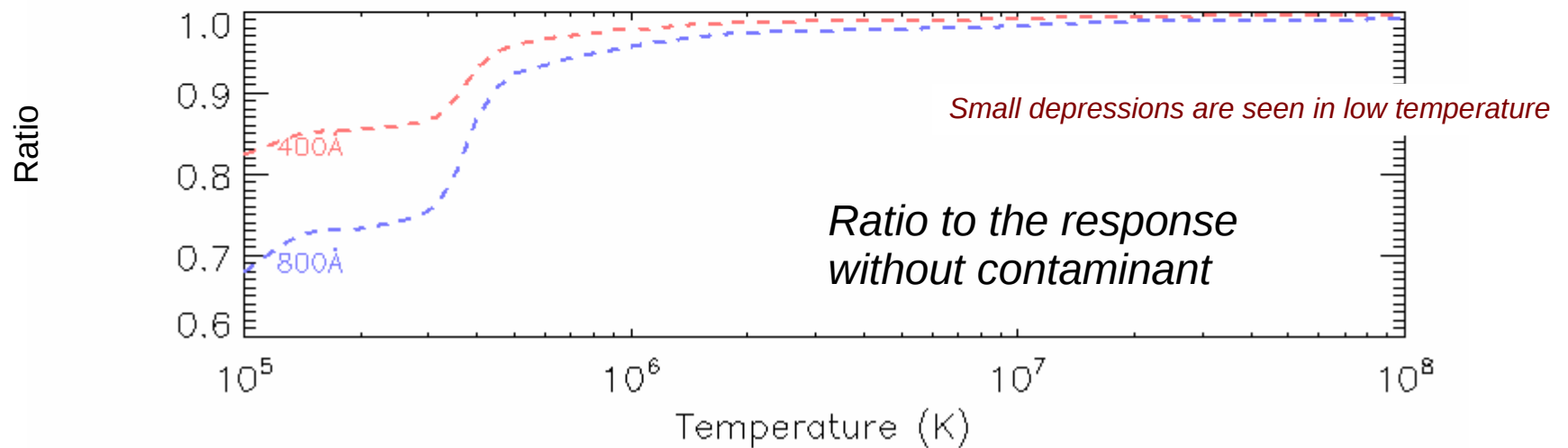
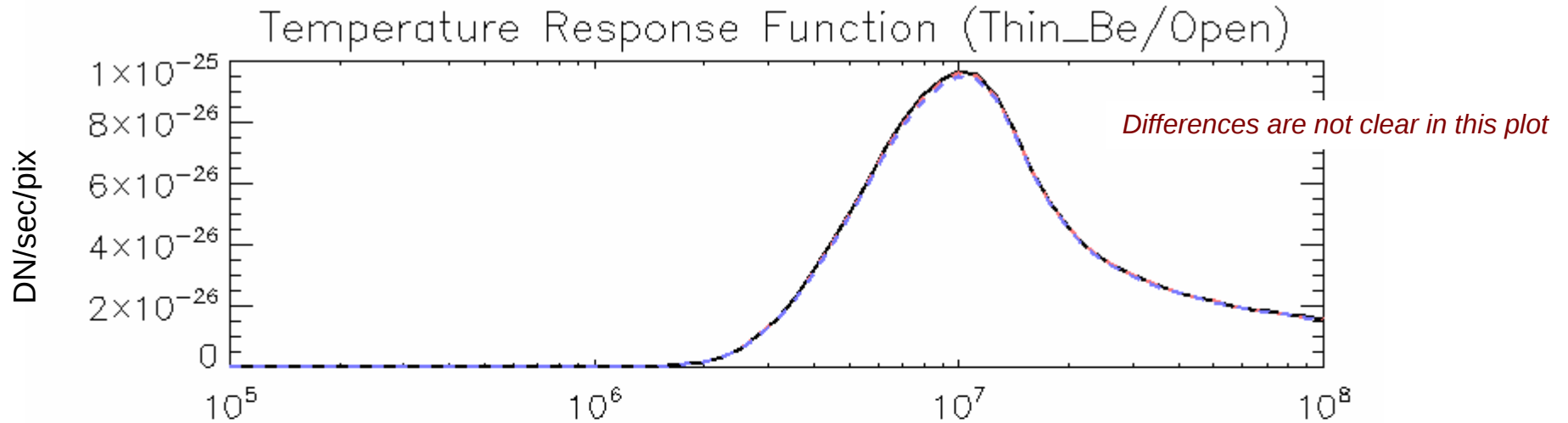


Upgrade of the XRT Contaminant Thickness Database

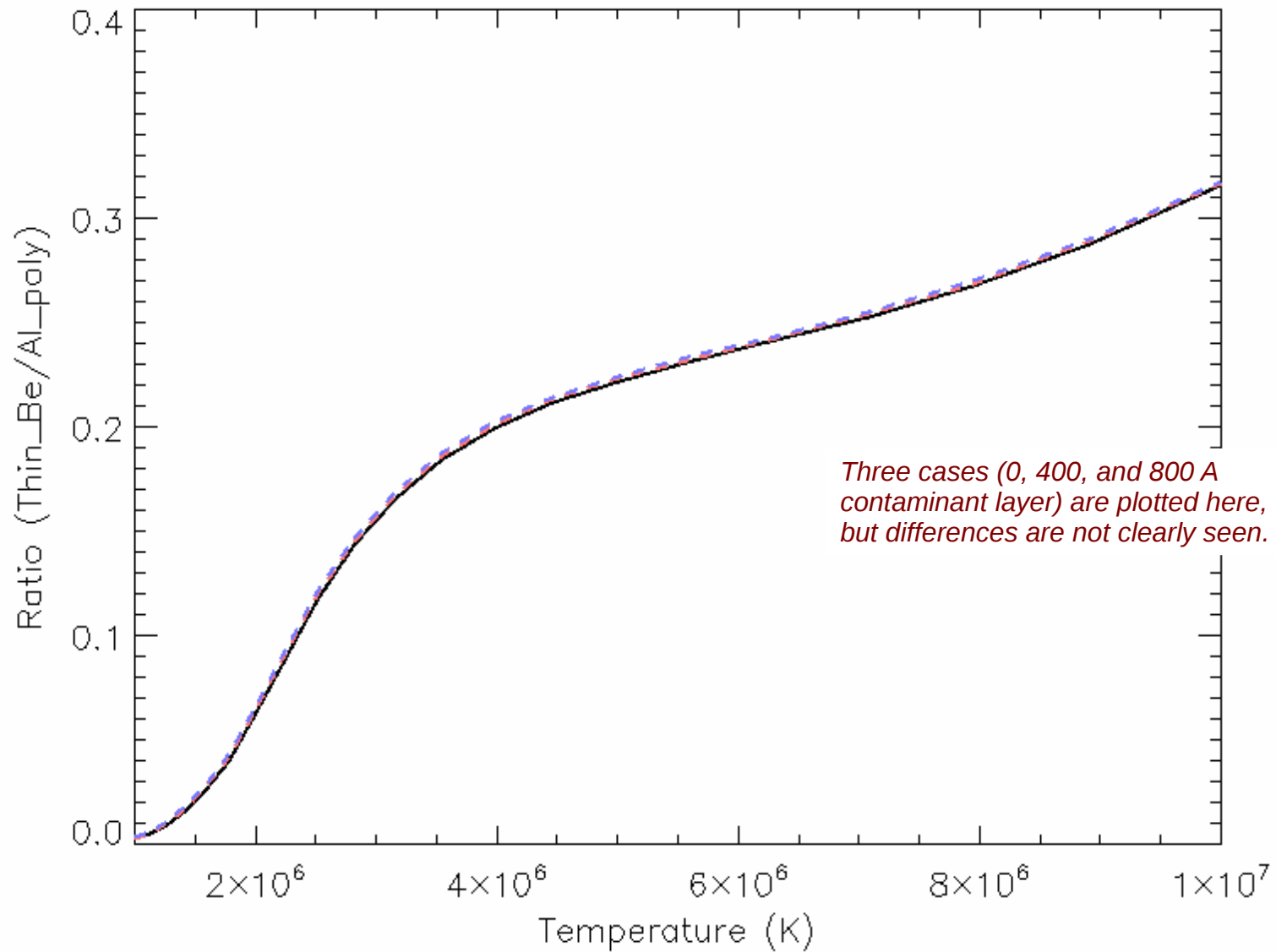
K. Yoshimura and A. Takeda (MSU)

