OverSampling Mode

C. Quentin, R. Cautain,
C. Surace, R. Savalle, J-C. Meunier
P.Barge, R. Alonso,
M. Deleuil, C. Moutou

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The various steps of the OSM

1) Preprocessing

- To filter residuals of the SAA
- To remove disturbing low frequencies of Stellar Variability
- To filter (possible) orbital perturbations

2) Detection of transit candidates

- Two complementary algorithms running in parallel
- Estimate of a confidence level for each detection

3) Discrimination

- Use of simple procedures to identify most striking ambiguities
- Check for binary star

4) Sorting and list management

Sketch of the OSM procedures

Oracle ⟷ **DataJiver** ⟷ **IDL**

BD Alarm

N1 Fits Files, Intermediate products

1. Preprocessing

- Moving Box
- Low Filter
- Gauging Filter

2. Detection

- MID → RDE
- BLS → SDE
- EPF , WPDM → VR

3. Discrimination

- Binary-Test

4. Sorting

- Merging by priority levels

List_Initial{Corot_ID}
Maximum: 500 targets

List_AddProg{Corot_ID}
Maximum: 50 targets

List_BLS{Corot_ID}
SDE > $(SDE)_0$

List_MID+EPF{Corot_ID}
VR > $(VR)_0$

List_MID{Corot_ID}
RDE > $(RDE)_0$

XML file
« list2oversample »
Maximum: 500 targets for each CCD

1. Preprocessing

Goals :

(a) To reduce the level of instrumental noise

(b) To remove the most disturbing frequencies (at low frequency)

Possible Methods:

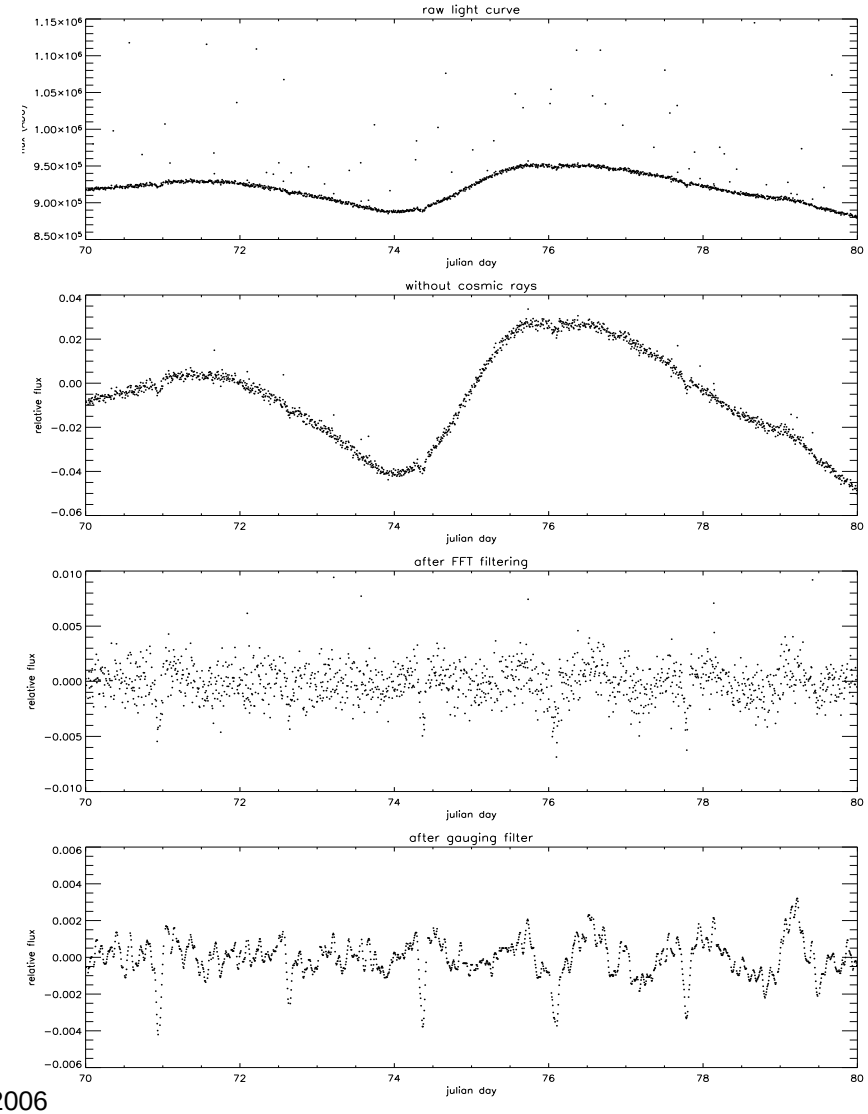
- Based on individual target
- Based on collective analysis (multiplex approach → PCA, SysRem, …)

