

POSSIBLE IMPROVEMENTS FOR COROT DATA PIPELINES

Based on a workshop held in December 2013

WHY?

- Corot data suffer from known perturbations: discontinuities due to «hot pixel», gaps, systematics...
 - Decision of a workshop at the SC in Tenerife
 - Some tools are developed at the level of the individual user
- => meeting of these users to discuss possible improvements of the pipelines

Limited amount of time to achieve these improvements!

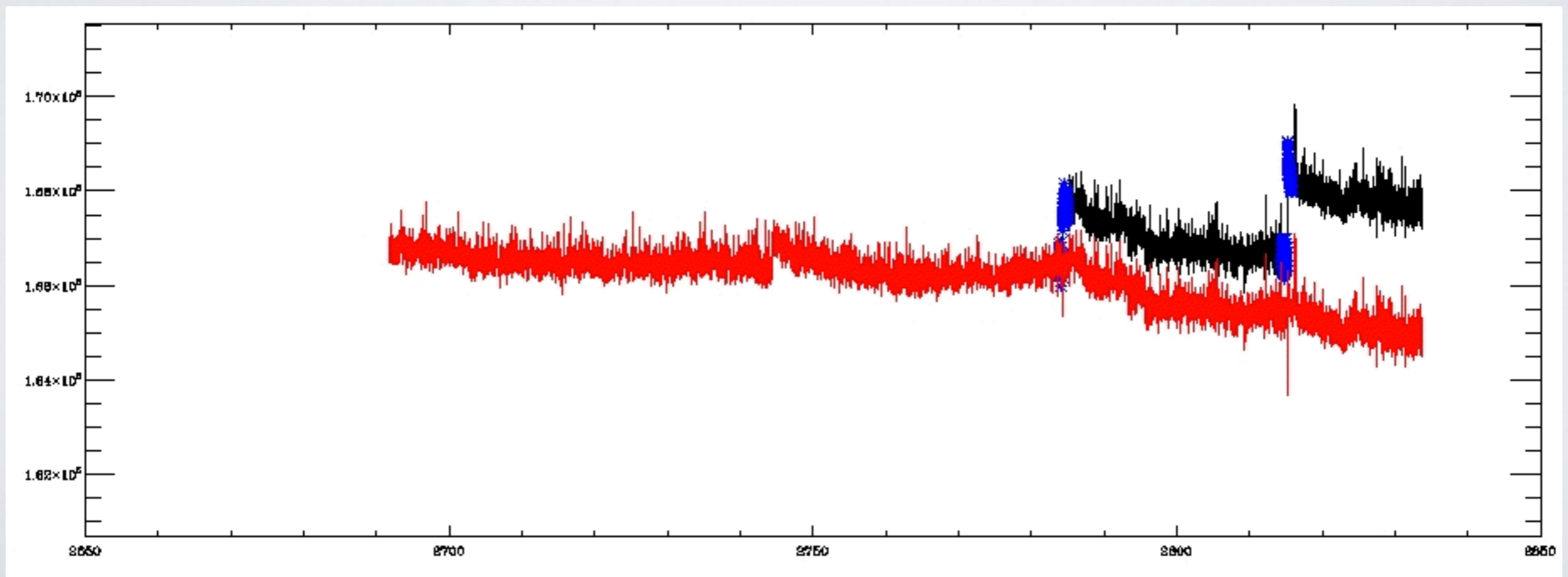
PREAMBLE

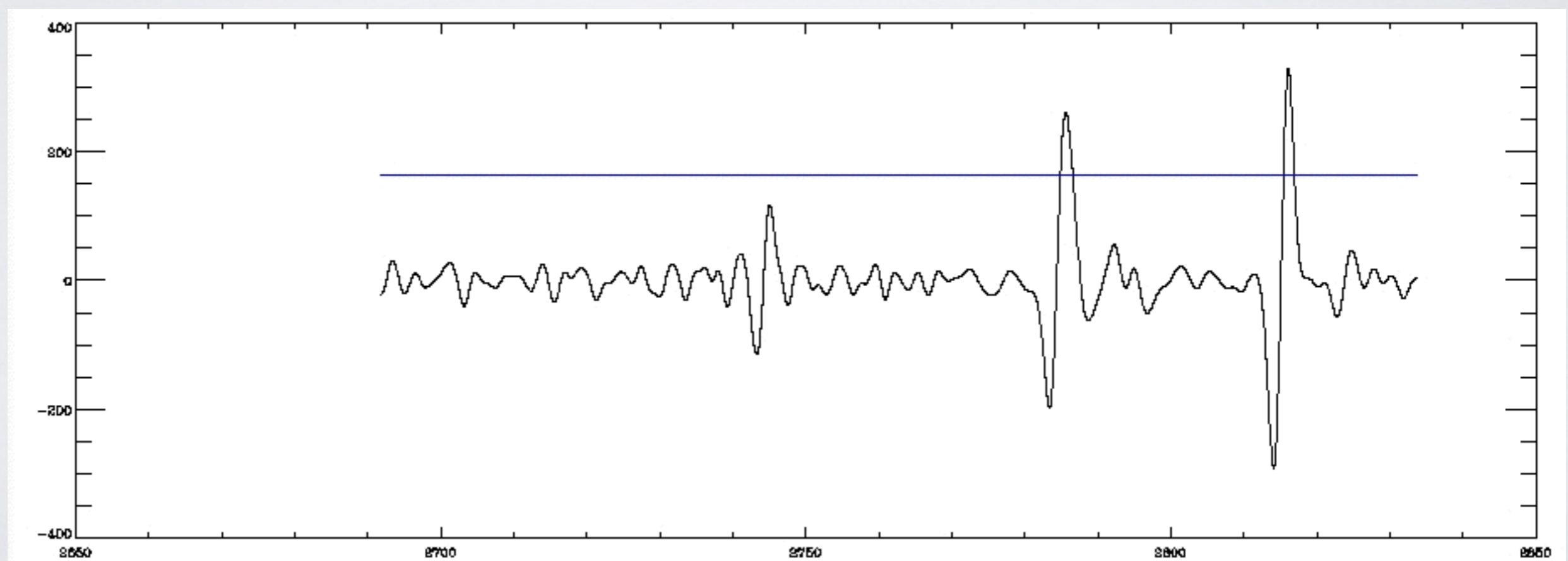
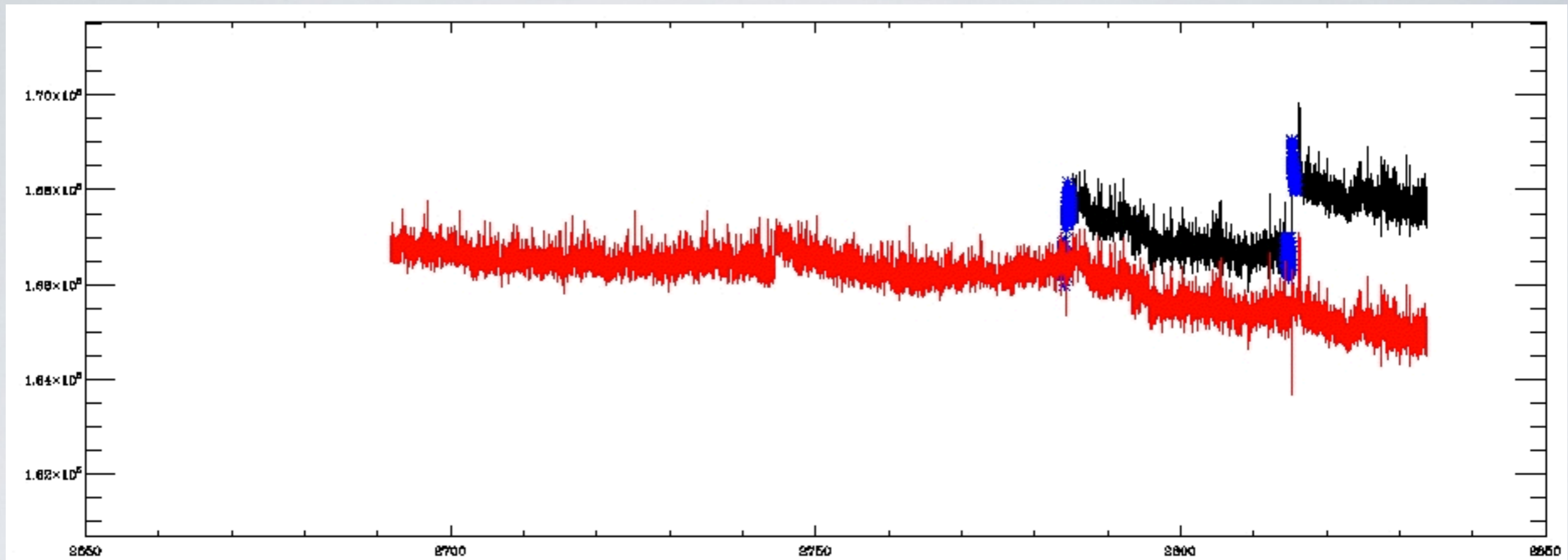
- Existing pipelines have been continuously improved since the launch: if no improvements is possible, delivery of an invaluable legacy is not jeopardized.
- If improvements are to be developed, the decision has to be made on 1) scientific interest 2) feasibility.

