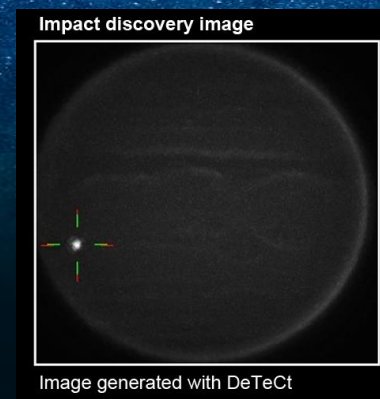
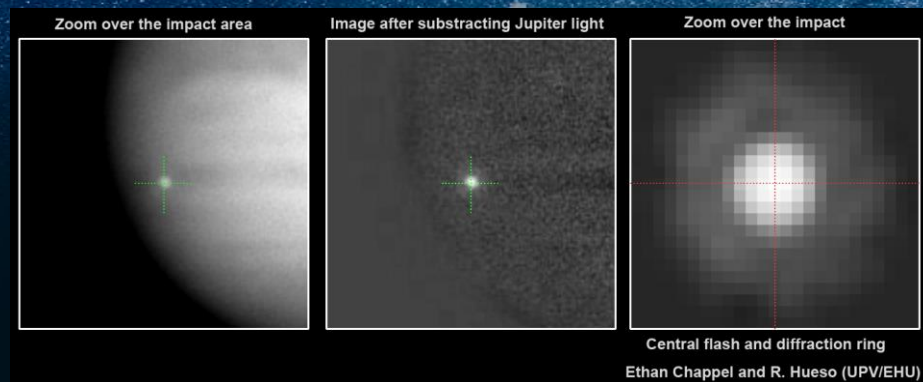


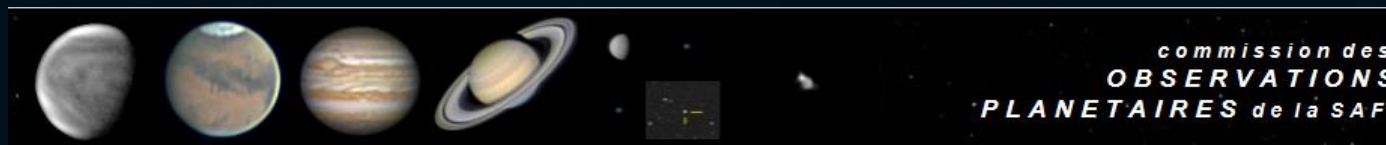


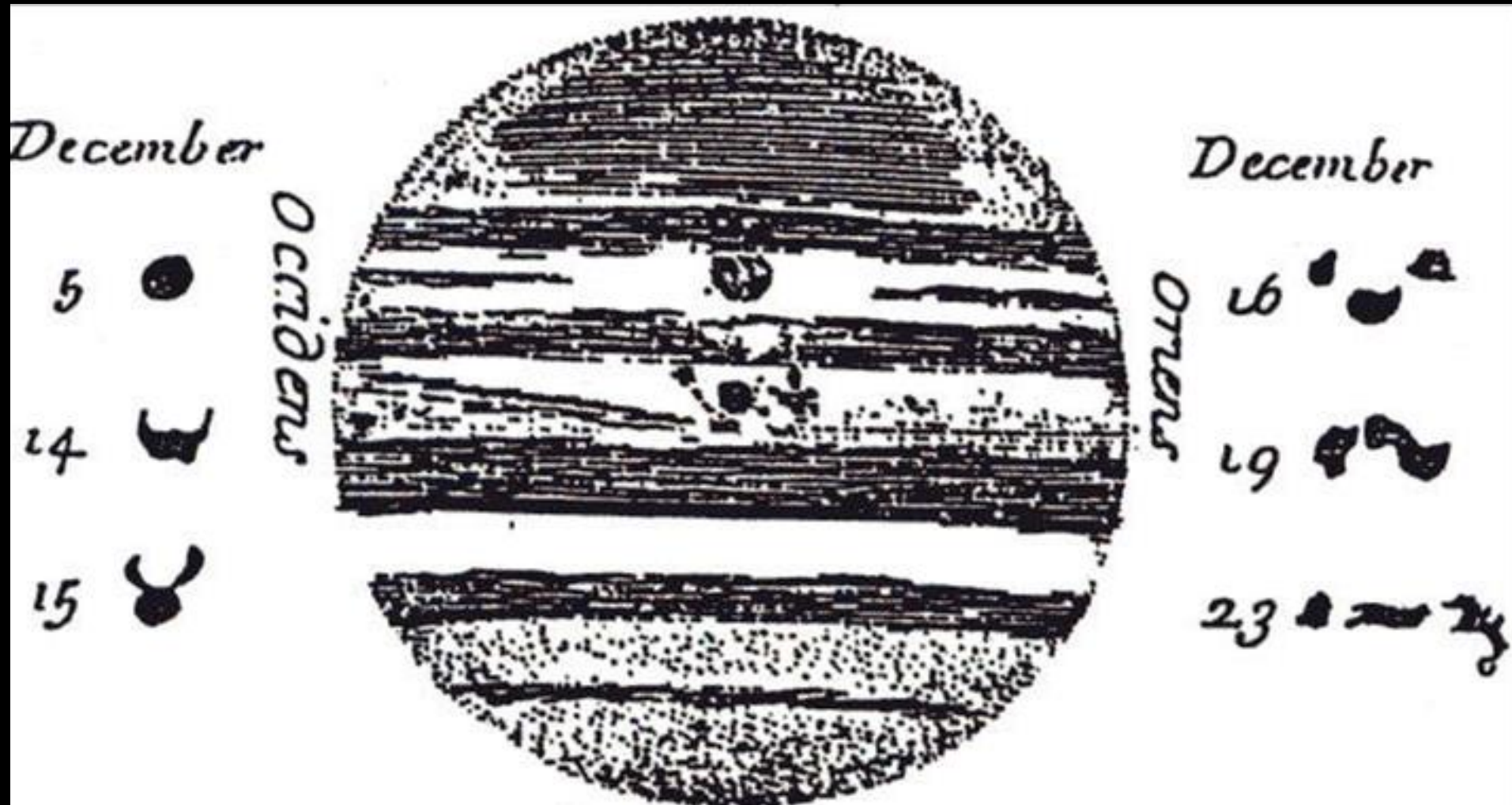
## Projet de détection d'impacts sur Jupiter et Saturne: un exemple de projet collaboratif amateurs-professionnels