Developed Procedures (individual targets):

- Moving Box
- Low Filter (Fourier Analysis)
- Gauging Filter

The three stages

- Raw light curves will contain some peaks due to cosmic rays and the Southern Atlantic Anomaly
- The moving box is applied to remove theses residual peaks
- Then, the slow variations of the signal are reduced thanks a Fourier analysis
- At the end, we use Morphological filtering “gauging filter”



2. Detection

Goal :

To identify transit like events in the Light-curves and to estimate a confidence level.

Methods:

- Based on the search of individual shape (transit like event)
- Based on the search of periodic features

Developed algorithms :

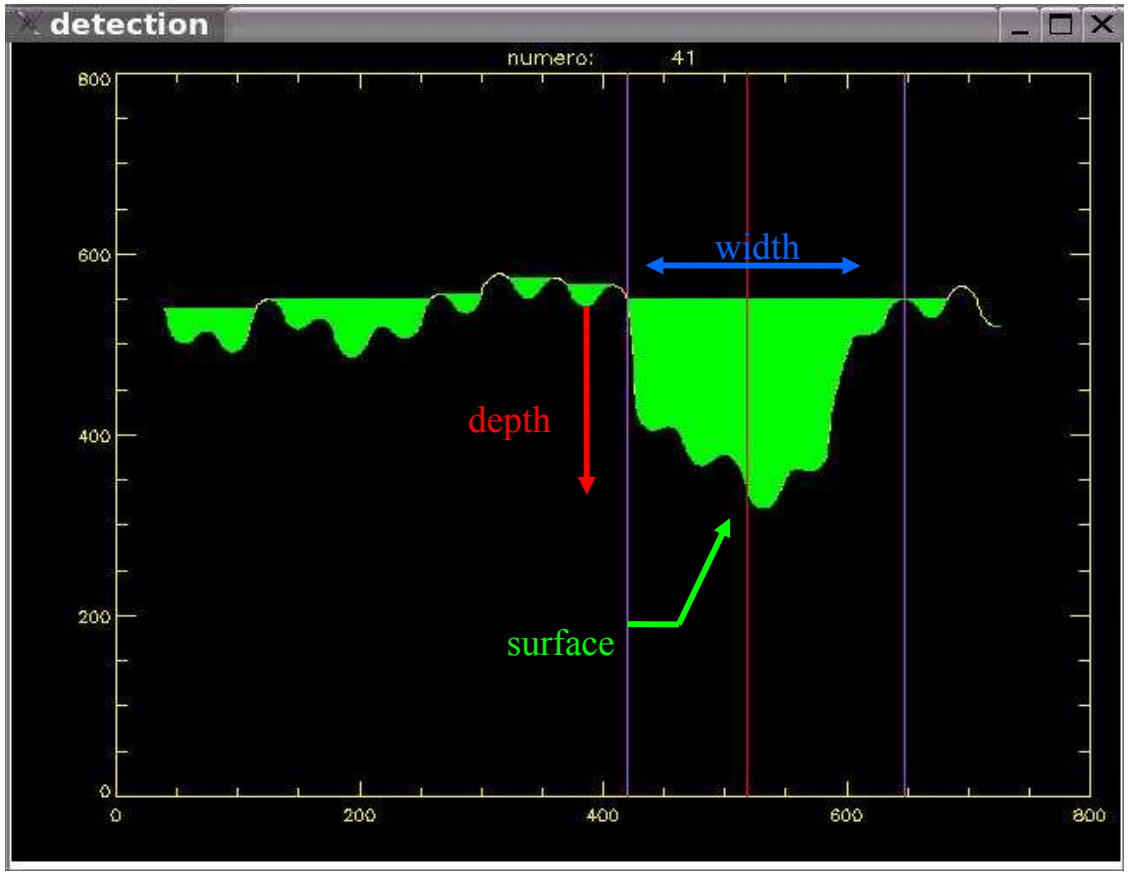
- MID (Morph. Individual Detector)
  + EPF (Event Periodicity Finder)
- BLS (Box fitting Least Square)