PROPOSALS FOR IMPROVED PIPELINES

Discontinuities (also known as jumps, hot pixels...)

=> Detect them then correct them





PROPOSALS FOR IMPROVED PIPELINES

Discontinuities, aka jumps, hot pixels...

- Algorithm existing (IDL), already applied (to red giants) quite successfully
- What about a systematic application (to transit for ex: filtered out or not?)
- Need for parameter determination (threshold, wavelet band...)
- Correction: constant level or decaying exponential?

PROPOSALS FOR IMPROVED PIPELINES

Filling gaps

ARMA process

$$x_t = \sum_{k=1}^p \alpha_k x_{t-k} + a_t$$

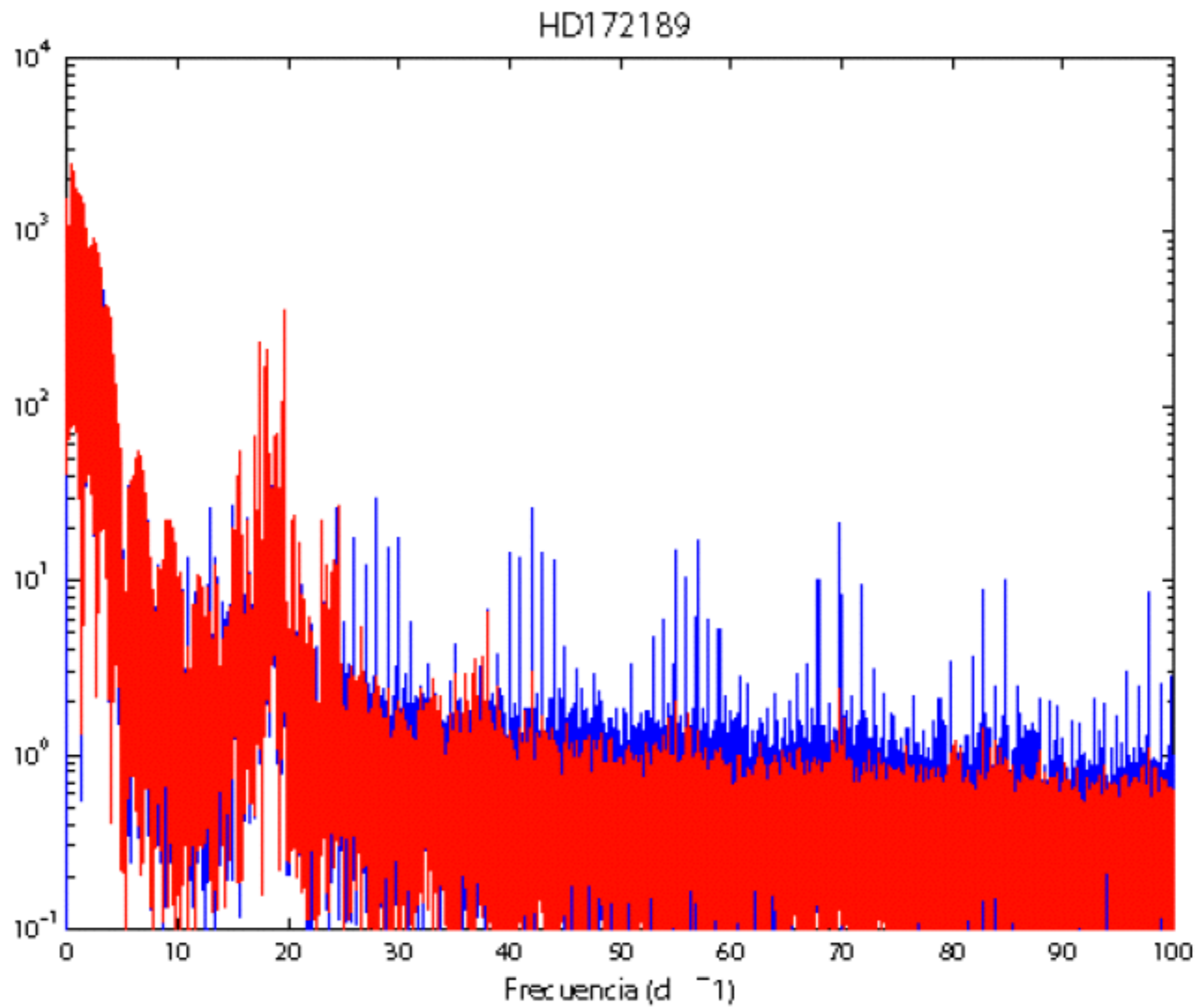
→ **Autoregressive model**

$$y_t = - \sum_{k=1}^p \alpha_k n_{t-k}$$

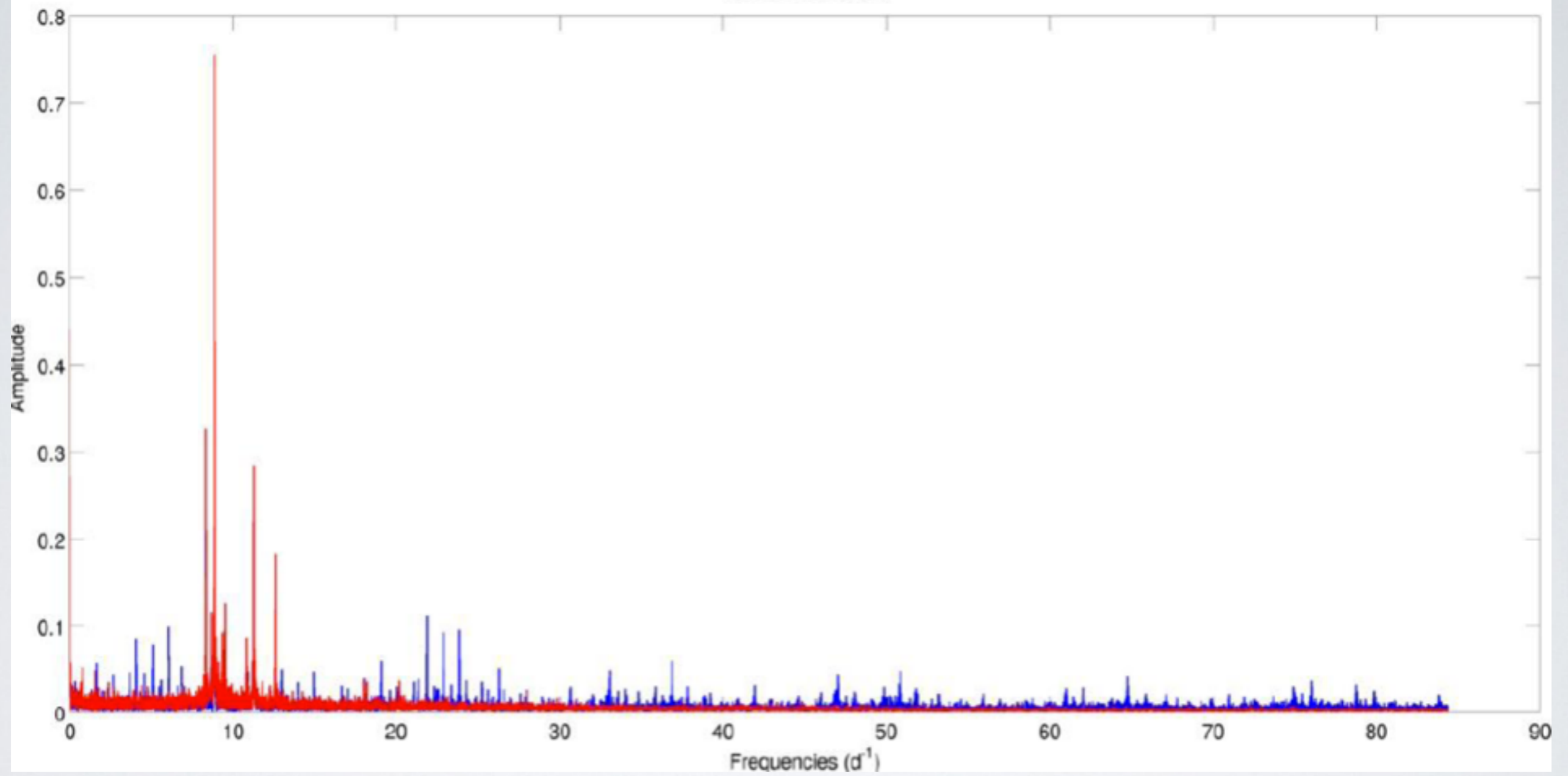
→ **Moving average model**

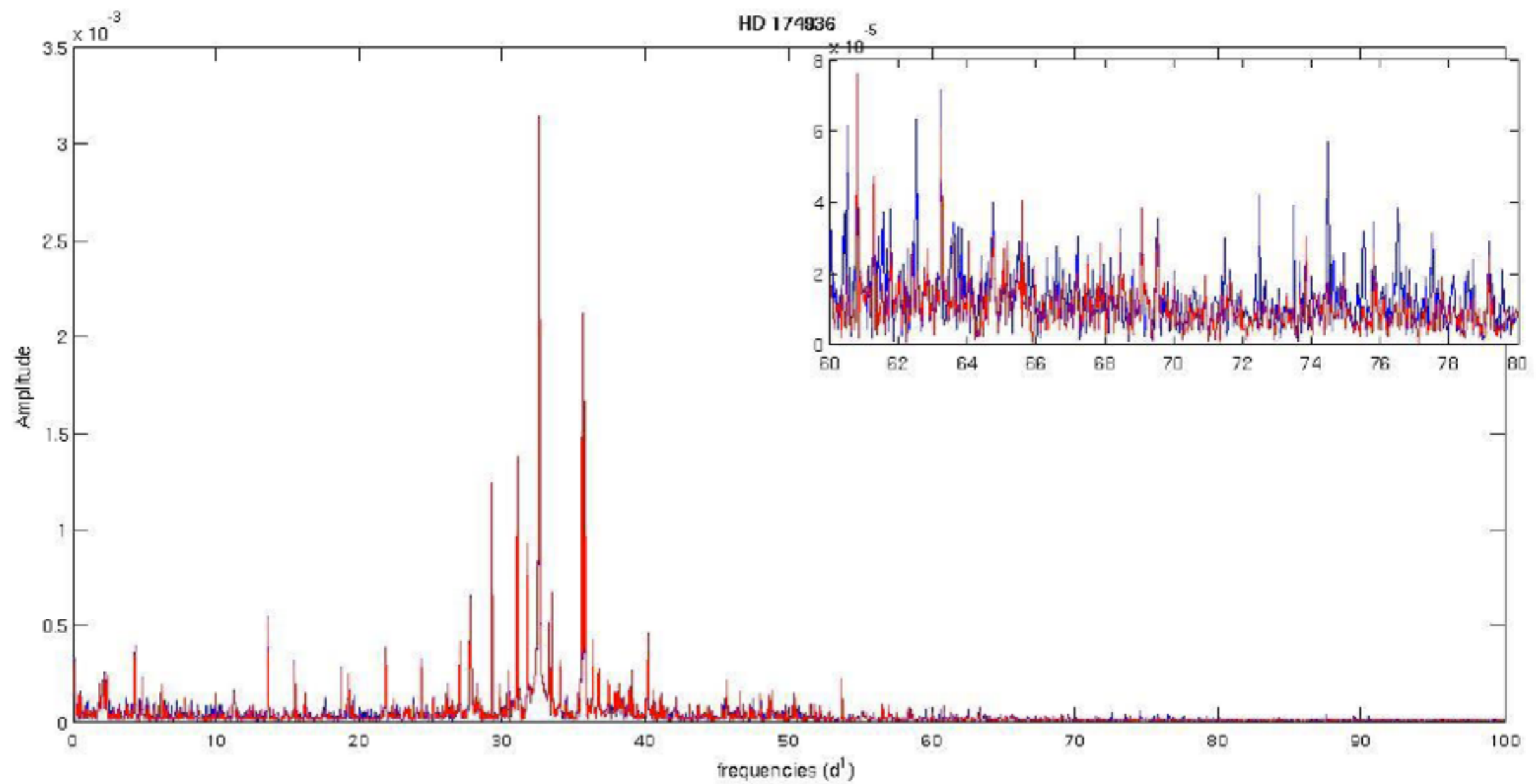
$$y_t = \sum_{k=1}^p \alpha_k y_{t-k} + n_t - \sum_{k=1}^p \alpha_k n_{t-k}$$

→ **AR + MA = ARMA**



CoRoT100445224





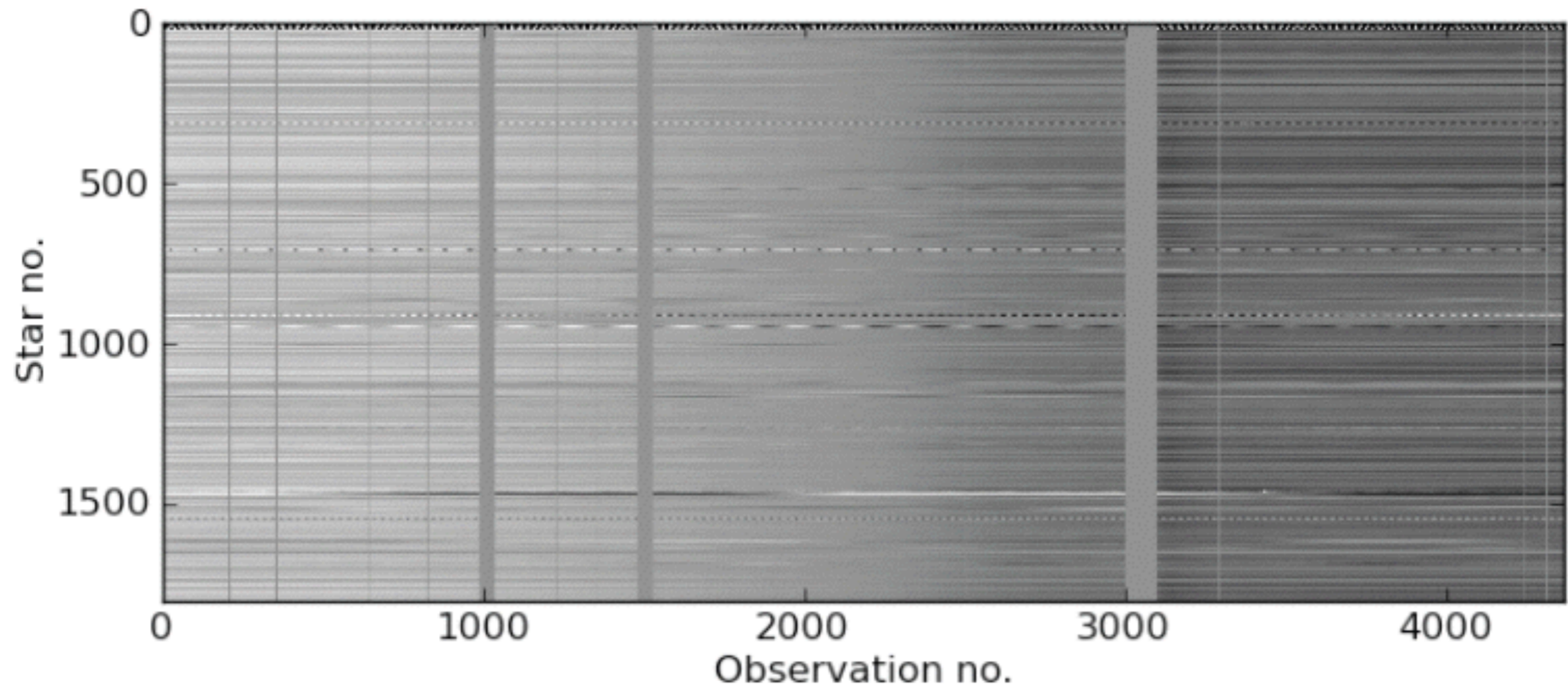
PROPOSALS FOR IMPROVED PIPELINES

Gap filling

- Algorithm existing (Matlab), already applied quite successfully
- No need for parameter determination
- As usual, filled points flagged