Journée des commissions SAF 2021/05/29



Marc Delcroix ([delcroix.marc@free.fr](mailto:delcroix.marc@free.fr))  
(président des observations planétaires)



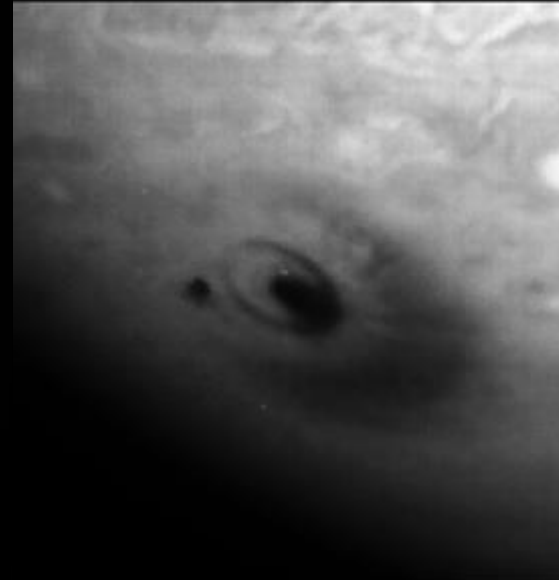


**Dec. 1690:**

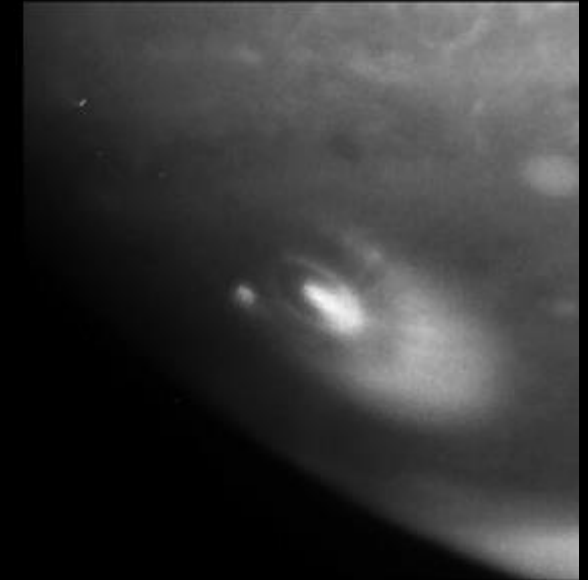
Possible trace d'impact détectée par Jean-Dominique Cassini ?



Green



Methane



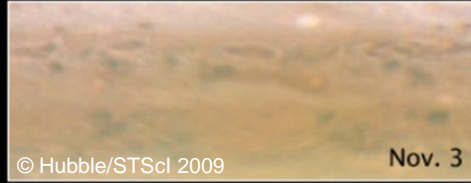
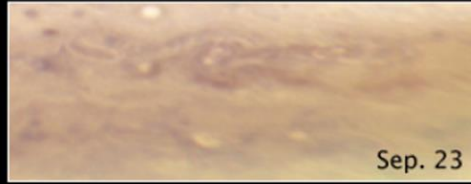
© Hubble/STScI 1994/07/18

**Jul. 16-22, 1994:**

21 morceaux de P/Shoemaker-Levy 9 impactent Jupiter  
Les impacts prévus ont été observés en direct par professionnels et amateurs  
Ils ont été générés des flashes et des traces d'impacts, taille des corps ~1km

© Hubble/STScI 1994

Dec.  
1690Jul.  
1994



14:11 15:06 15:55 16:43

**Jul. 19, 2009:**  
Trace d'impact découvert par A. Wesley  
 Corps ~500m, impact non vu en direct



**Jun. 3, 2010:**  
**flash** de 2s découvert by am. A. Wesley  
confirmé par C. Go  
Corps ~11m, pas de trace

Dec.  
1690

Jul.  
1994

Jul.  
2009

Jun.  
2010



**Aug. 20, 2010:**

flash de 2s découvert par M. Tachikawa  
confirmé par K. Aoki et M. Ichimaru  
Corps ~11m, pas de trace