Impact on temperature & EM analysis



*Comparison of Temperature Response Function (Thin-Be) with
contaminant layer of 0, 400, and 800 Å*

Impact on temperature & EM analysis



Impact on temperature & EM analysis

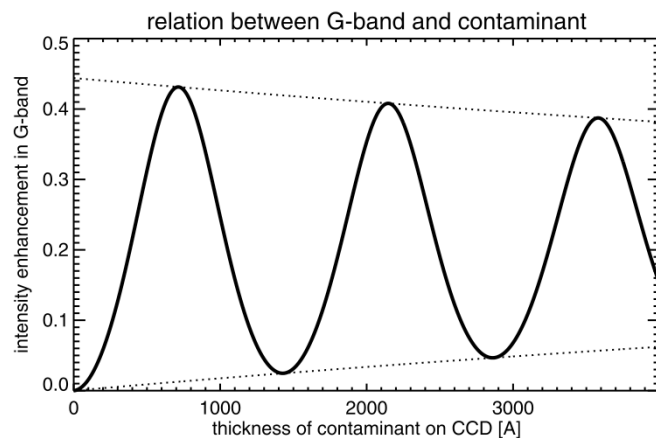
With these amount of contamination (400, 800 A):

- Impact on temperature analysis is very limited
- Impact on EM analysis is not serious, may result in small underestimation of density

Current Database (by Narukage-san)

- Use G-band data
 - 512x512 pix @CCD center, Disk Center pointing
 - No stray light correction
- Convert “intensity enhancement in G-band” to “contaminant thickness” (*see the figure of lower left in this page*) then fitted by linear (time-thickness) function (*see the figure of lower right*)

assuming the accumulation rate is constant during each time period, which looks to be right. Some examples of constant accumulation will appear later
- Assuming CCD bakeout can purge all contaminant layer
- Create thickness database and distribute through SSW

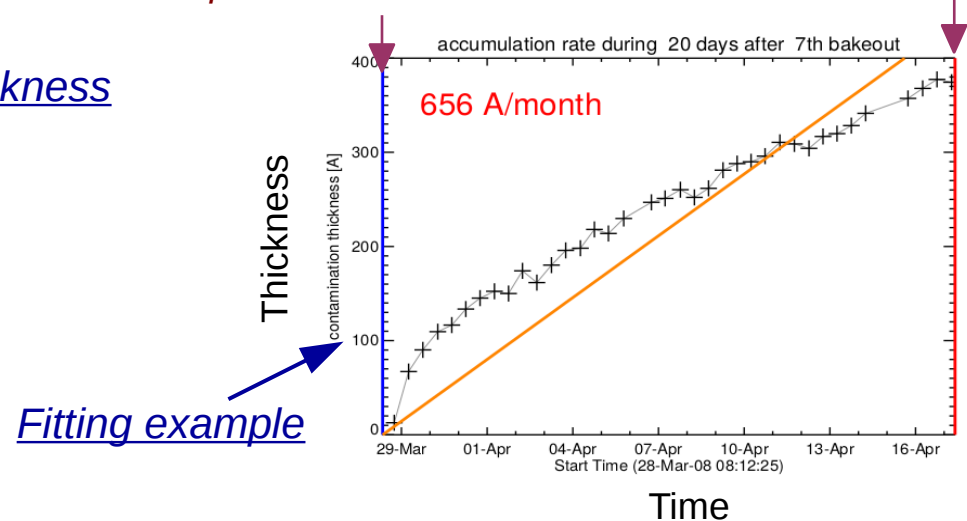


To derive thickness



previous bakeout off

next bakeout on



Fitting example

Figure 27 in Narukage et al. (2011)

Items to be improved

We may be able to improve the current thickness database for some points listed below:

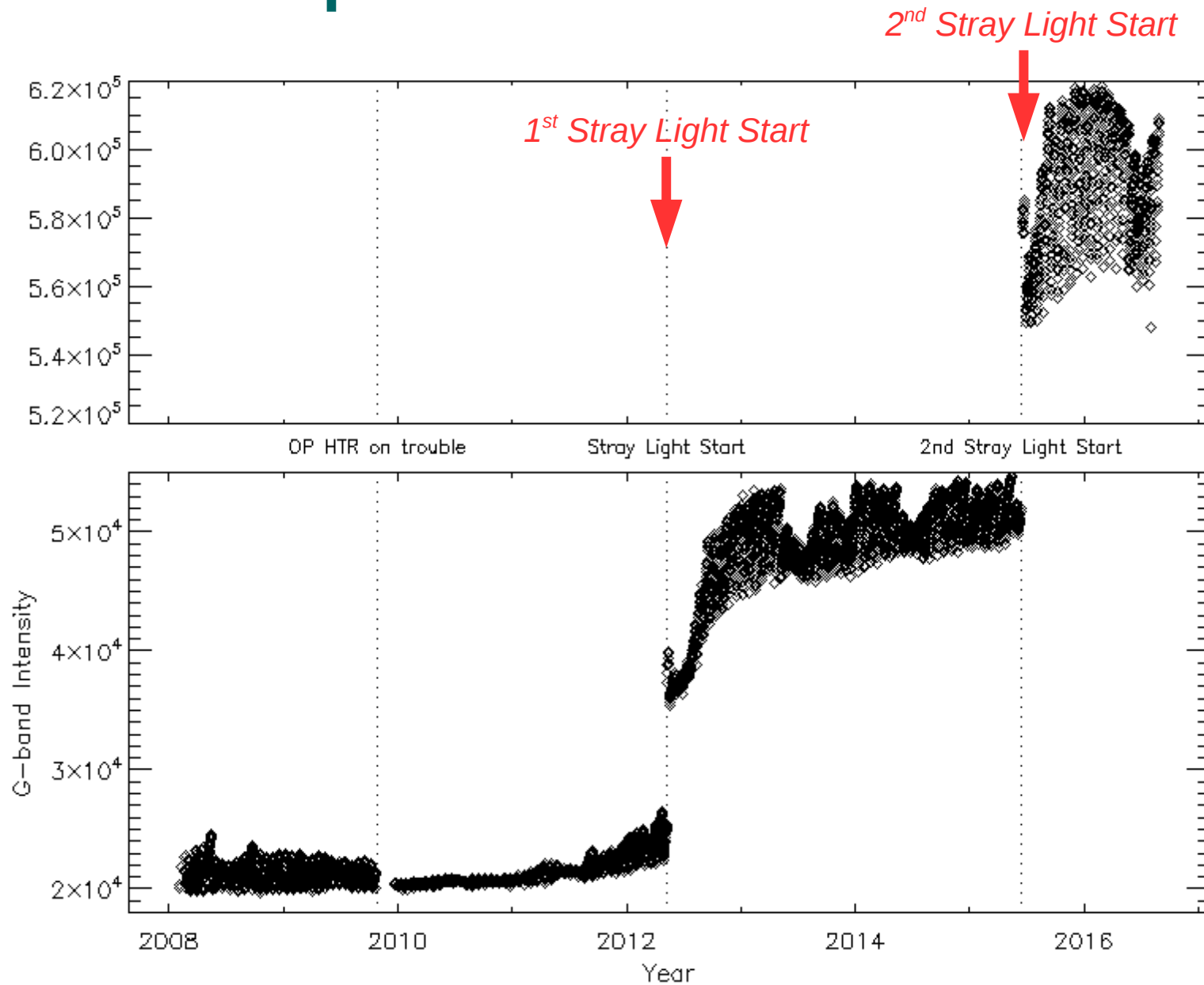
- Stray light correction
- Any “persistent” layer?