PROPOSALS FOR IMPROVED PIPELINES

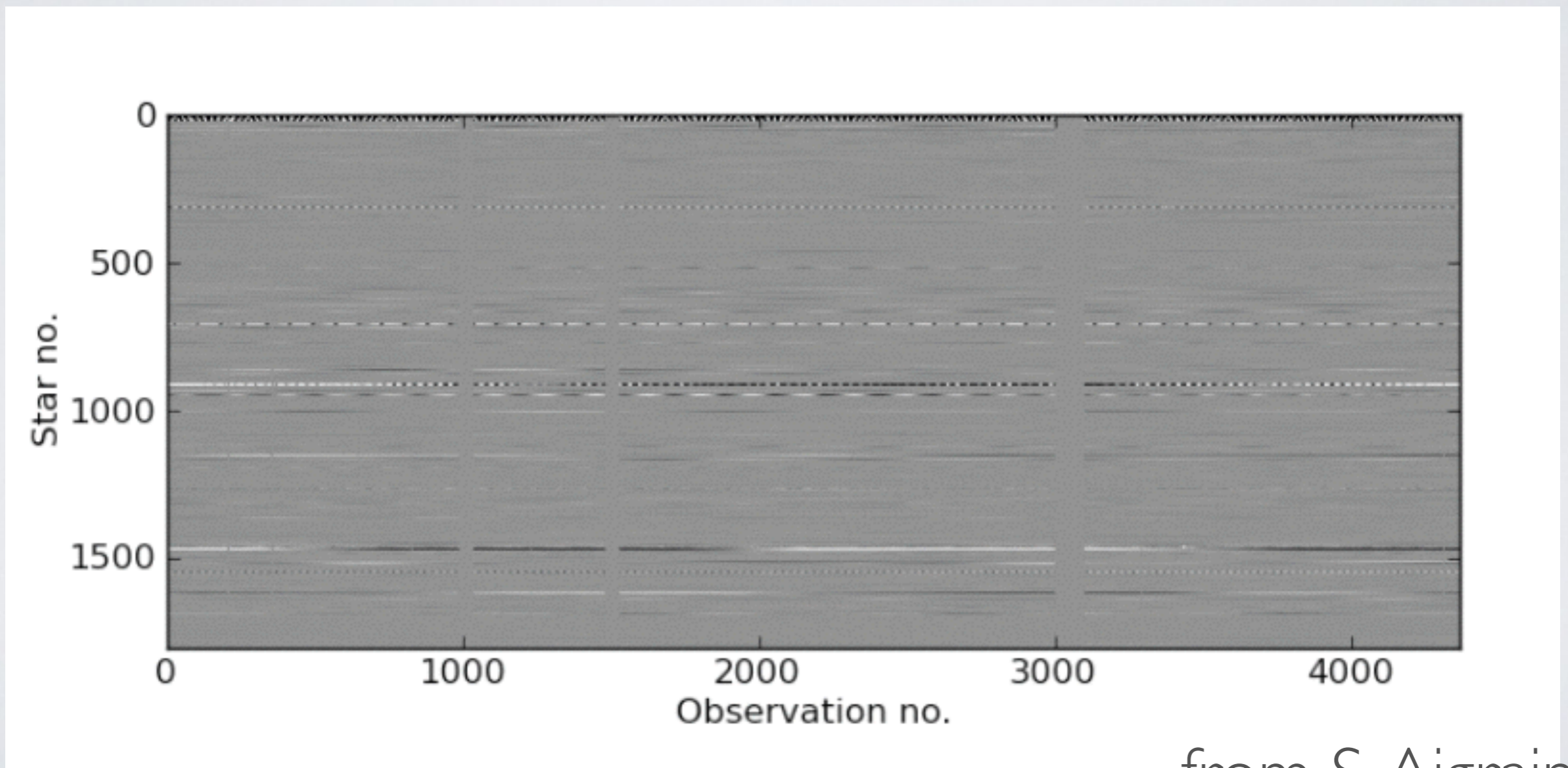
Systematics removal



from S. Aigrain

PROPOSALS FOR IMPROVED PIPELINES

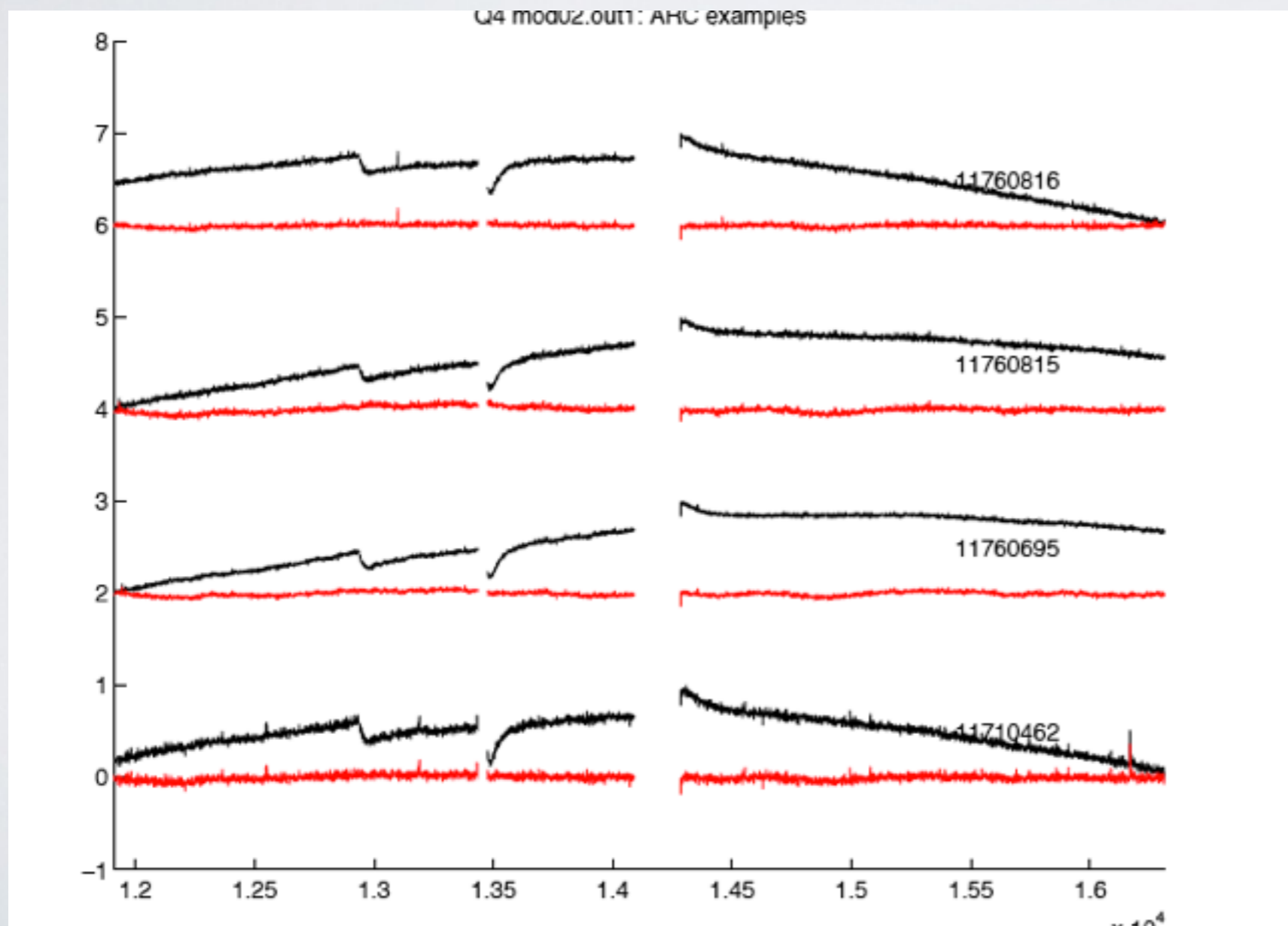
Systematics removal



from S. Aigrain

PROPOSALS FOR IMPROVED PIPELINES

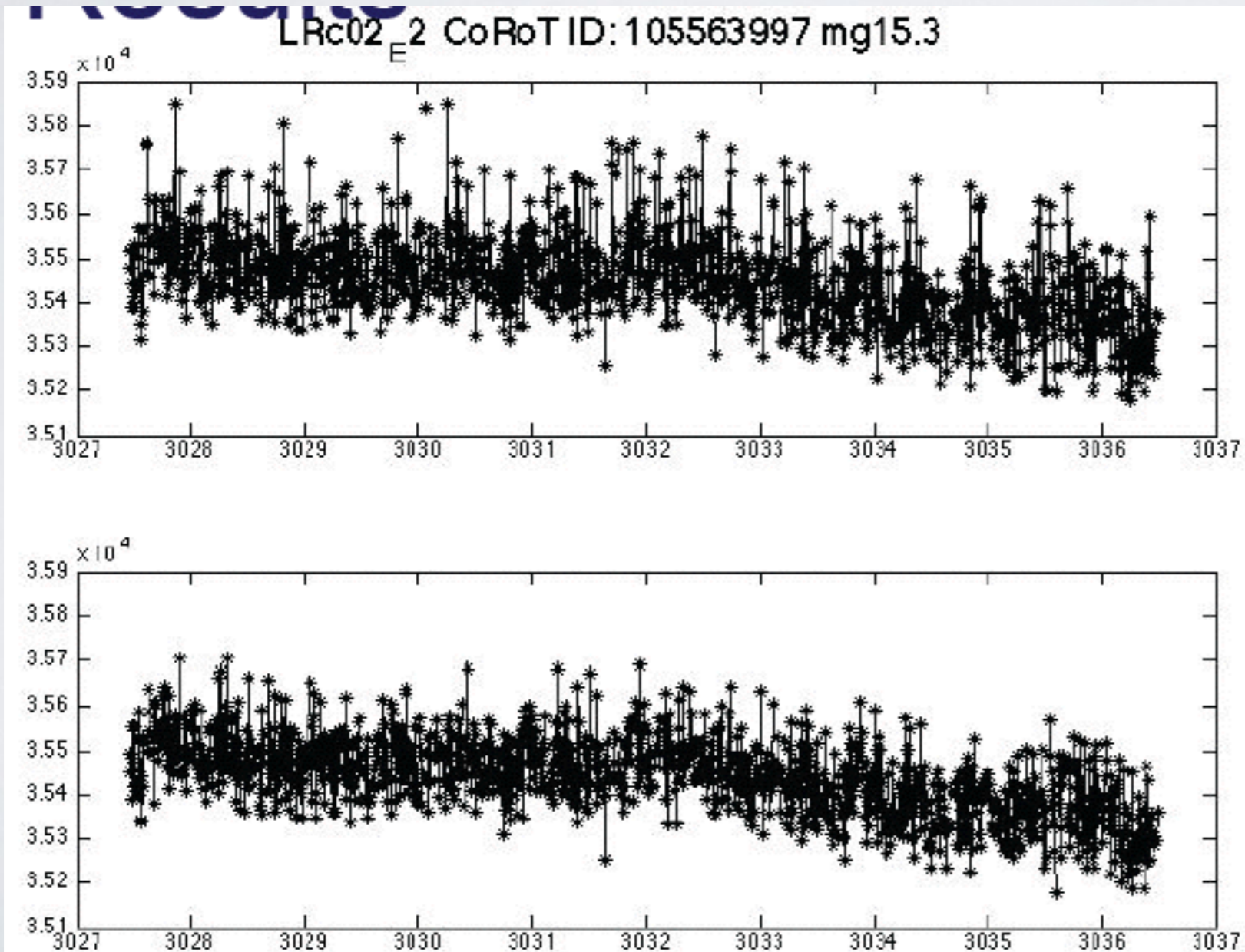
Systematics removal



from S. Aigrain

PROPOSALS FOR IMPROVED PIPELINES

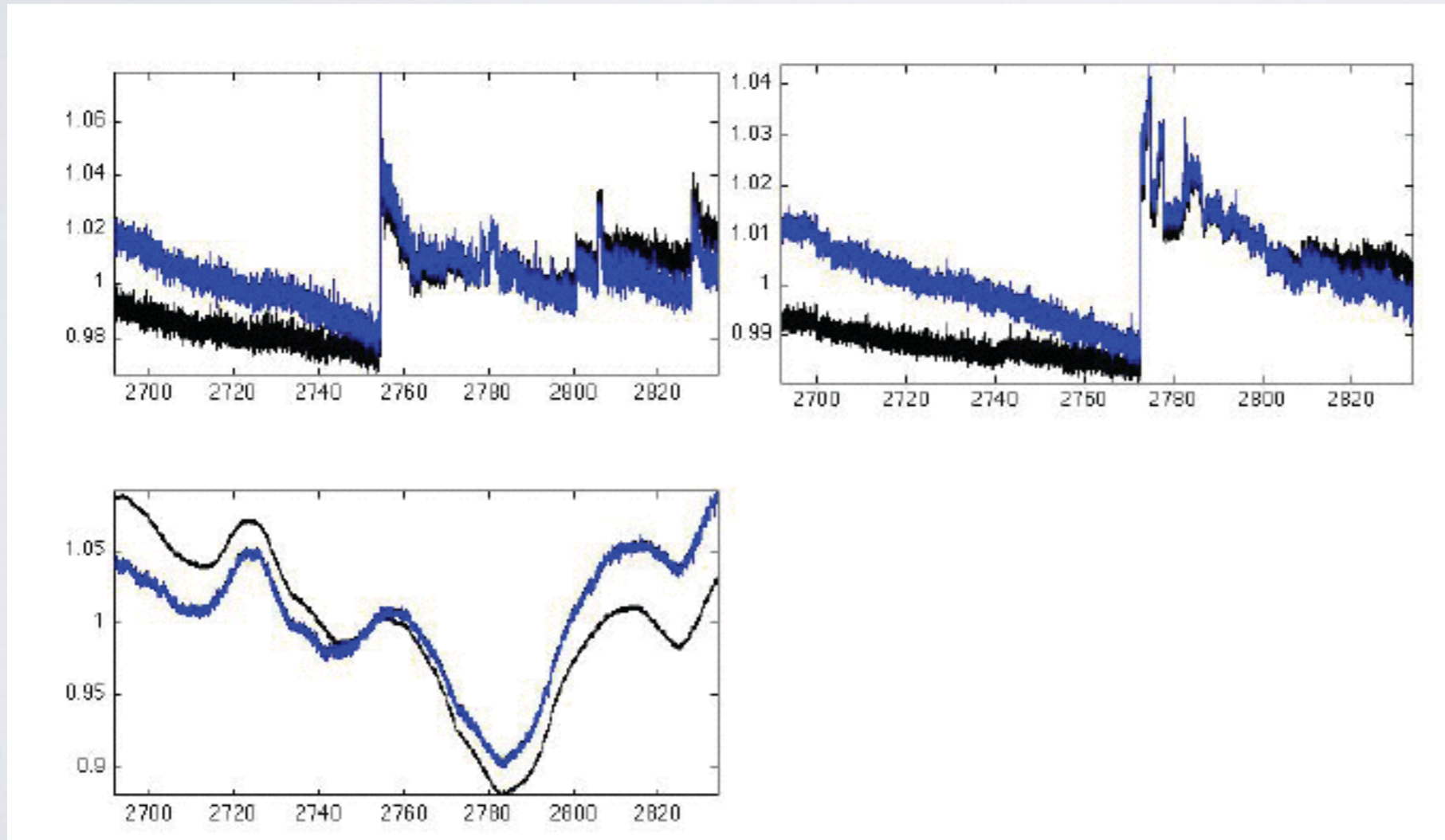
Systematics removal



from P. Guterman

PROPOSALS FOR IMPROVED PIPELINES

Systematics removal



Blue =
corrected

from P. Guterman

PROPOSALS FOR IMPROVED PIPELINES

Systematics removal

- Algorithms existing (SysRem, Oxford), already applied but maybe not a full success?
- High potential but development to be done (but already in progress at LAM)
- Can remove stellar signal?