Dec.  
1690

Jul. 1994

Jul. 2009

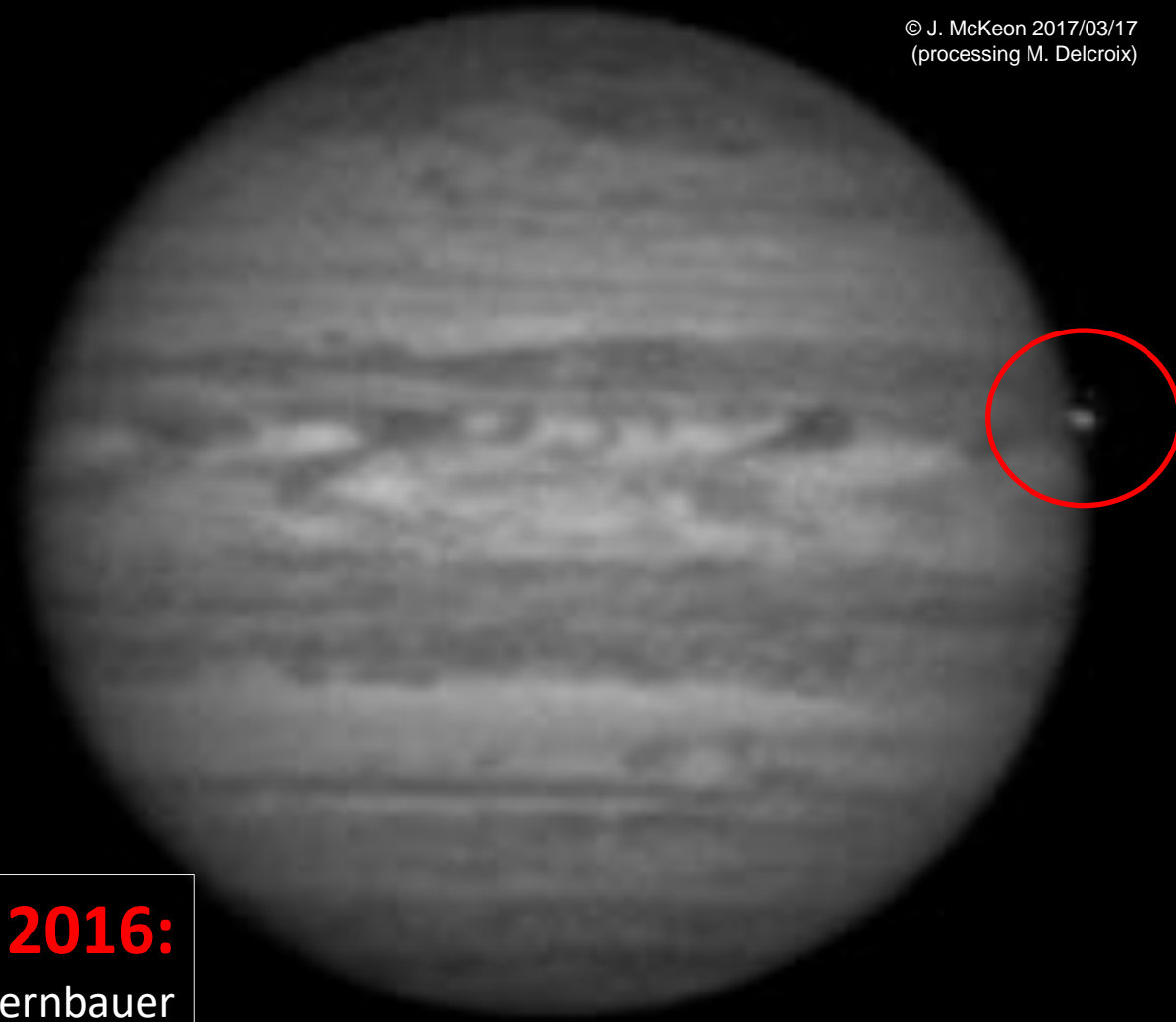
Juin.  
2010

Aou.  
2010



**Sep. 10, 2012:**  
flash de 2s découvert par D. Petersen  
confirmé par G. Hall  
Corps ~15m, pas de trace





© J. McKeon 2017/03/17  
(processing M. Delcroix)

**Mar. 17, 2016:**

flash de 1,5s découvert par G. Kernbauer  
confirmé par J. Mc Keon  
Corps ~12m, pas de trace

Dec.  
1690

Jul. 2009    Jul. 2010    Juin. 2010    Sep. 2012    Mar. 2016



© S. Pedranghelu 2017/05/26  
(processing M. Delcroix)



