





The exoplanet « channel »





A two speed data analysis



Roi in the « data flow » river

Early analysis of the data (« alarm » mode)

- On nearly raw data (N1 level)
- During the run of the observation
- Using automated procedures



Brainstorming in the detection teams

Detailed analysis (regular mode)
 On completely reduced data (N2)
 At ~mid run and at the end of run
 Performed by 8 differents teams





The « alarm » mode

On board change in the rate of the observations

Goal:

- A better coverage of the transit profile (TTVs, etc ..)
- To reduce the noise level
- To trigger Follow up operations as soon as possible

Capacity:

- Sampling rate: $1/512s \rightarrow 1/32s$
- Possible only for 1000 windows
- Management of the target lists:
 - Initial list: the best targets, ...known to host planets
 - Opdate: after early detection in quickly reduced data





The regular mode





Use fully processed data (up to 8 teams on the bridge)

Pre-processing

- Removal of outliers
- Identifying hot pixels
- Filtering star variability

(median or NL filters, etc ..)

Studying systematics

Detection

- Standard methods: Bayesian, Box fitting LS
- Others: based on correlation, wavelets, ...
- \rightarrow Folded ligth curves



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Possible blends

- Eclipsing binary
 Secondary transit diluted in the noise
- Background impostors
 - B. Eclipsing Binaries
 - Eclipse (star or planet) diluted by a third star
 - Neighbourhood

 \rightarrow Follow up confirmation mandatory

6





DF/F = 1.6% ; D = 6.8h ; P = 15 days





DF/F = 0.15% ; D= 2.8 h ; P= 3.5 d ; mv = 15.7



DF/F = 0.45% ; D = 3.5 h ; P=4.26 d ; mv = 13.3



DF/F = 1.3% ; D= 8.7 h ; P= 30 d ; mv = 13.56





Detection/confirmation



Detection Made by different teams Merging of the results Case by case analysis Remove binaries Compare depth/duration Out of transit modulations Look at colours Sorting by priorities Follow up confirmation On/off photometry Radial velocities





Organization of the work

Different working groups:

- Data reduction $N1 \rightarrow N2$
- Light-curve analysis
 (8 different teams)
 - Detrending/Detection
 - Sorting of candidates

- Follow-up operations
 - On/Off Photometry
 - Radial Velocities
 - Stellar Parameters
 - Space observations

Light curve fitting and modeling

→ Coordination of detection & follow-up Goal: to start the follow up obs. as soon as possible



Tools for the Follow up

- On/Off photometry
 - IAC 80cm
 - ESO VLTFORS & NTT/SUSI2
 - EULER La Silla
 - OHP 120cm
 - CFHT 3.6m
 - Wise obs. 1m

- Radial velocities
 - CORALIE
 - SOPHIE at OHP
 - HARPS
- Star parameters
 - High res. Spectros.
 - Space facilities





CoRoT Exo. Science Team

Composition of the Team (core program)

- CoRoT Exoplanet Co-Is: 26
 - France (IAS, LAM, LESIA, LUTH, OCA)
 - Austria (SRI)
 - Belgium, Brasil
 - ESA (ESTEC)
 - Germany (DLR, Köln Univ., Tautenburg Obs.)
 - Spain (IAC)
 - Switzerland (Geneva obs.) UK (univ. Exeter)
- Associated Scientists: ~ 20
- → Work as a single coherent group

What is found in the analyzed light curves

Present sample: 45,222 light curves

Anticenter (IRa01, LRa01, SRc01) : 26,759

Center (LRc01, SRc01) : 18,463





Transit like signals (1)



Only 1168 light curves contain transit like signals

All kind of signals

- Eclipsing binaries
- Transiting planets
- Others ...
- Peak at short periods
 - Due to piling up on the line of sight
 - Some A/C differences
 (cut off in the piling up !?)





Transit like signals (2)

The fainter the star, the higher the detection limit



Transit like signals (3)

Many short periods on the faint stars

Transit like signals (4)

Candidates/Planets (1)

m 1168 detected signals only 374 consistent with planetary transits

(%)

- Anticenter
- \rightarrow 294 candidates
- Exo-1b
- ▲ Exo-4b

▼ Exo-5b Exo-7b

Center \rightarrow 93 candidates ***** Exo-2b Exo-3b Exo-6b

Results for the first 5 runs

Run	Stars	Transit signals	Discussed	candidates	F. Up	Planets
IRa01	9921	230	~ 90	51	51	2
SRc01	7015	256	~ 90	57	57	0
LRc01	11448	228	~ 50	50	50	2
LRa01	11448	299	~ 90	45	45	2
SRa01	5390	155	34	14	5	0
Total	45,222	1168	~ 354	217	208	6

2.5% of the targets have transit like signals rom which: ~ 70% are eclipsing binaries and 30% planet candidates

6 confirmed planete (5 completely observatorized)

Final comments (1)

- Up to now CoRoT has detected:
 - Six giants planets (see talk by H. Rauer)
 - One small planet (see talk by D. Rouan)
 But particularly interesting objects !

We expect more planets:

- With the next runs of observations
- When data will be reprocessed with the new pipeline version
- Thanks to our experience of the first runs

Theoretical interpretation are just beginning:

Structure and composition of CoRoT's planets (talks by T.

What we learned from the first runs:

- From the initial run (talks by S. Carpano & C. Moutou)
- Studying the detection limits (talks by Pont & Samuel)
- Using the color information (talk by P. Borde)
- From the photometric Follow up (talks by Deeg & Gillon)
- From the radial velocity Follow up (talk by F. Bouchy)
- From the study of stars (talks by M. Deleuil, D.Gandolfi & M. Barbieri)
- Studying the noise level (talks by M. Auvergne, M. Olivier, S. Aigrain, D. Fialho, T. Mazeh)