Morphological Individual Detector

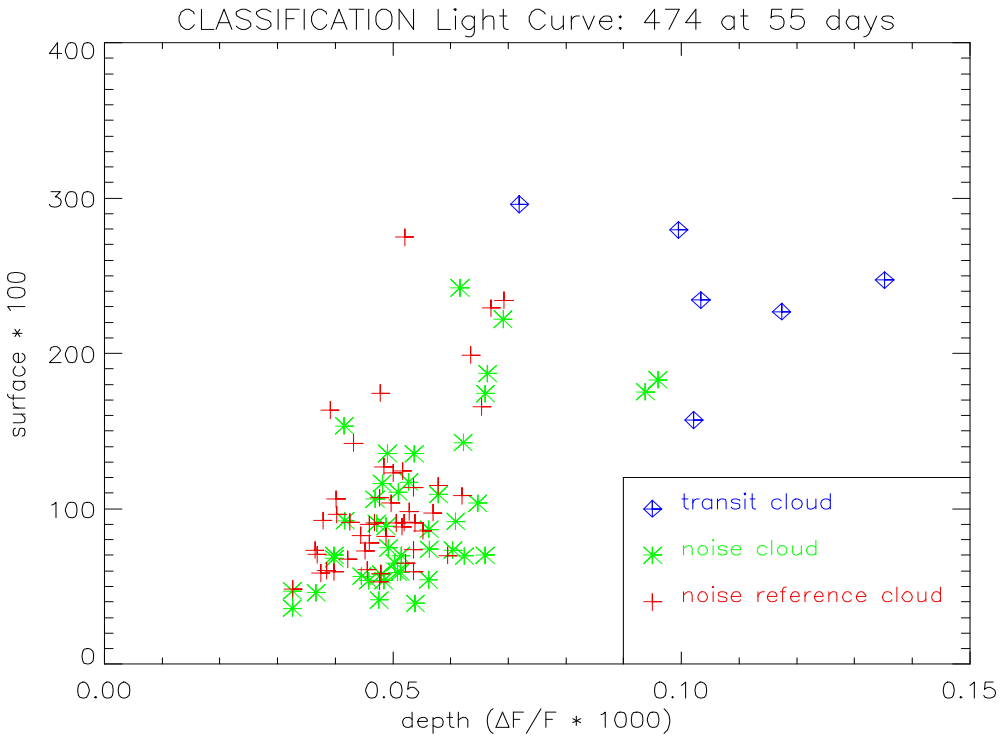
- Light curves are sliced in blocks of 36h each 24h
- Detection on each block
- Segmentation by watershed
- Identification of the deepest feature
- *Determination of three parameters:*

depth, width, surface,

in the two parts of the signal.



MID - Clustering and sorting



Projection in 2D-space (depth, surface) for one light curve in 55 days.

- *Three clusters on a map:*
  - *noise in opposite signal,*
  - *possible transit events or candidates,*
  - *noise features*

- Candidates are sorted following confidence level

  RDE:

  Ratio of Detection Efficiency

  defined with distances « noise cloud » / « transit cloud »

Box Least Square

- BLS (Kovacs et al,2002) is high efficient with short period
- Results are sorted by SDE (Signal Detection Efficiency)
- The cut-off of the list is defined by the statistic of SDE.