We have to check if the CCD bakeout can purge all contaminant layer. Take it into account, if exists.

- More frequent update of the database

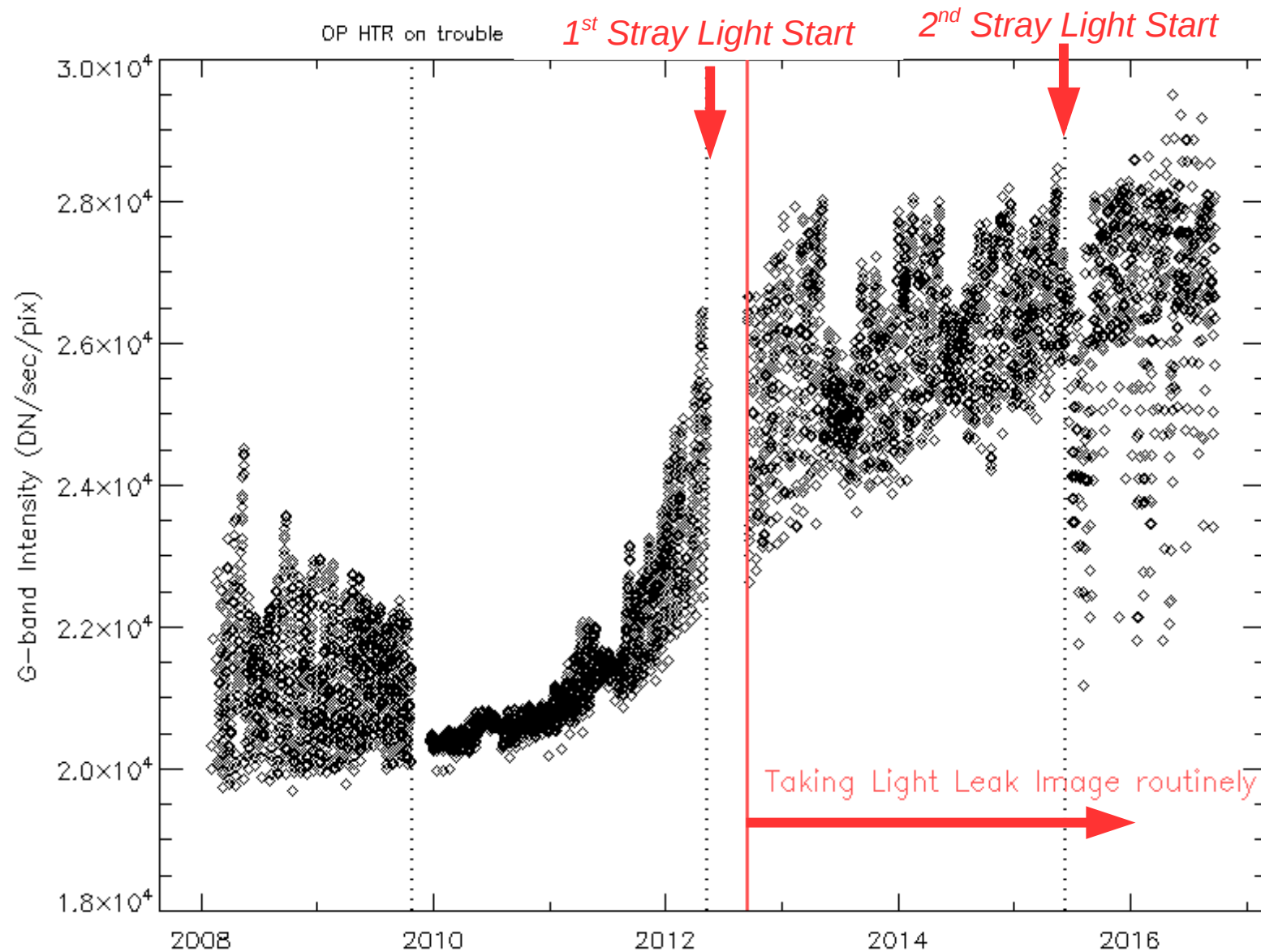
A warning message appears, when the thickness database does not cover the time period of the analyzing data. This confuses users. The current database covers until 2015/08/25 (as of 2017/01/09).

Persistent component?



Long Term variation of G-band Intensity (no stray light correction)

Persistent component?