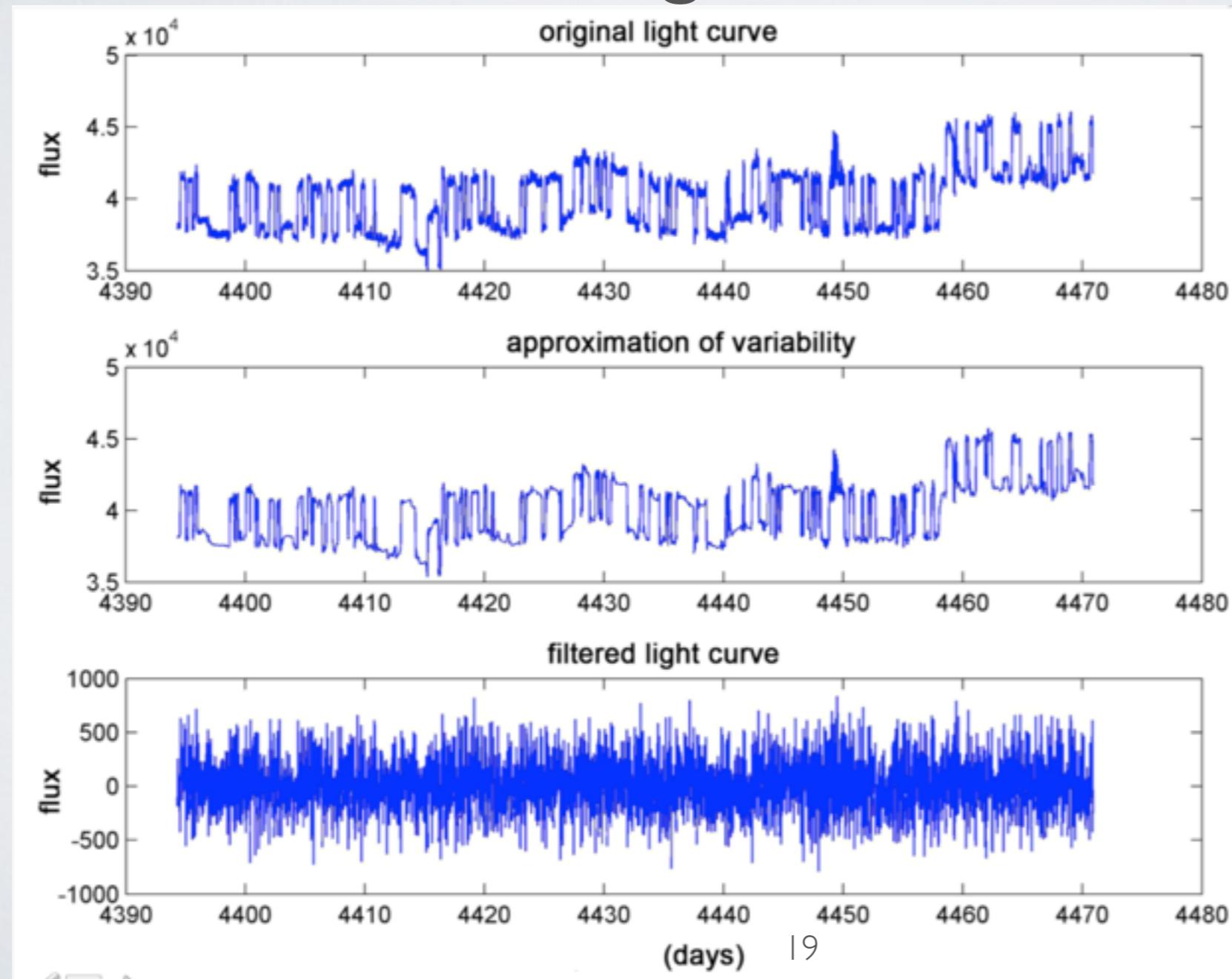
PROPOSALS FOR IMPROVED PIPELINES

Transit oriented filtering

- Algorithms existing (U. Koln), already applied.
- Filtering of anything else (any variability)
 - => interest for only a part of the community

PROPOSALS FOR IMPROVED PIPELINES

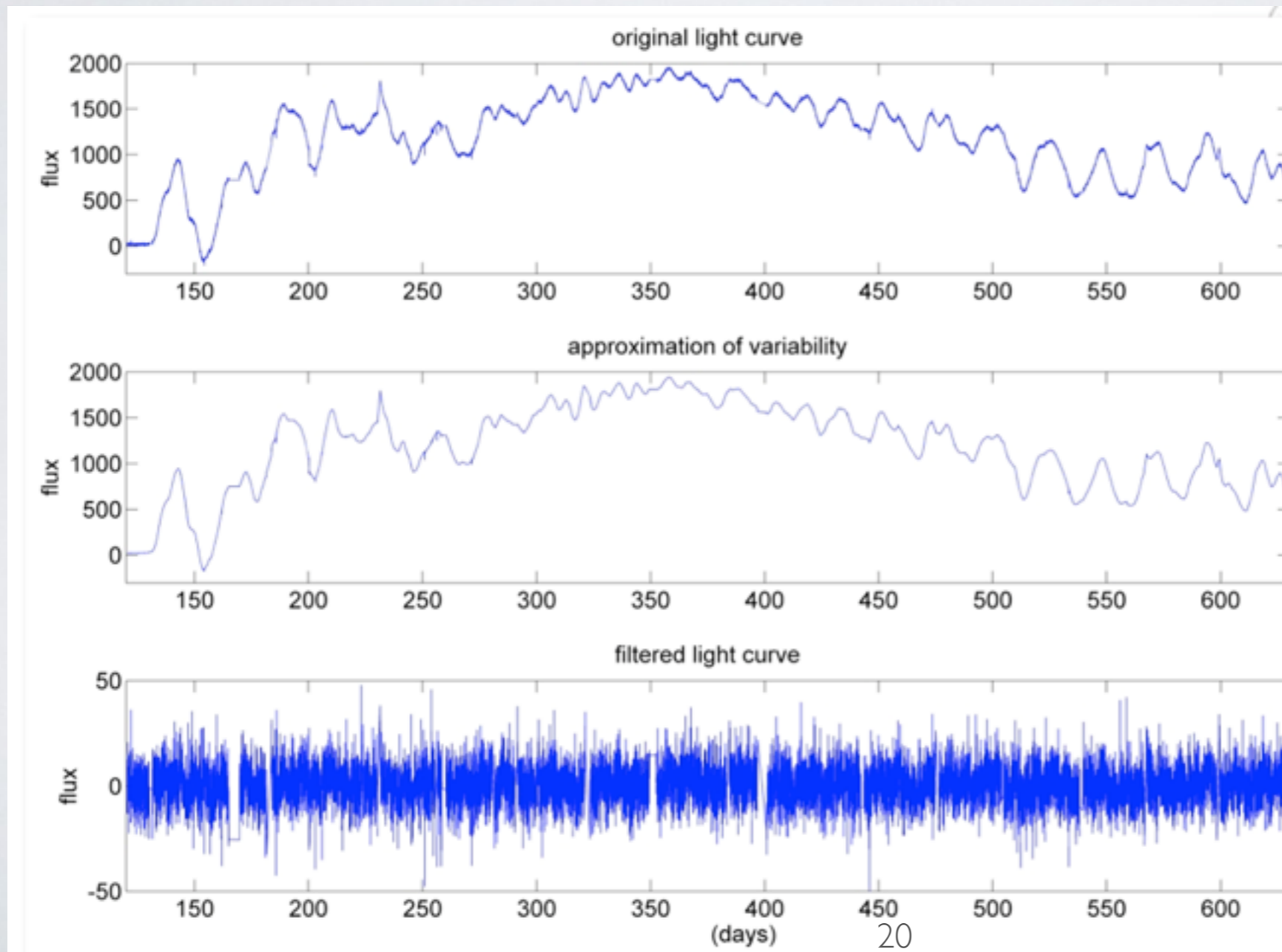
Transit oriented filtering



from S. Grziwa

PROPOSALS FOR IMPROVED PIPELINES

Transit oriented filtering



from S. Grziwa

PROPOSED PRIORITIES

1. Jump correction
2. Gap filling
3. Systematics removal
4. Transit-oriented filtering

WHY THESE PROPOSED PRIORITIES?