**May. 26, 2017:**

**flash** de 1,5s découvert par S. Pedranghelu  
confirmé par T. Riessler et A. Fleckstein  
Corps ~10m, pas de trace

Dec.  
1690

Jul. Aou. Mar.  
2009 2010 2016  
Jul. Juin. Sep. Mai.  
1994 2010 2012 2017



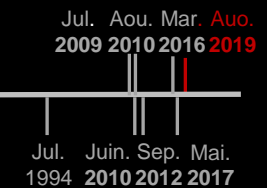
**17 août 2019:**

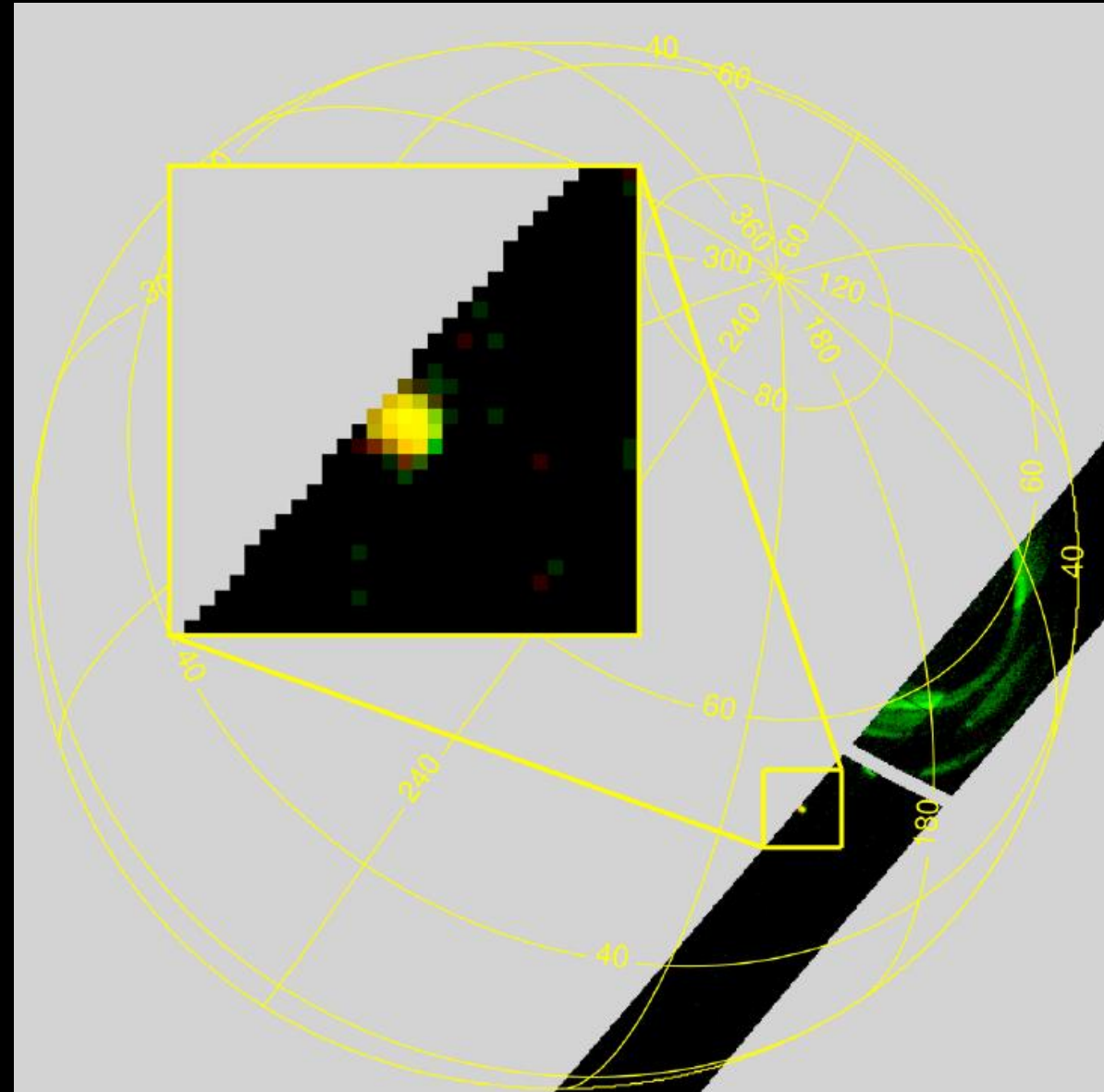
flash de 1,5s découvert par E. Chapell

grâce à DeTeCt

corps ~10m, pas de trace

Dec.  
1690





**10 avril 2020:**  
flash découvert par la sonde JUNO  
corps ~2m, pas de trace

**2** planètes  
surveillées

**1** flash d'impact détecté

**9** années de projet

**18** années  
d'opposition étudiées

**16** articles et présentations  
aux conférences

**109** participants

**174** jours complets  
d'observations

de **20** pays

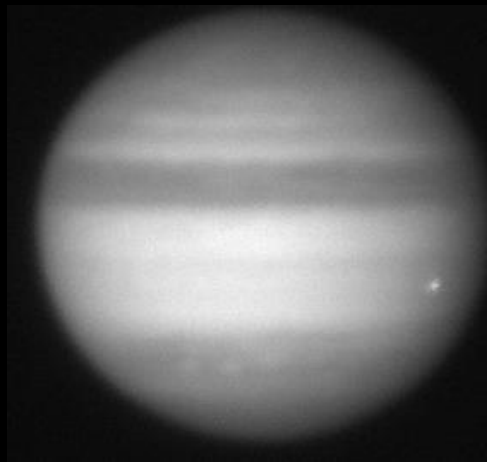
**27 000** lignes de code

**165 000** vidéos analysées

Deux méthodes pour détecter les flashes:

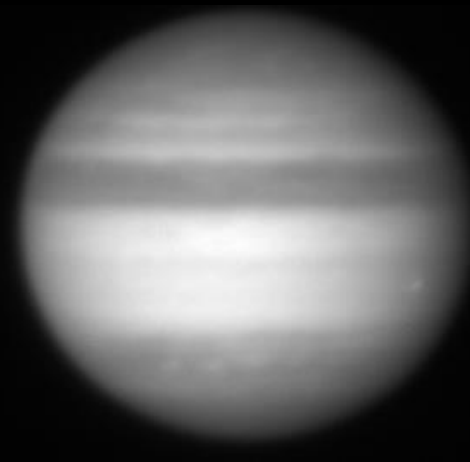
- par **photométrie différentielle** entre les trames de vidéos
- par la génération **d'images de détection** à analyser

© C. Go 2010/06  
processing M. Delcroix



MAX

-



MOYENNE

=



IMAGE de DETECTION

DeTeCt est un projet et un logiciel avec pour objectif:

- d'aider les amateurs à **découvrir des flashes d'impact** sur leur vidéos de Jupiter et Saturne
- d'estimer la **fréquence d'impact**, en collectant les résultats (positifs ou négatifs) d'analyses faites avec le logiciel

DeTeCt v3.4.1.20210523\_x64 Analysis of Jupiter/Saturne videos to find impact flashes

File Preferences Help

File selection and process automation

Select folder recursively ...or... Select file  auto processing  auto exit when done  then shutdown PC Max instances: 12/12

Impact detection

Detect impacts Probability (total) : Null / Error 1 Low 4 High 7

Check detection images, send results [Detection images to check](#) [Detection log](#) [Folder with zip file to send](#)

File processing

(Click) check detection images and send email with zip file!

Processing improvement:  ASI session  dark file

7 acquisitions with high probability impacts  
4 acquisitions with low probability impacts  
1 acquisition without any impact

DATE FROM:  acquisition log  SER  timestamps  FITS  file date info

CHECK and SEND the RESULTS to: delcroix.marc@free.fr NO DETECTION also MATTERS!

Progress

Duration processed (total): 568s

Total (12/12) File

Execution full log Processing time: 204.0s (file) 205.8s (total) 1/12 instances

```

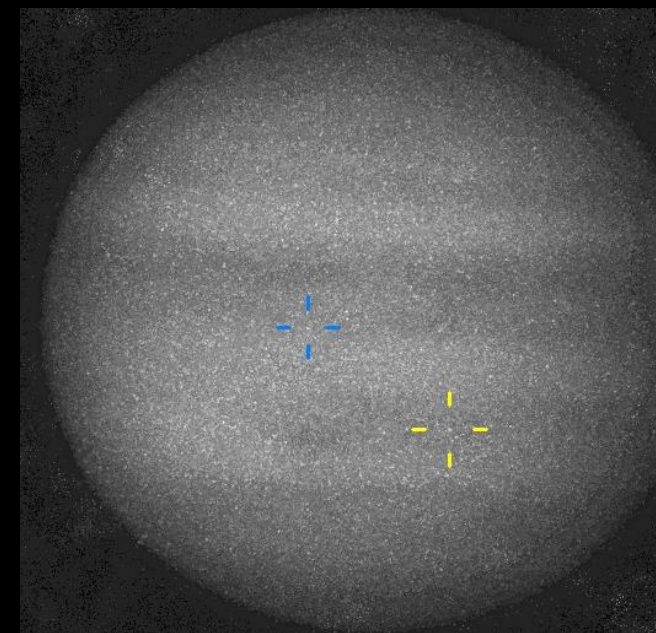
2021-05-23 20:48:38 - 7 acquisitions with high probability impacts
2021-05-23 20:48:38 - 4 acquisitions with low probability impacts
2021-05-23 20:48:38 - 1 acquisition without any impact
2021-05-23 20:48:38 -
2021-05-23 20:48:38 - Click "Check detection images..." button to open in "G:\work\Impact\tests\data_set\positives" :
2021-05-23 20:48:38 - - an explorer in "Impact_detection_run@2021-05-23_20-45-11" to check the detection images
2021-05-23 20:48:38 - - an explorer where "Impact_detection_run@2021-05-23_20-45-11.zip" to be sent by email is (along with DeTeCt log)
2021-05-23 20:48:38 - - an email to send the results by attaching "Impact_detection_run@2021-05-23_20-45-11.zip" file
2021-05-23 20:48:38 -
2021-05-23 20:48:38 - CHECK the DETECTION IMAGES for impacts and SEND the RESULTS, NO DETECTION also MATTERS!
2021-05-23 20:48:38 - delcroix.marc@free.fr
2021-05-23 20:48:38 -
2021-05-23 20:48:38 - You can SAFELY CLOSE this window.
2021-05-23 20:48:38 - =====