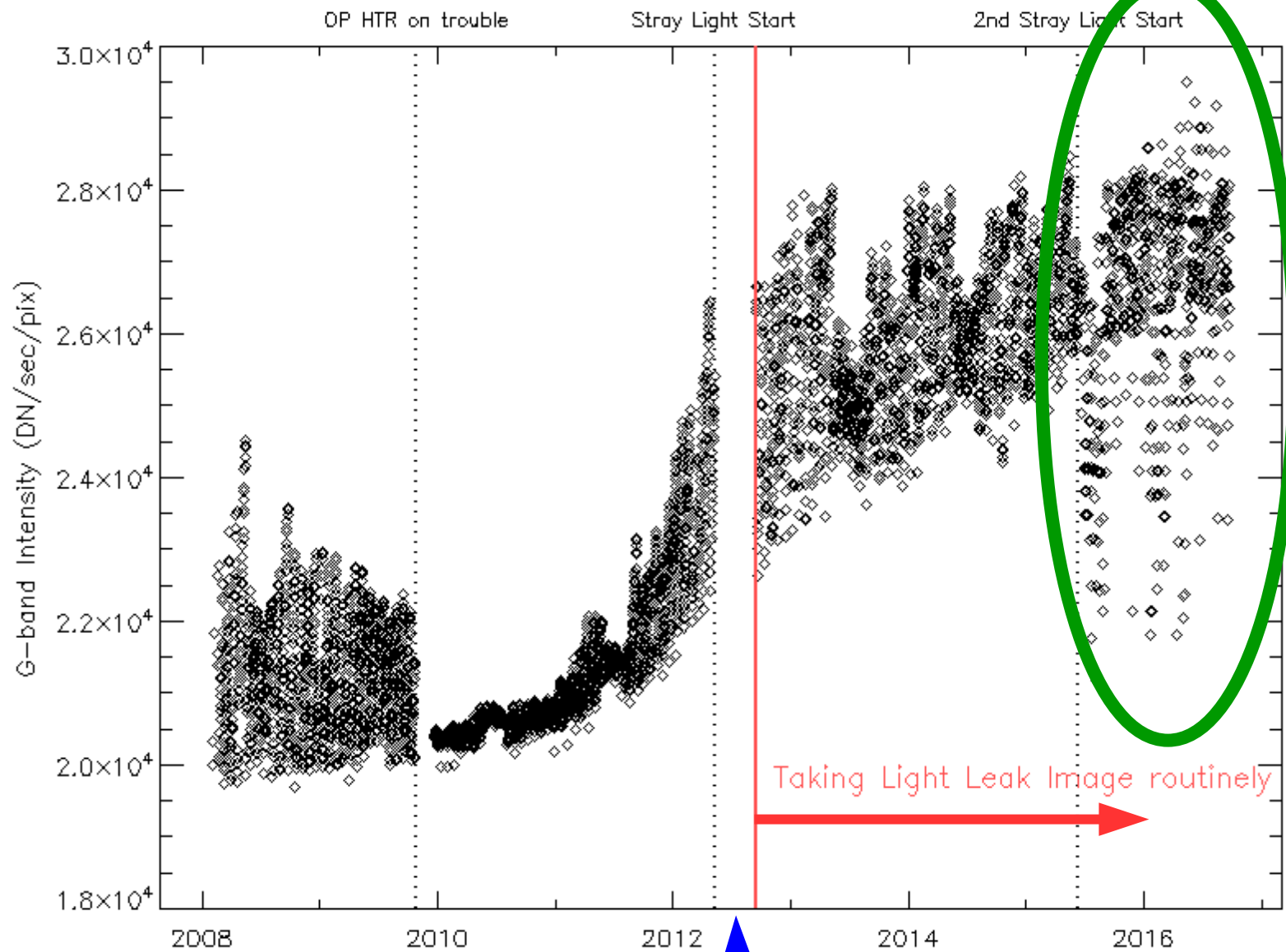


Apparently there is some "persistent" contaminant layer

Long Term variation of G-band Intensity with stray light correction

Two Problems....

Large scattering
after 2nd Stray Light



Gap due to the lack of "light leak" images

Gap after the 1st Stray Light Increase

Since we started to take light leak images routinely after 2012/9/15, it is impossible to correct the stray light in G-band data from 2012/5/9 through 2012/9/15.

- We can guess thickness:
 - Accumulation rates are similar in the same season (in or out-of eclipse season) of different year
 - “persistent” component changes slowly
- Without stray light correction (not yet tried)

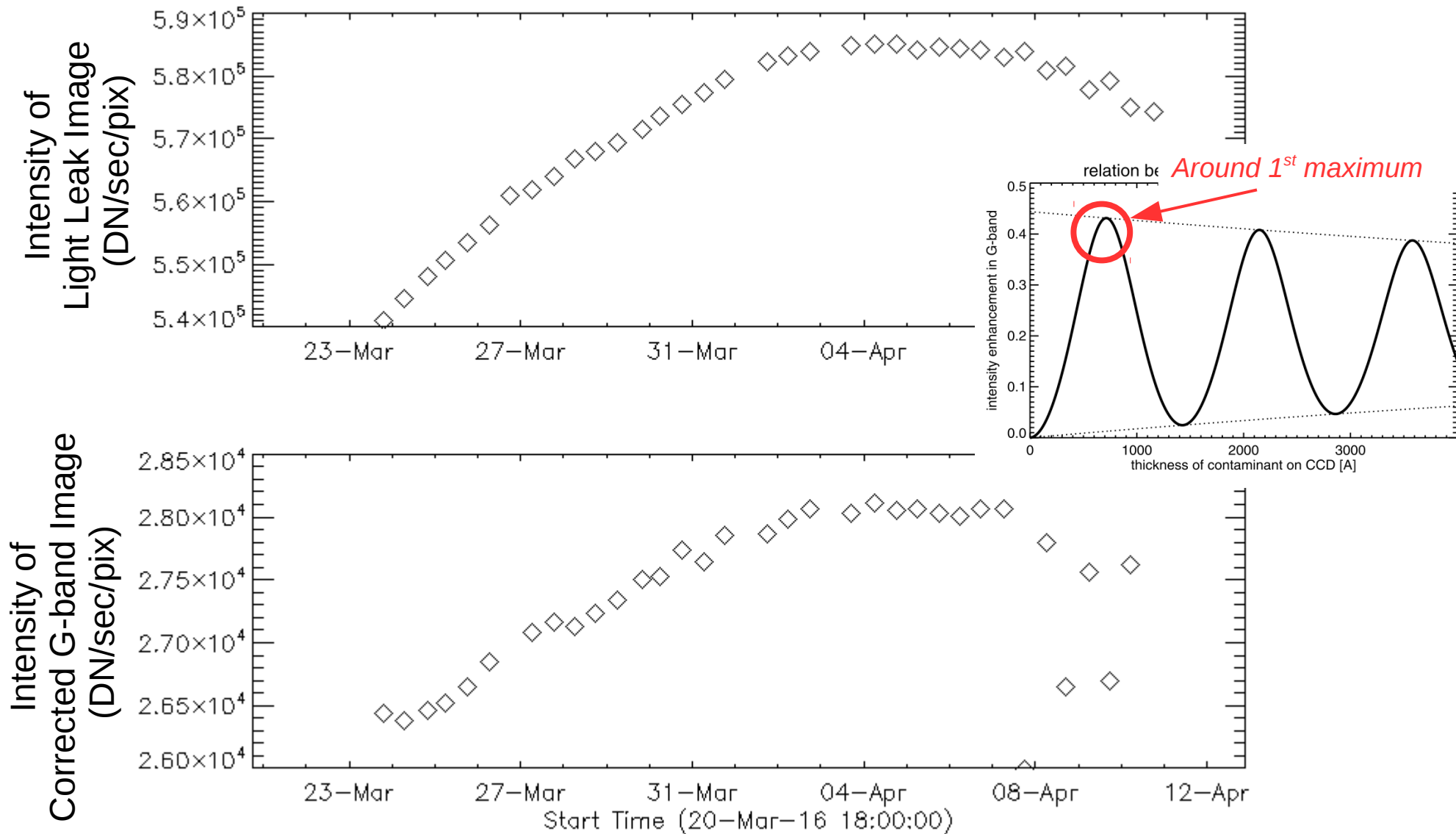
I'm going to show that we can estimate thickness of contaminant layer from G-band image without stray light correction later in this presentation.

Scattering after the 2nd Stray Light Increase

Some parts of plots show similar increasing profiles in the “expected” range, but not all.