1. Jump correction: THE main problem, algorithm already existing (in IDL), feasibility seems OK
2. Gap filling: interesting except for transit search, algorithm already existing (Matlab), feasibility seems OK

WHY THESE PROPOSED PRIORITIES?

3. Systematics removal: important correction but algorithms not yet satisfactory, feasibility not certain

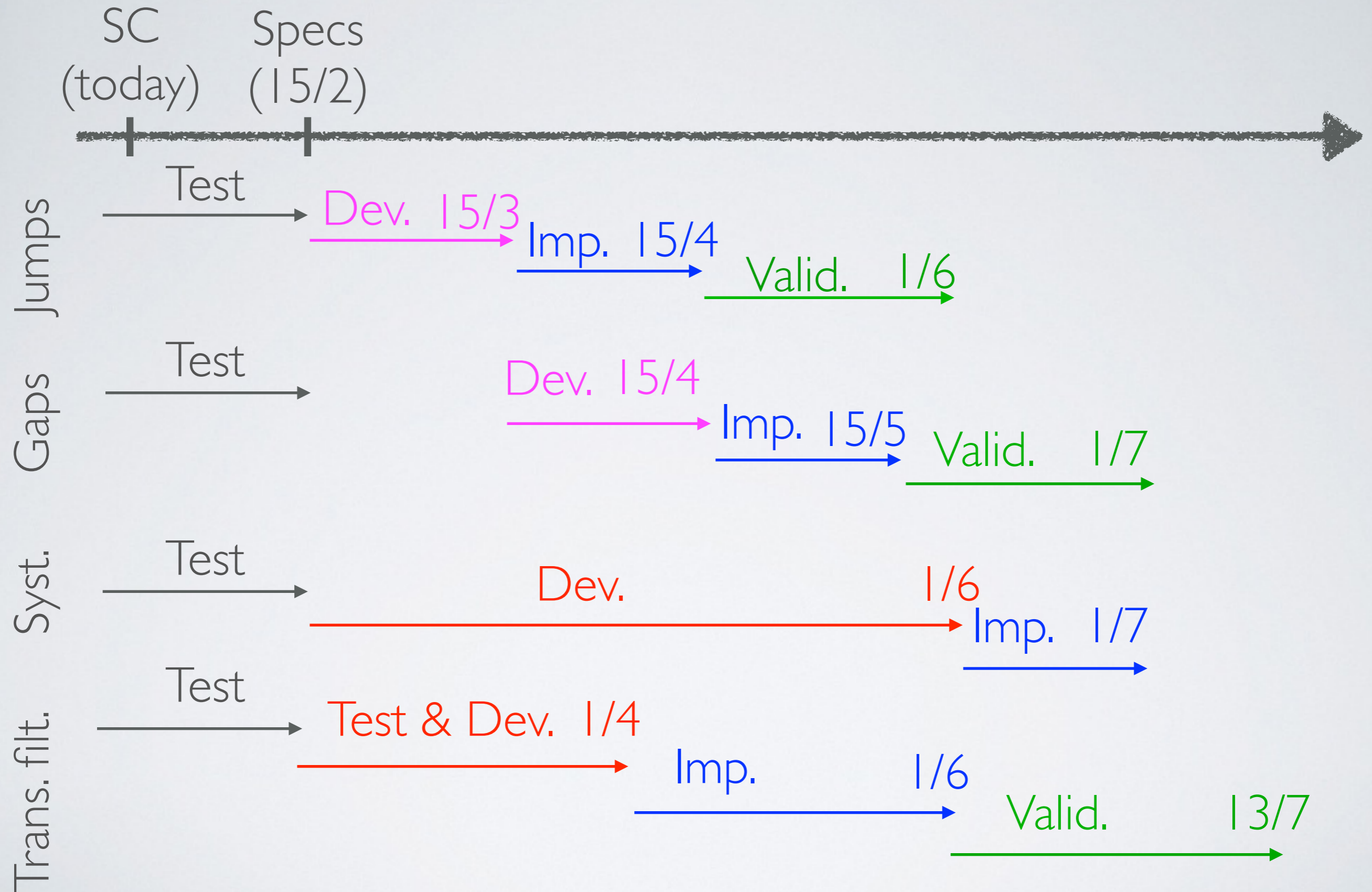
4. Transit-oriented filtering: interesting only for transit search (=one of the main objective of the mission), algorithm already existing (Matlab), feasibility OK?

WORKPLAN

1. Choice of priorities: today
2. Specification
3. Development
4. Validation
5. Data production: from October 15th to March 2015

WORKPLAN

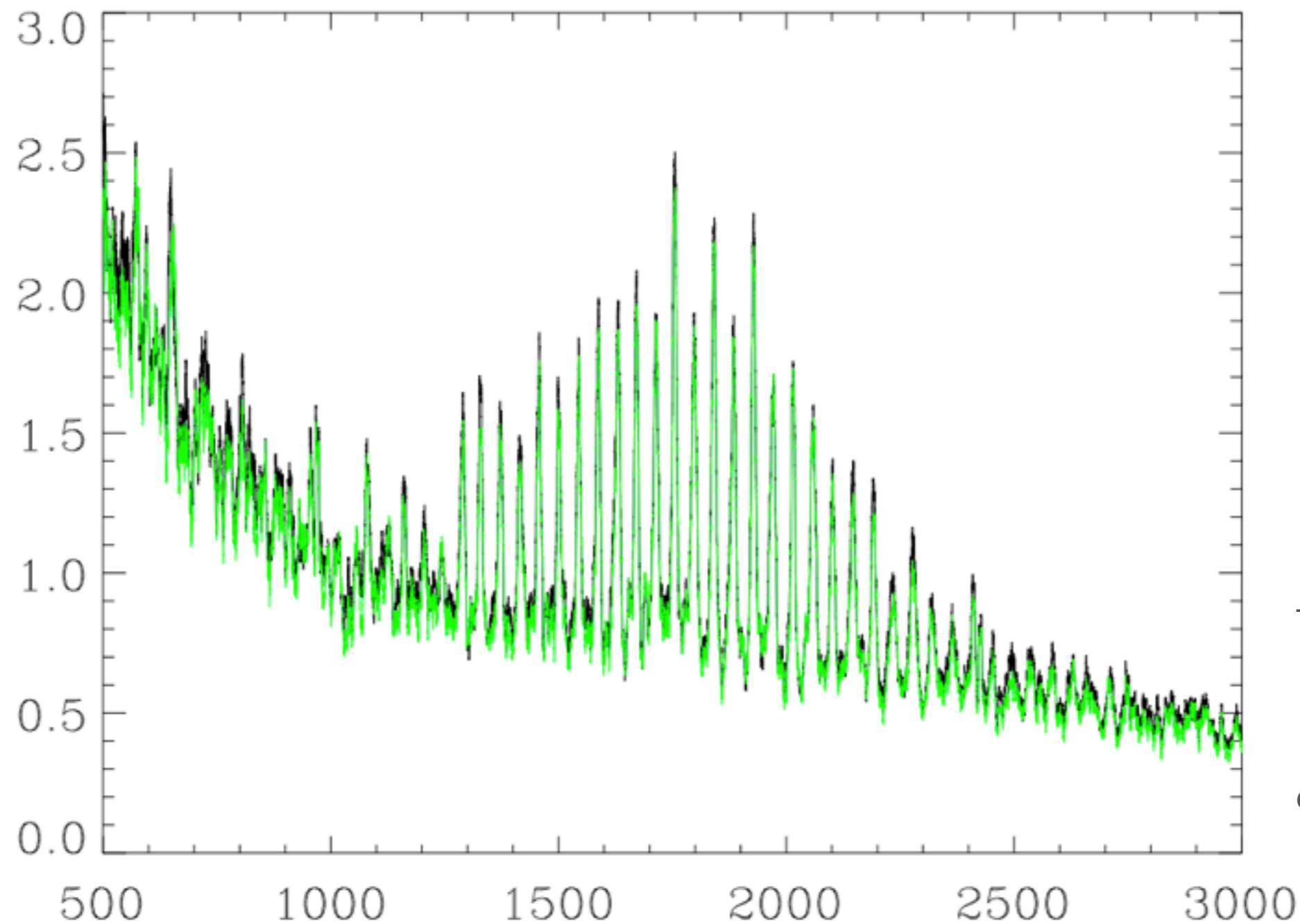
IAS LESIA LAM Valid. team



WHAT IS BEING DONE

- HD4933 gap filled (IAS)
- SysRem development (LAM)
- Testing transit oriented data, jump corrected data, gap filled data