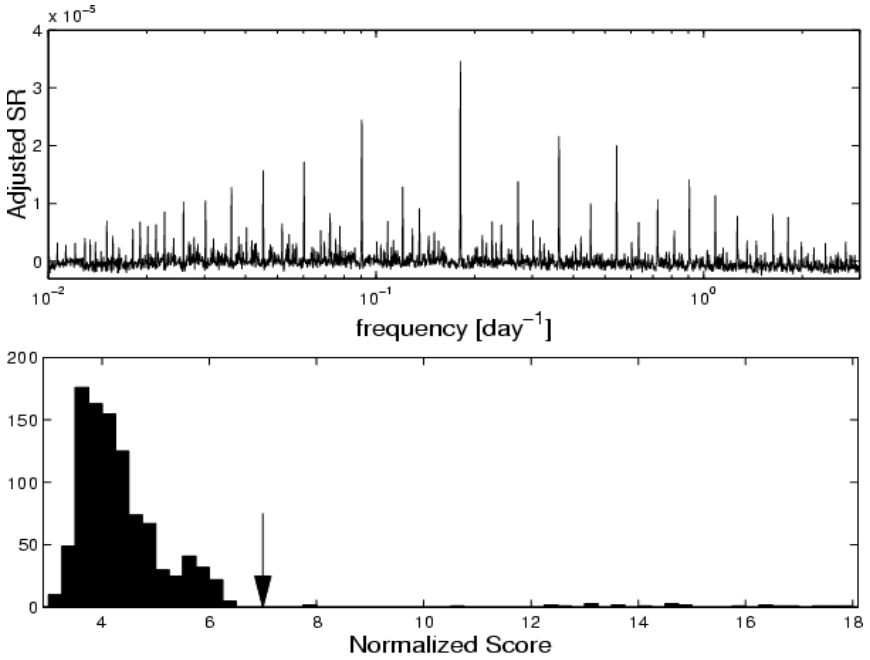


Figure extracted from BlindTest1 (Moutou et al, 2005)

4. Sorting and list management

Goal :

To draw up a list of targets that merit to be oversampled.

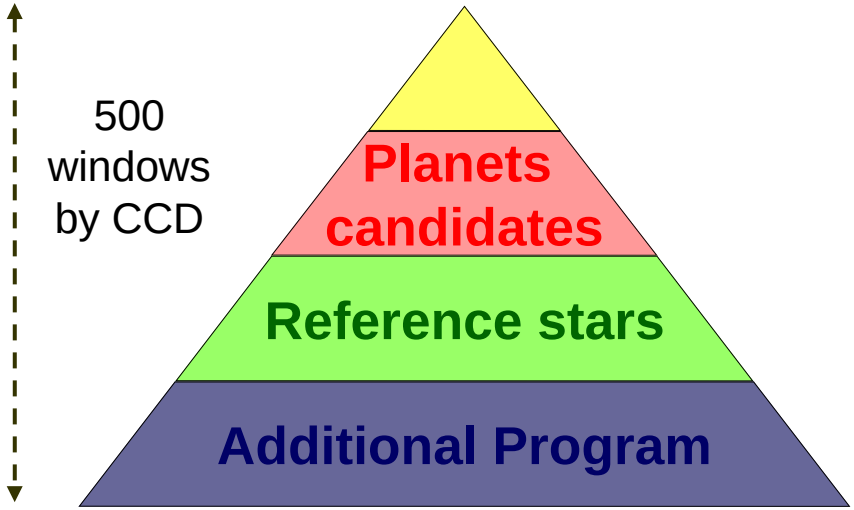
The list must be sorted following:

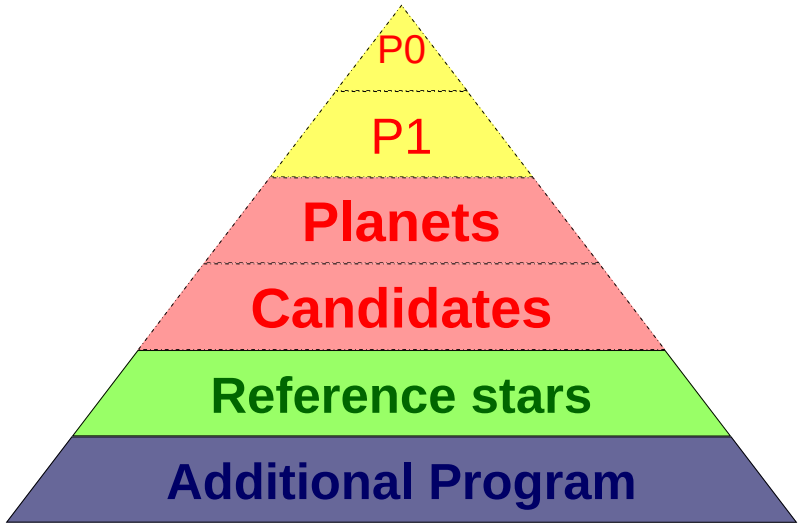
- a confidence level in the detections
- a number of scientific priorities

Procedure (under development) :

- Merging of the lists issued from the previous steps.

List Management





- **At the beginning of a run**,
  the initial list is built with:
  - the planet candidates known by preliminary ground surveys,
  - some reference stars chosen within the HR diagram,
  - and some targets defined by the additional program

- **Along a run**, the list will move as new planet candidates will be found.
  They will be sorted by their priority levels (P0, P1,…).
- some reference stars will be removed
- 50 windows will be devoted to the additional program (defined at the beginning of the run)