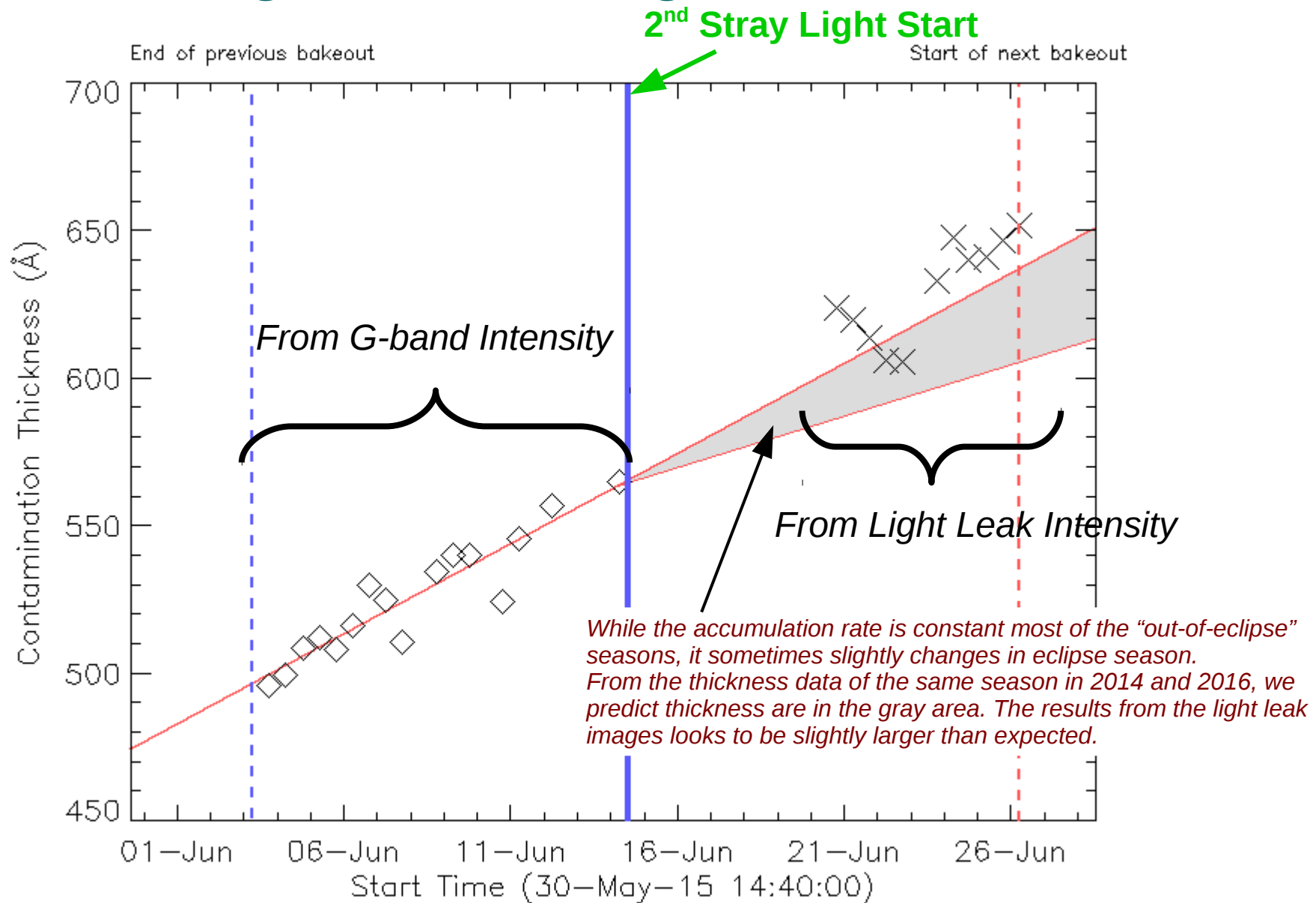
- FITS header information (exposure time) may not be accurate enough...
 - 0.01-0.02 ms ambiguity causes the scattering
(Exposure time of G-band and Light Leak : 3 ms)
- Use “Light Leak” image (VLS close) instead of G-band?

Can we use “light leak” image instead of G-band?



Both curves peak almost same time

Can we use “light leak” image instead of G-band?



Thickness in the plot were derived from G-band intensity enhancement (before 2nd stray light increase) and from light leak intensity enhancement (after 2nd stray light increase)

The “light leak method” may overestimate the thickness.
But they are still in acceptable range.