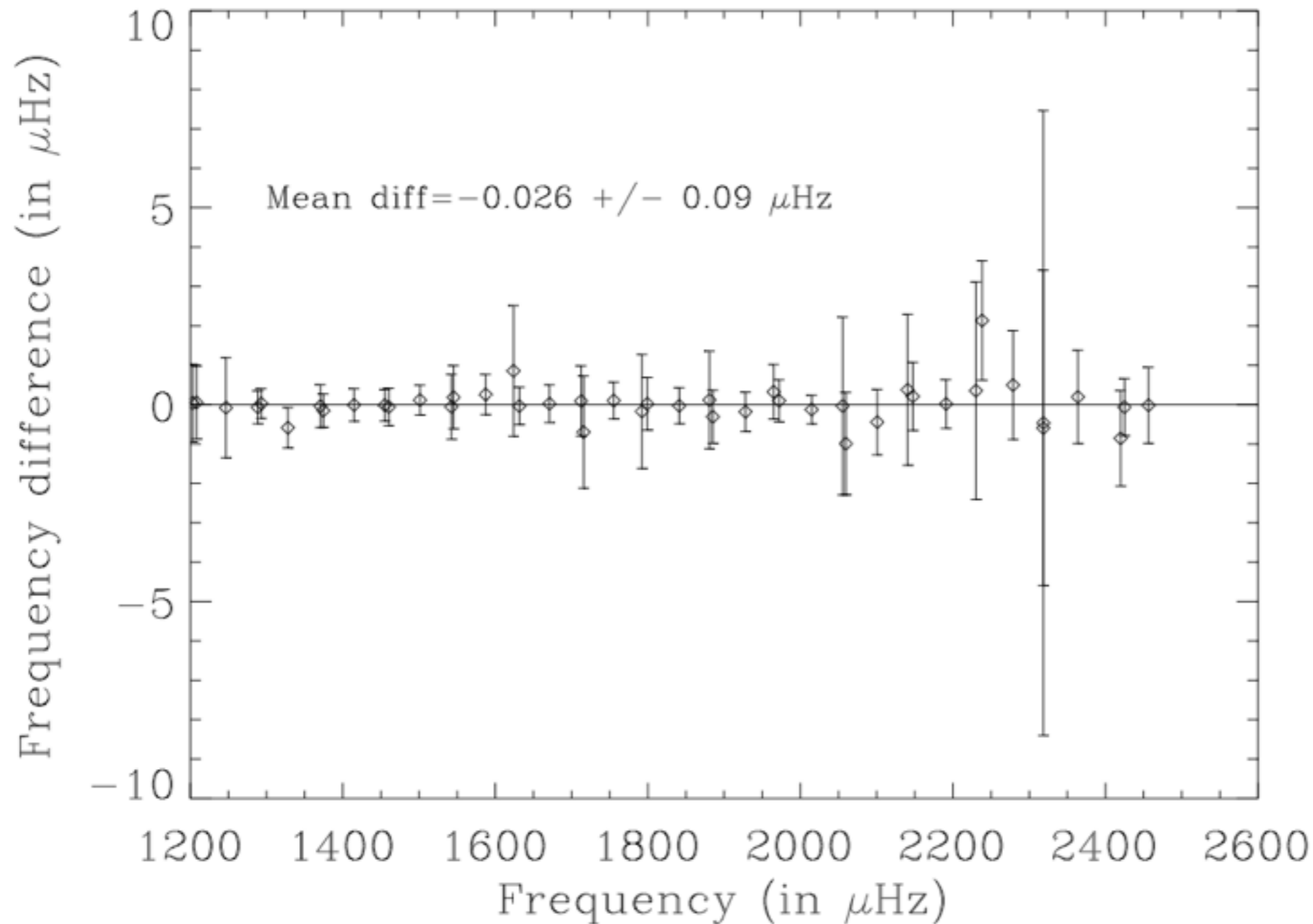
A GAP-FILLED SOLAR LIKE PULSATOR: HD49933



from J. Granado

& T. Appourchaux

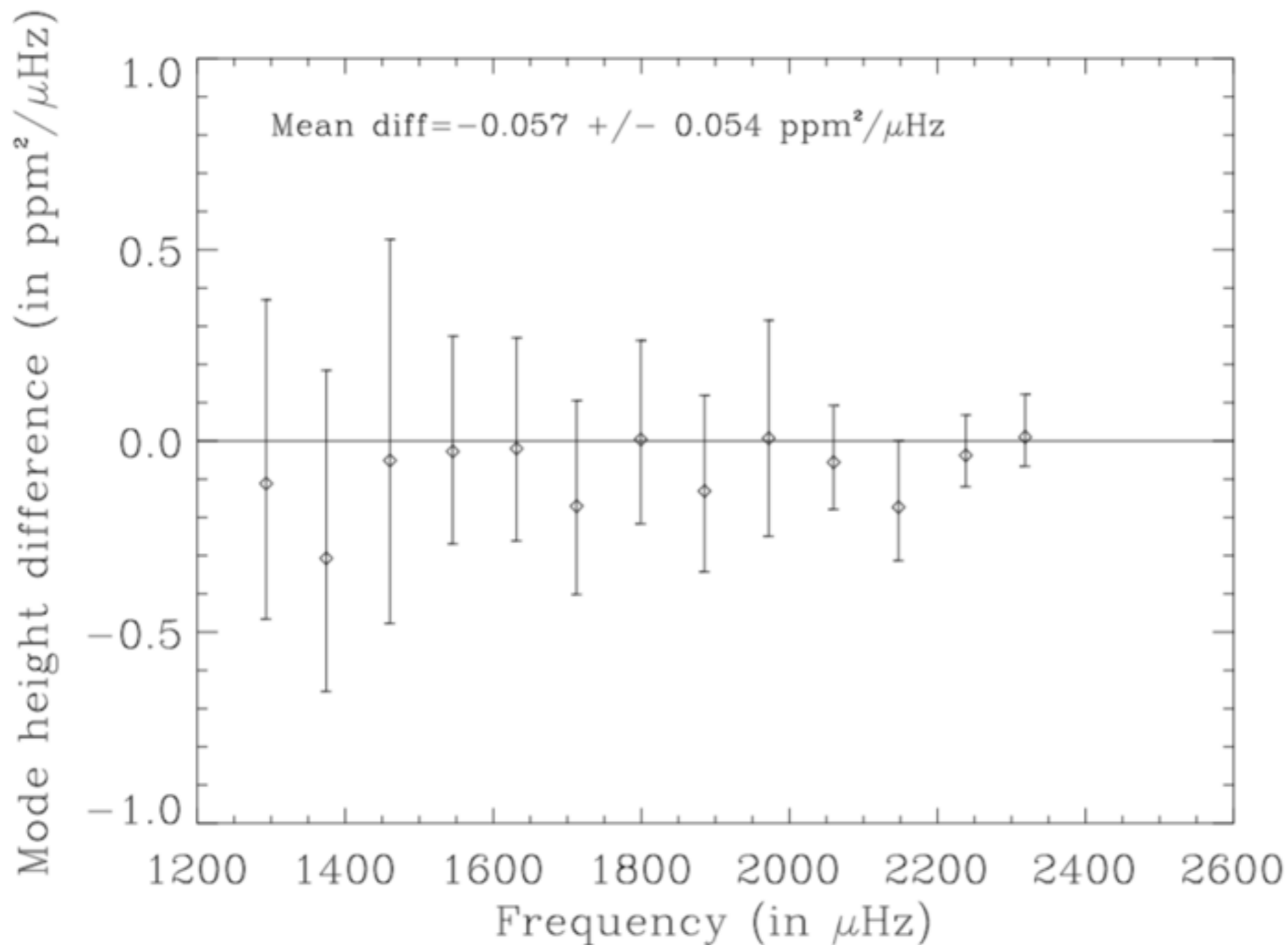
A GAP-FILLED SOLAR LIKE PULSATOR: HD49933



from J. Granado

& T. Appourchaux

A GAP-FILLED SOLAR LIKE PULSATOR: HD49933



from J. Granado
& T. Appourchaux