```

Toutes les informations disponibles venant des vidéos, des logiciels d'acquisition et de traitement sont utilisées pour caractériser les observations

L'amateur analyse lui-même ses vidéos, et envoie ses résultats au projet pour confirmation et prise en compte

Consolidation et analyse des contributions permet d'estimer les fréquences d'impacts



```

DeTeCt_jupiter_20210522_0634-0655_impact_detection_run@2021-05-22_04-37-57.log - Bloc-notes
[ Fichier  Éditeur  Format  Déchiffrement  Aide ]
DeTeCt: Jovian impact detection software DeTeCt v3.4.0.20210518_v64
PL#48 SEND THIS FILE to Marc Delcroix - delcroix.marc@free.fr - for work on impact frequency (participants will be named if work is published) - NO DETECTION MATTERS!
confidence Rating | Start | End | Mid | Defect version and comment; os version; mean minjavgmax; mean2 minjavgmax; max-mean meanjavgmax; max-mean2 minjavgmax; diff minjavgmax; diff2 minjavg max; distance; @observer; Location; Scope; Camera; filter; Profile; Diameter (arcsec); Magnitude; Central Meridian (°); Focal length (mm); Resolution (arcsec); Binning; Bit depth; Debayer; Shutter (ms); Gain; Ga
0.0000 Null | 2021/05/22 06:34,785184 UT | 2021/05/22 06:35,785416 UT | 2021/05/22 06:35,285400 UT | 60.0020 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_26\2021-05-22-0635_2-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;106.282;255.000; 0.000; 22.922; 55.000; 0.000;102.794;255.000; 0.000; 6.925; 17.000; 0.000; 16.902;255.000; 0.000; 0.528; 8.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 207.2 CHII-339.8 CHII-3
0.0000 Null | 2021/05/22 06:40,997767 UT | 2021/05/22 06:41,997817 UT | 2021/05/22 06:41,497817 UT | 60.0000 s | 128.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_27\2021-05-22-0641_4-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;112.751;255.000; 0.000; 18.111; 41.000; 0.000;111.094;255.000; 0.000; 5.277; 12.000; 0.000; 22.441;255.000; 0.000; 0.440; 5.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 211.0 CHII-341.5 CHII-3
0.0000 Null | 2021/05/22 06:35,813283 UT | 2021/05/22 06:36,313500 UT | 2021/05/22 06:36,313500 UT | 60.0080 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_27\2021-05-22-0636_3-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;107.682;255.000; 0.000; 20.997; 50.000; 0.000;106.492;255.000; 0.000; 6.712; 18.000; 0.000; 16.520;255.000; 0.000; 0.510; 7.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 207.8 CHII-342.4 CHII-3
0.0000 Null | 2021/05/22 06:38,801100 UT | 2021/05/22 06:39,401217 UT | 2021/05/22 06:39,401158 UT | 60.0070 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_28\2021-05-22-0639_4-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;108.645;255.000; 0.000; 19.172; 45.000; 0.000;101.994;255.000; 0.000; 6.276; 16.000; 0.000; 14.472;255.000; 0.000; 0.399; 7.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 209.7 CHII-342.3 CHII-3
0.0000 Low | 2021/05/22 06:42,038750 UT | 2021/05/22 06:43,038750 UT | 2021/05/22 06:42,538750 UT | 60.0000 s | 114.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_30\2021-05-22-0642_5-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;110.412;255.000; 0.000; 19.484; 45.000; 0.000;113.422;255.000; 0.000; 5.183; 46.000; 0.000; 17.240;255.000; 0.000; 0.407; 6.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 211.6 CHII-342.2 CHII-3
0.0763 Null | 2021/05/22 06:45,366600 UT | 2021/05/22 06:46,366817 UT | 2021/05/22 06:45,866808 UT | 60.0070 s | 111.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_33\2021-05-22-0645_8-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;110.331;255.000; 0.000; 6.490; 15.000; 0.000;89.704;255.000; 0.000; 5.078; 14.000; 0.000; 12.253;255.000; 0.000; 0.391; 4.000; 141.824; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 213.7 CHII-346.2 CHII-3
0.0000 Null | 2021/05/22 06:43,265816 UT | 2021/05/22 06:44,265816 UT | 2021/05/22 06:43,765816 UT | 60.0000 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_31\2021-05-22-0643_7-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;111.310;255.000; 0.000; 15.278; 35.000; 0.000;79.973;255.000; 0.000; 7.082; 23.000; 0.000; 14.654;255.000; 0.000; 0.347; 6.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 212.4 CHII-344.9 CHII-3
0.0000 Low | 2021/05/22 06:46,290813 UT | 2021/05/22 06:47,290813 UT | 2021/05/22 06:46,790816 UT | 60.0040 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_32\2021-05-22-0647_7-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;107.536;255.000; 0.000; 12.653; 30.000; 0.000;75.471;255.000; 0.000; 5.893; 20.000; 0.000; 15.631;255.000; 0.000; 0.366; 5.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 213.0 CHII-345.0 CHII-3
