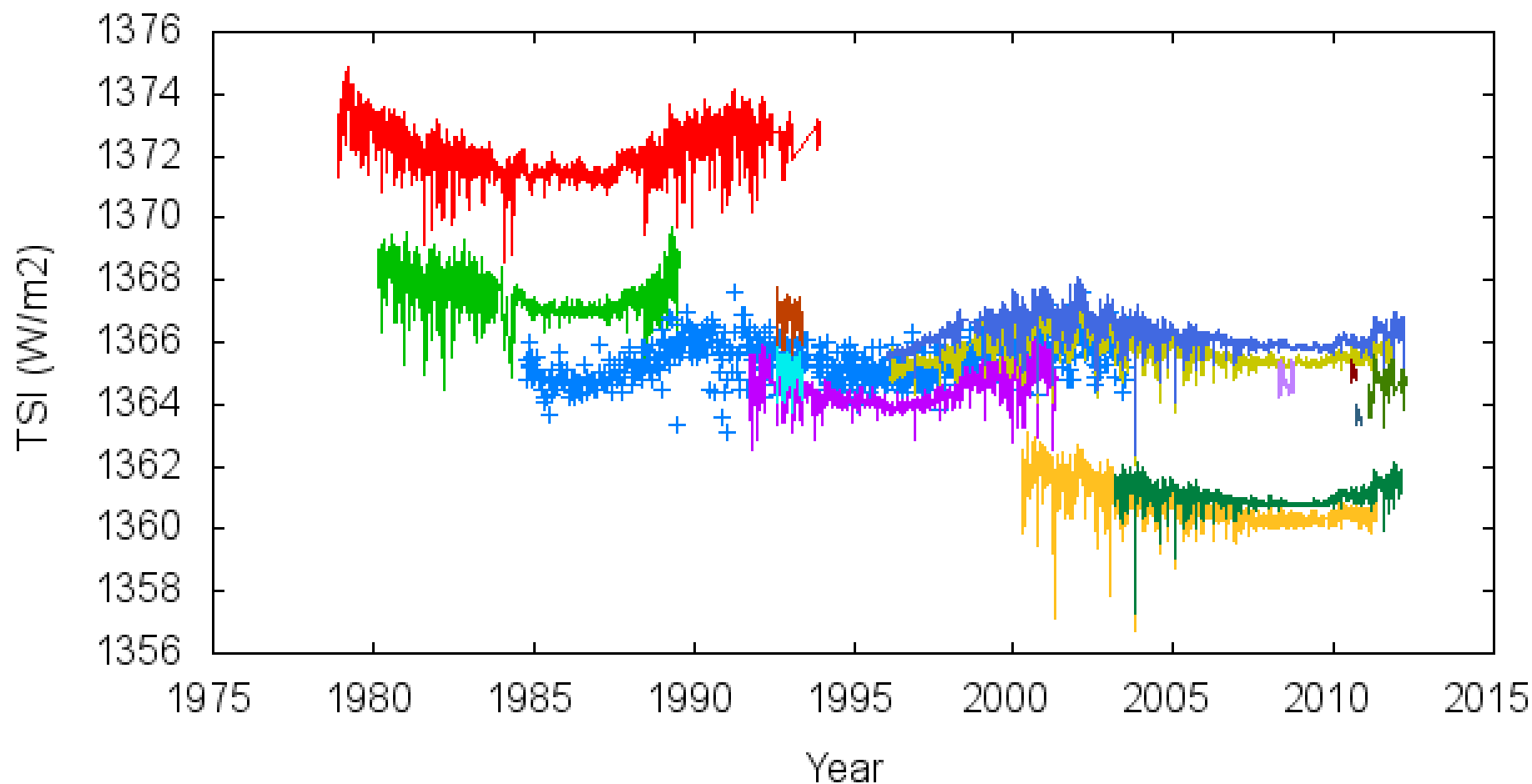
Differential left-right measurement (right side)