Summary of new upgraded database

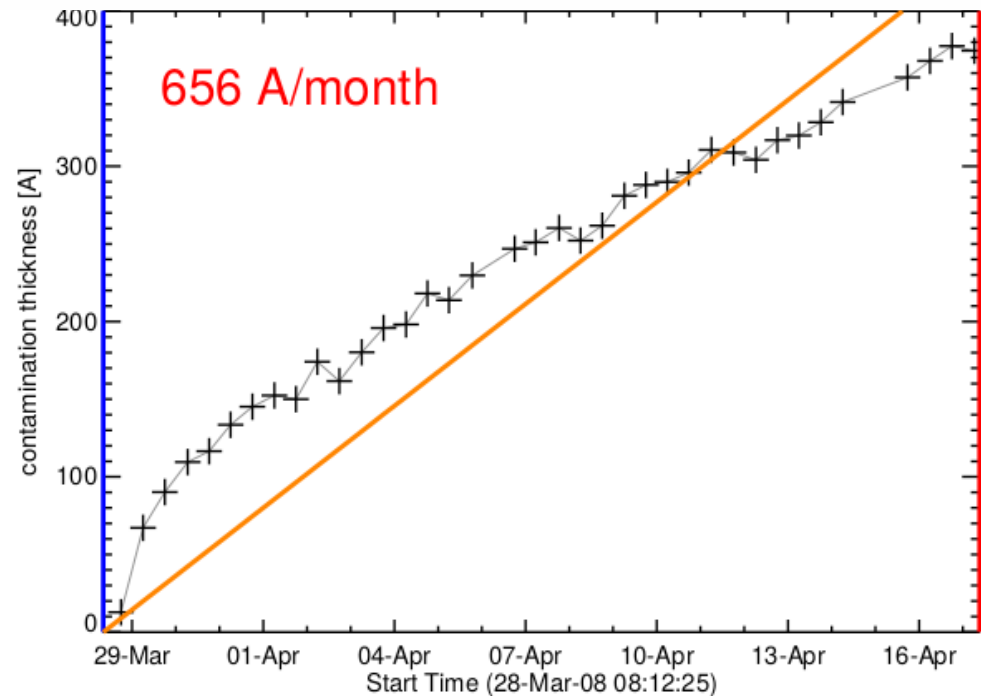
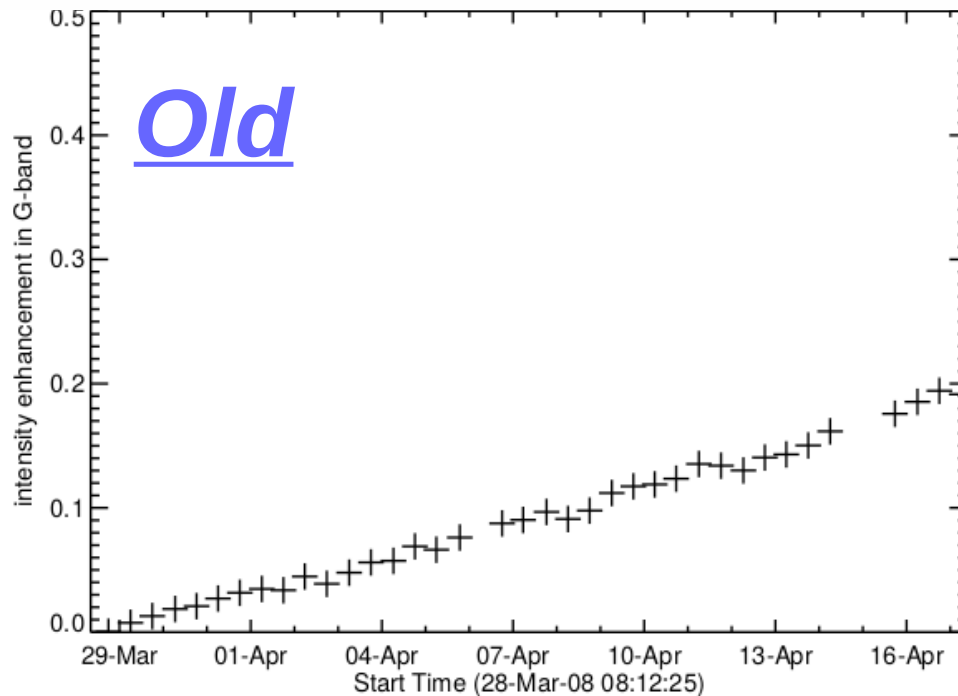
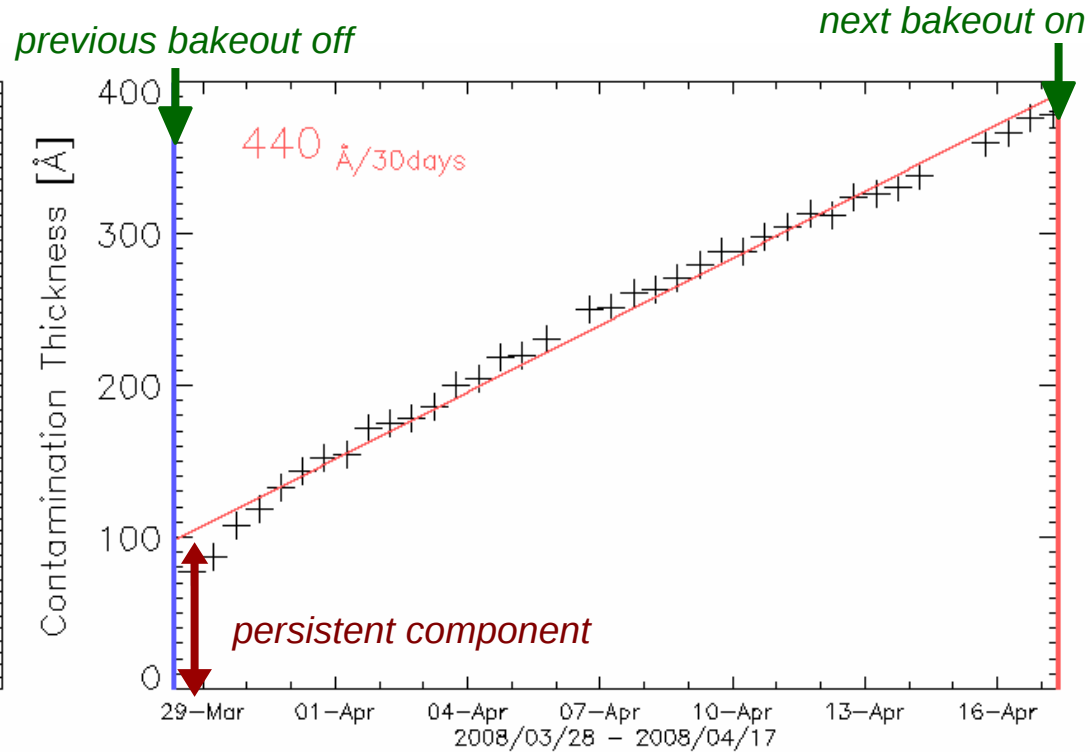
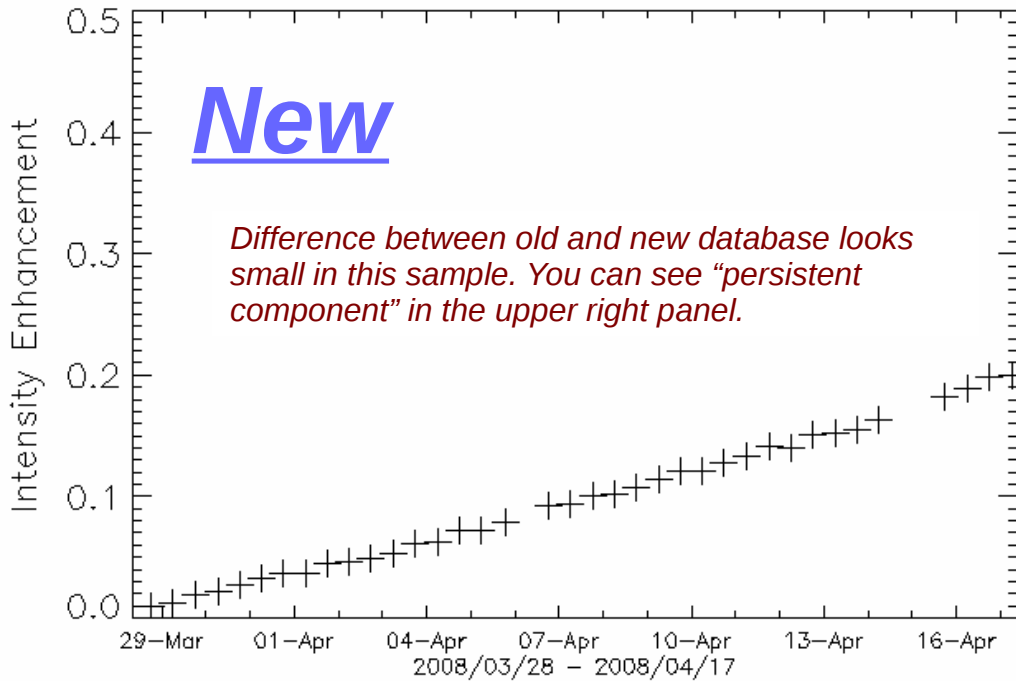
- Upgrade the entries **after 2008/02/01**
- Taking account of “**persistent**” component
- **Stray light** correction (*after 1st stray light increase before 2nd*)
- Use **light leak image** with which we can get almost consistent results
- Possible **faster** release
 - Pipeline script for DB update is (almost) ready

Previous calibration for the data before this date has done very well. No improvement we can make.