0.9999 Low (# 75) | 2021/05/22 06:46,704983 UT | 2021/05/22 06:47,705000 UT | 2021/05/22 06:47,204992 UT | 60.0010 s | 122.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_34\2021-05-22-0647_2-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;111.912;255.000; 0.000; 20.629; 47.000; 0.000;70.160;255.000; 0.000; 8.673; 20.000; 0.000; 19.221;255.000; 0.000; 0.454; 6.000; 174.485; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 214.5 CHII-347.0 CHII-3
1.5286 Low (# 342) | 2021/05/22 06:47,972700 UT | 2021/05/22 06:48,972800 UT | 2021/05/22 06:48,472791 UT | 60.0130 s | 123.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_35\2021-05-22-0648_4-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;111.710;255.000; 0.000; 22.342; 51.000; 0.000;63.247;255.000; 0.000; 7.340; 30.000; 0.000; 18.445;255.000; 0.000; 0.436; 6.000; 26.077; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 215.3 CHII-347.8 CHII-3
0.0000 Null | 2021/05/22 06:49,449500 UT | 2021/05/22 06:50,449500 UT | 2021/05/22 06:49,449474 UT | 60.0030 s | 126.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_36\2021-05-22-0649_6-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;112.820;255.000; 0.000; 23.406; 52.000; 0.000;69.128;255.000; 0.000; 7.083; 18.000; 0.000; 16.922;255.000; 0.000; 0.466; 7.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 216.0 CHII-348.5 CHII-3
0.0000 Null | 2021/05/22 06:50,183300 UT | 2021/05/22 06:51,183300 UT | 2021/05/22 06:50,683300 UT | 60.0000 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_37\2021-05-22-0650_8-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;105.862;255.000; 0.000; 19.094; 46.000; 0.000;97.222;255.000; 0.000; 7.223; 19.000; 0.000; 18.216;255.000; 0.000; 0.502; 7.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 216.6 CHII-349.1 CHII-3
0.0000 Null | 2021/05/22 06:51,213500 UT | 2021/05/22 06:52,213500 UT | 2021/05/22 06:51,713500 UT | 60.0010 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_38\2021-05-22-0651_7-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;114.221;255.000; 0.000; 17.468; 39.000; 0.000;92.516;255.000; 0.000; 5.921; 16.000; 0.000; 20.548;255.000; 0.000; 0.521; 5.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 217.2 CHII-349.7 CHII-3
0.0348 Null | 2021/05/22 06:52,241583 UT | 2021/05/22 06:53,241583 UT | 2021/05/22 06:52,741542 UT | 59.9950 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_39\2021-05-22-0652_7-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;106.173;255.000; 0.000; 17.918; 43.000; 0.000;86.225;255.000; 0.000; 10.340; 31.000; 0.000; 18.909;255.000; 0.000; 0.447; 6.000; 47.424; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 217.9 CHII-350.3 CHII-3
0.0000 Null | 2021/05/22 06:53,269984 UT | 2021/05/22 06:54,269980 UT | 2021/05/22 06:53,769916 UT | 60.0040 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_40\2021-05-22-0653_7-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;109.515;255.000; 0.000; 21.473; 50.000; 0.000;89.316;255.000; 0.000; 6.527; 21.000; 0.000; 17.554;255.000; 0.000; 0.484; 7.000; 9999.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 218.5 CHII-351.0 CHII-3
3.0440 Null | 2021/05/22 06:55,079813 UT | 2021/05/22 06:56,079813 UT | 2021/05/22 06:55,492658 UT | 41.7150 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_42\2021-05-22-0655_8-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;101.294;255.000; 0.000; 14.179; 31.000; 0.000;89.922;255.000; 0.000; 9.311; 20.000; 0.000; 16.401;255.000; 0.000; 0.311; 5.000; 0.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 219.7 CHII-352.2 CHII-3
0.0000 Null | 2021/05/22 06:56,015000 UT | 2021/05/22 06:57,015000 UT | 2021/05/22 06:56,015000 UT | 60.0000 s | 129.000 f/ps | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mm\F06_ZAO Jupiter_FCL26 @ 421LRW_43\2021-05-22-0656_8-IRW-imp.ser; Defect v3.4.0.20210518_v64 (Firecapture 2.6); Mini@or_@above_64b; 0.000;100.600;255.000; 0.000; 14.488; 36.000; 0.000;80.100;255.000; 0.000; 8.000; 13.000; 0.000; 11.018;255.000; 0.000; 0.310; 6.000; 0.000; ; ; ; ZAO AS1290W[C] IRW; Jupiter; 39.87; -2.36; 219.7 CHII-352.2 CHII-3

```

Impact flashes detection with DeTeCt software project /  
 Projet de détection de flash d'impacts avec le logiciel DeTeCt  
 by/par Marc Delcroix

NEW v3.4.0! [Software download / téléchargement du logiciel](#) for participating to the project / pour participer au projet  
 NEW! [DeTeCt quick user guide](#)