$$Pleft = Psh + P_{IR,left} + Pref$$

$$Pright = Psun + P_{IR,right} + Popen$$

$$Pleft = Pright + \Delta$$

$$Psun = Pref - Popen + Psh - \Delta + P_{IR,left} - P_{IR,right}$$

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Psun

Psh

P_{IR}

P_{IR}

Popen

Pclosed

Open at t_0:
Pleft = Psun+P_{IR}+Popen
= …

Closed at t_0+90 s:
Pleft = Psh+P_{IR}+Pclosed
= …

Psun=
Pclosed – Popen +Psh

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All absolute levels adjusted to Diarad/Virgo Left
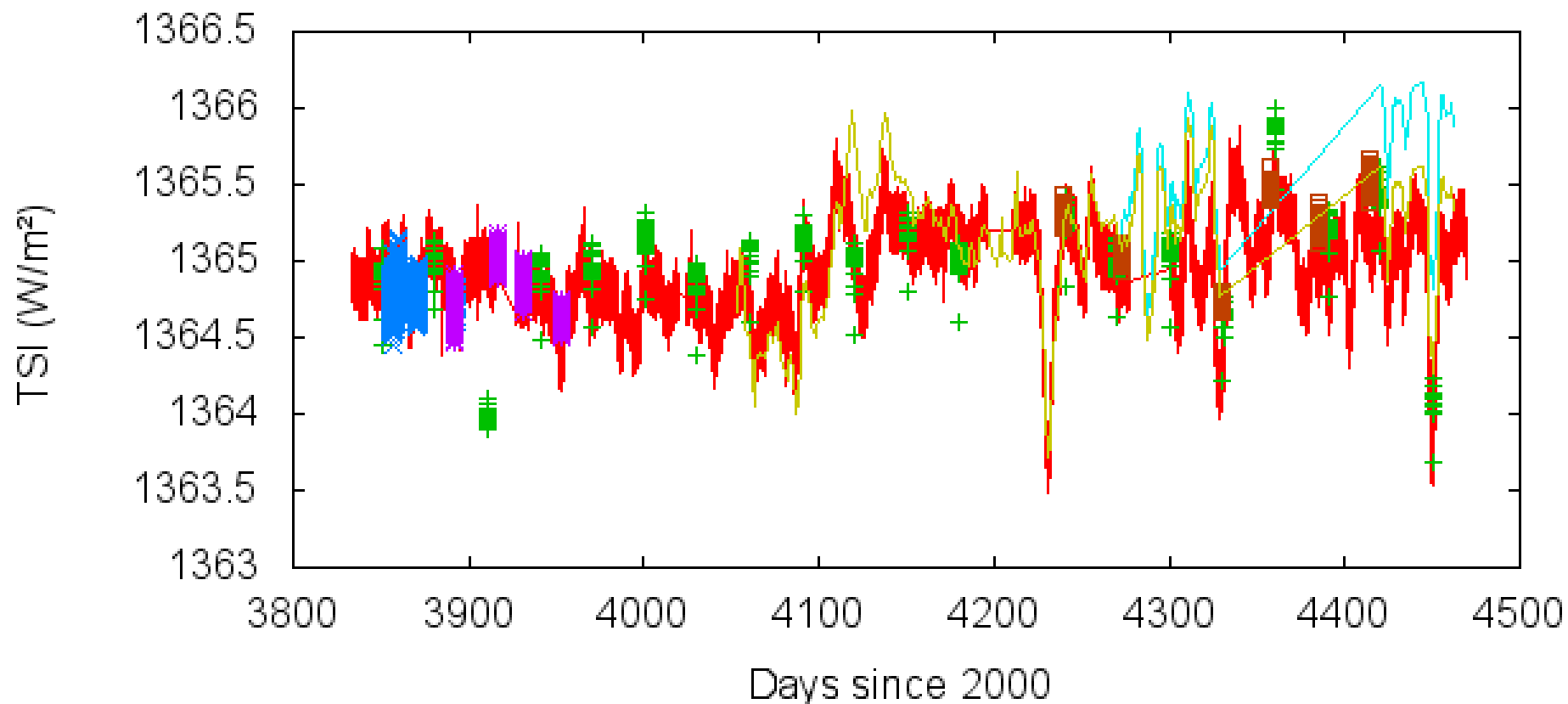
Legend:
- Diarad/Virgo Left (red line)
- Diarad/Virgo Right (green +)
- Nominal Sovap Right (blue ×)
- Nominal Sovap Left (purple *)
- New Sovap Right (daily mean) (cyan line)
- New Sovap Left (brown square)
- New Sovap Right (daily mean) corrected by Left (yellow line)

Conclusions

Procedure to derive absolute value from Sova-P based on $(\alpha_{th,el} / \alpha_{th,opt}) = 1$ instead of $\alpha_{th,el} = 1$.

Older radiometers Diarad/Sovim, Diarad/Virgo, Sova 1 and Solcon need to be revised.

Thermal drift differential left-right measurements corrected by monthly differential open-close measurements.

To be done: model thermal drift from temperature measurements.

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This is not the end, it is the beginning.