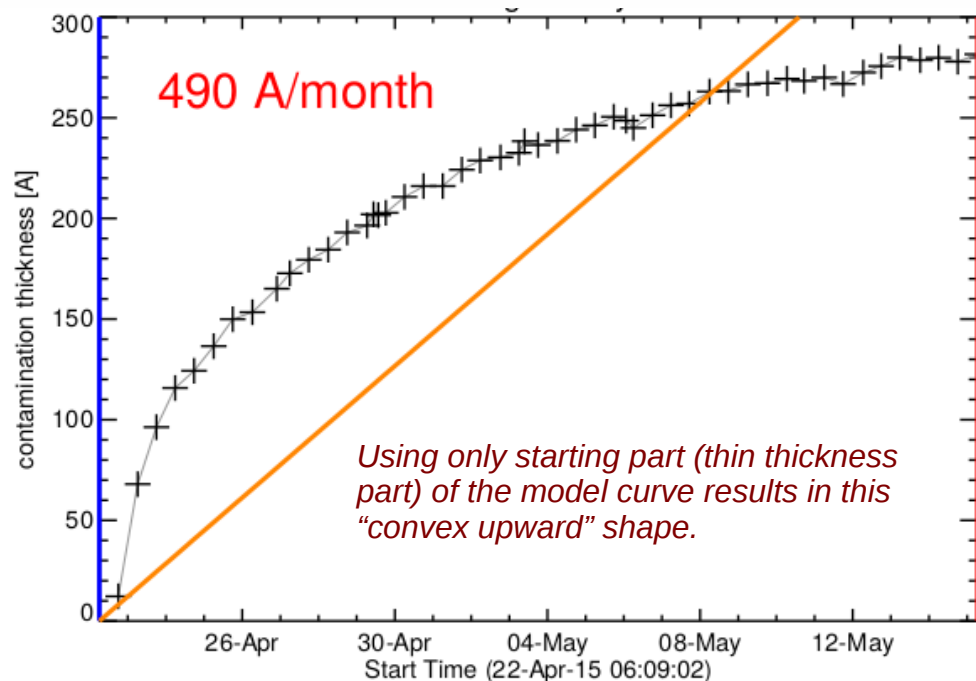
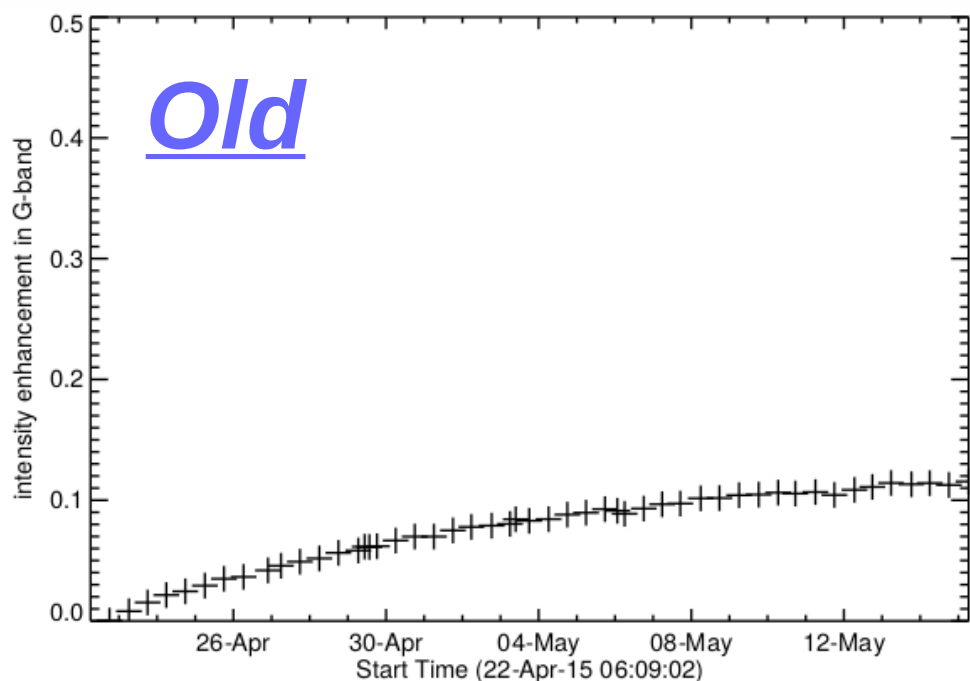
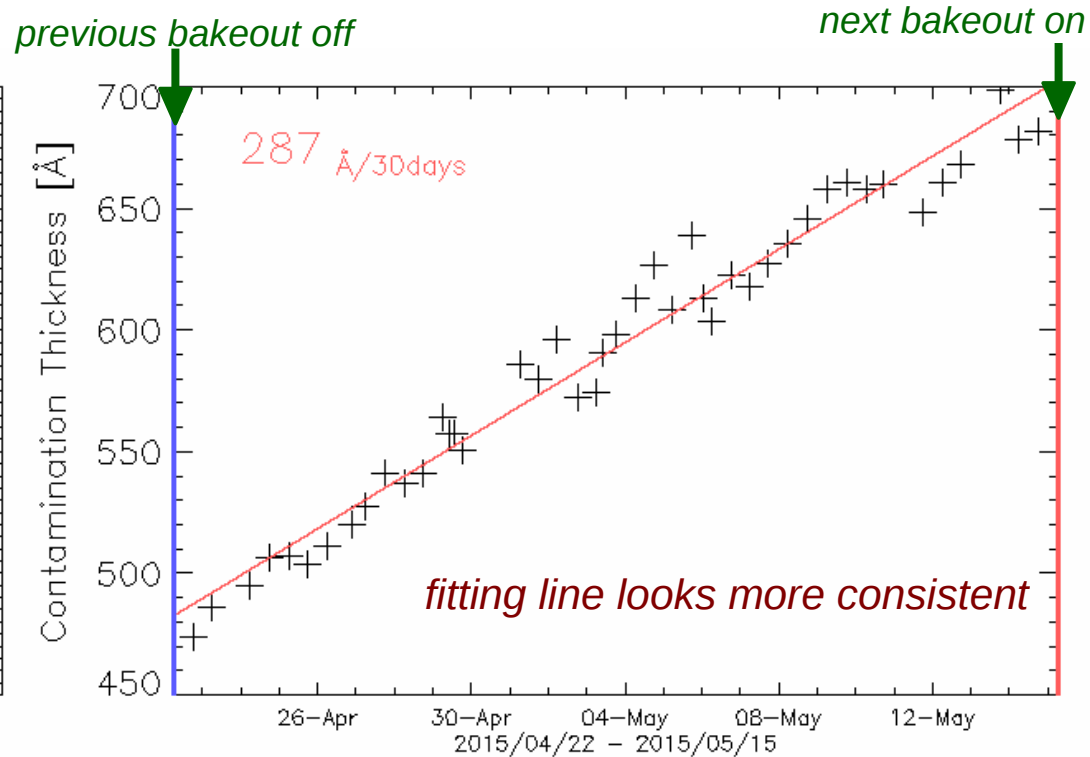
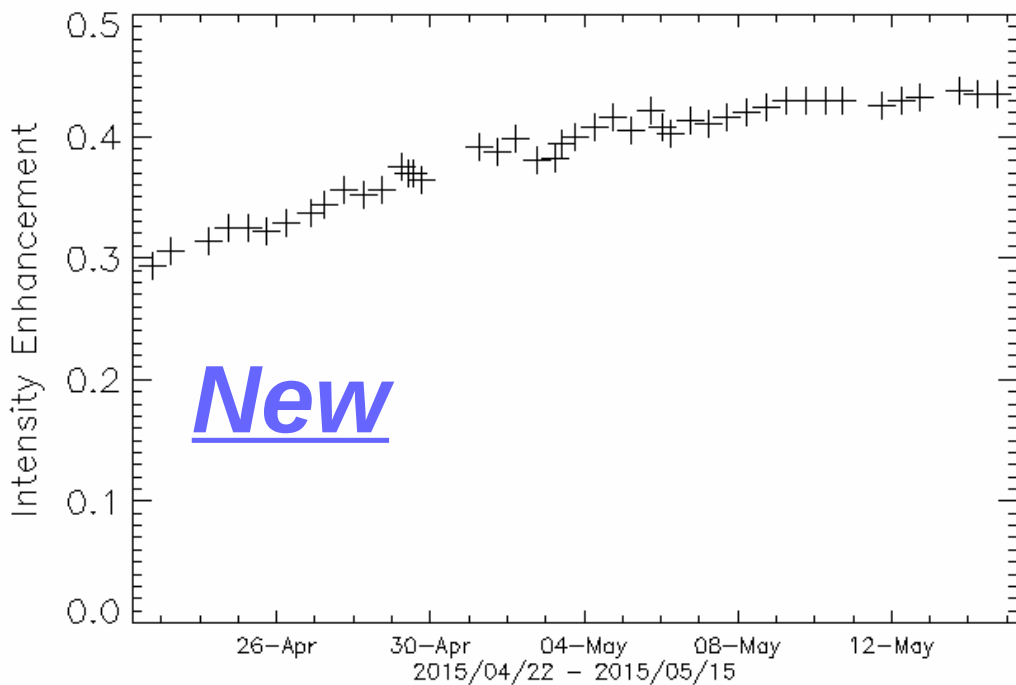
We confirmed that light leak image can be used instead of G-band image to derive the thickness.

Some examples of comparison between new and old database are found in the next several slide

Comparison of fitting (example 1)

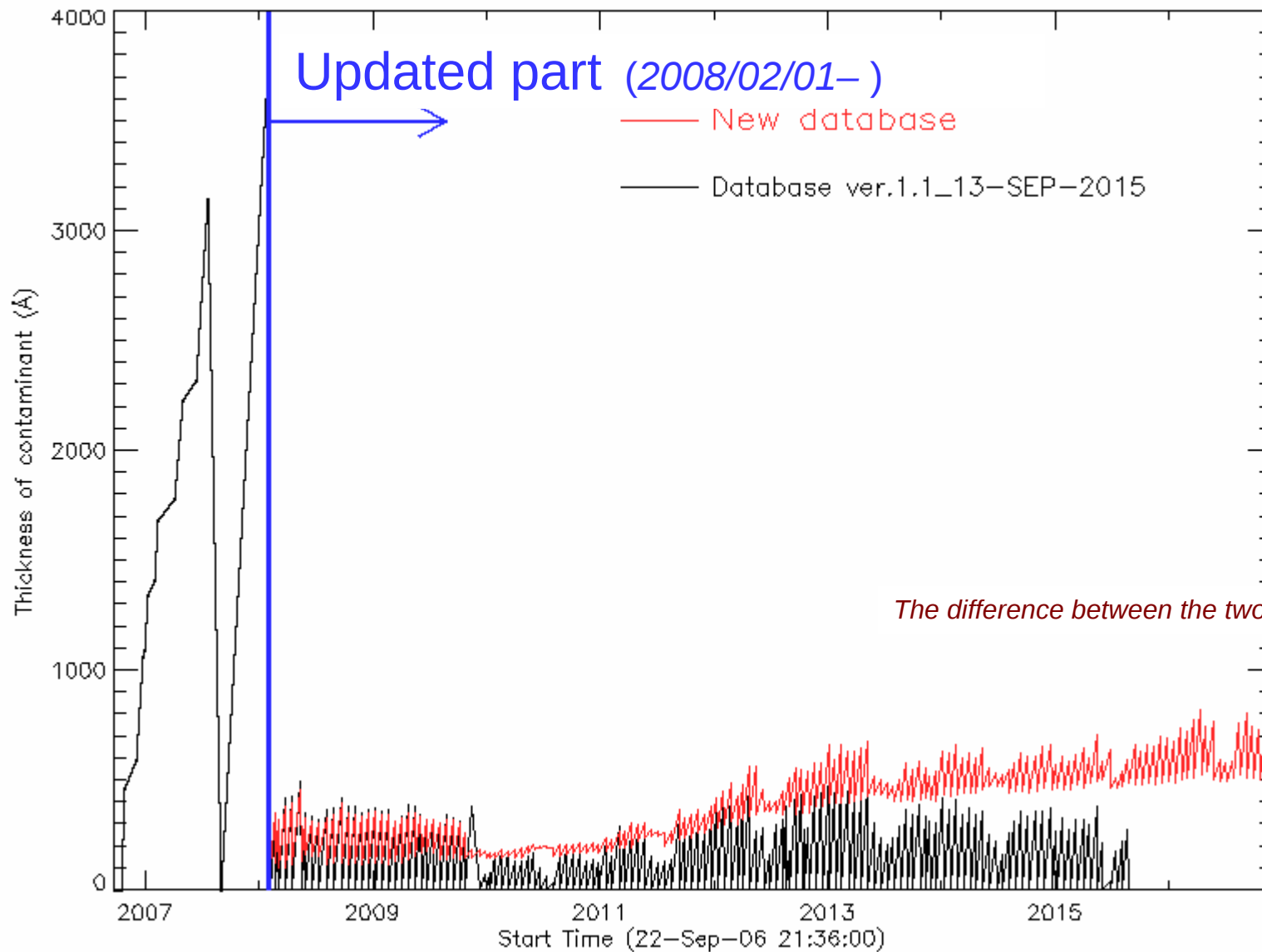


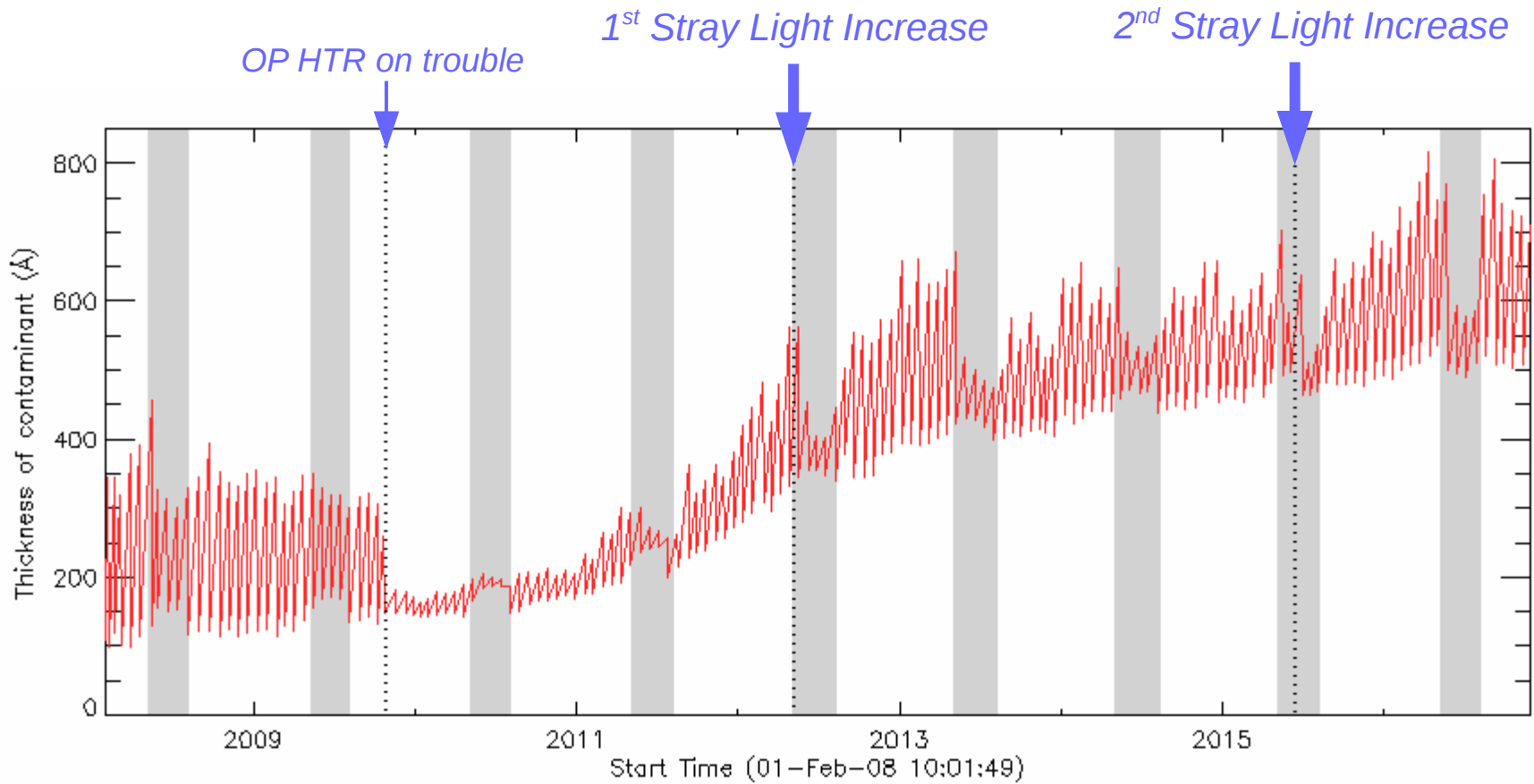
Comparison of fitting (example 2)



Comparison of database

Comparison of whole contents in the databases





- Only updated parts of the database are shown above.
- “Eclipse season” were indicated by gray area.
- Smaller accumulation rate of contaminant are observed during the season.

To Do

- How can we transfer the database to SAO?

- Current:

NAOJ/ISAS → SAO → SSW official tree

- New:

MSU → SAO → SSW official tree



*The updated database will be copied to SAO
(by using scp) and put into the svn archive.*