**Estimation des fréquences d'impact par DeTeCt (au of 24 mai 2021)**

**Jupiter:** ~12,6 impacts/an (109 observers ~165 000 videos ~174 jours de videos)

**Saturne:** <26,4 impacts /an (44 observers ~ 15 000 videos ~28 jours de videos)

estimation of 12.6 impacts per year (absolute number)  
 total excludes 10,236 days of simultaneous observations

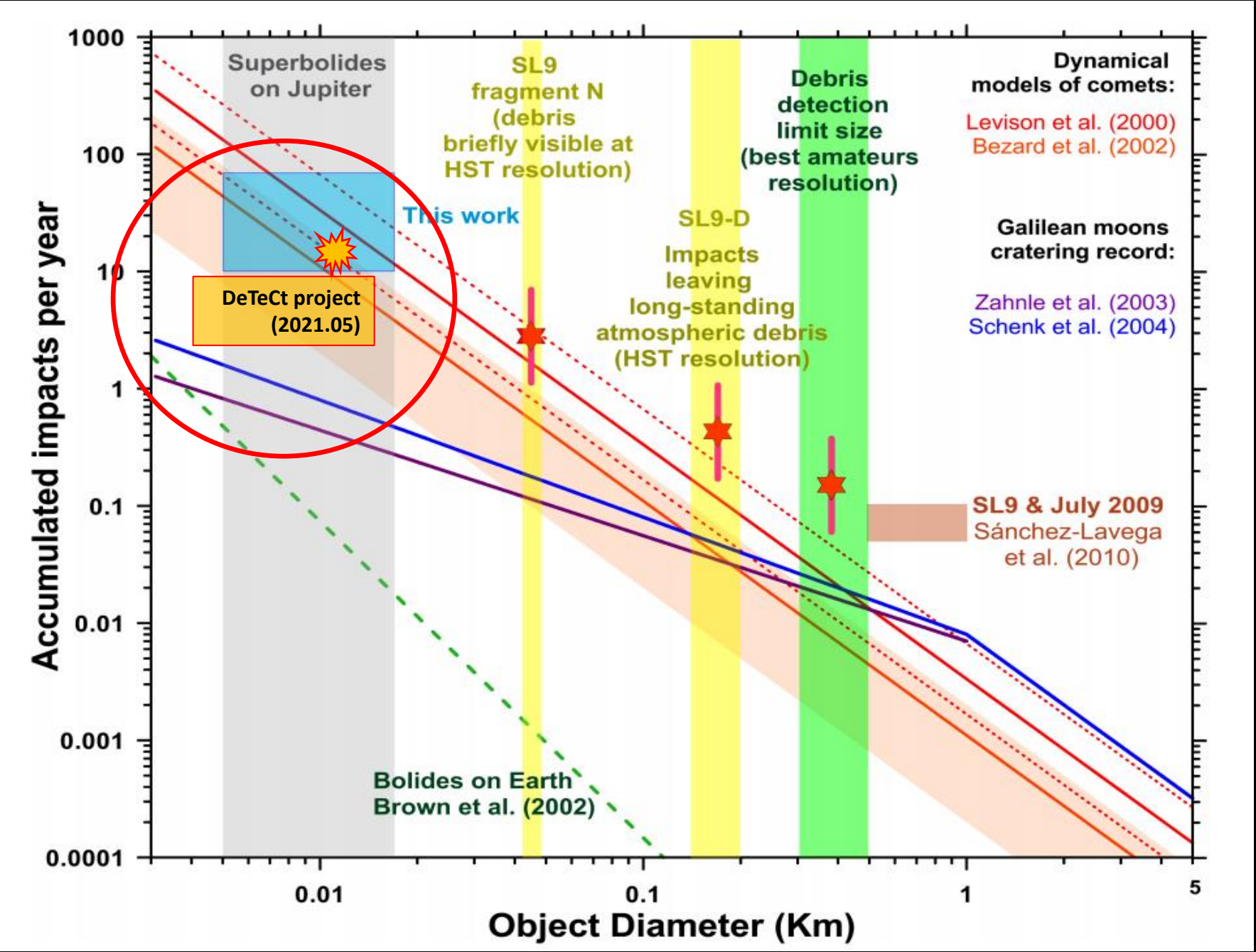
estimation of less than 26.4 impacts per year (absolute number)  
 total excludes 0,214 days of simultaneous observations

Observer	Duration	Number of videos	Date range
<b>Total : 109 observers</b>	<b>174.122 days</b>	<b>164620 videos</b>	<b>2003/04/18 - 2021/05/22</b>
Zac Pujic (Australia)	22.511 days	9081	2005/02/22 - 2020/09/04
Benito Loyola (USA)	20.164 days	21551	2018/02/17 - 2020/11/15
Michel Jacquesson (France)	19.773 days	10158	2014/03/12 - 2020/08/26
Paul Rolet (France)	16.245 days	13647	2012/09/07 - 2020/11/12
Clyde Foster (South Africa)	9.640 days	11752	2015/01/30 - 2021/04/27
Manos Kardasis (Greece)	9.606 days	8161	2004/02/29 - 2019/11/27
Niall Mac Neill (Australia)	5.708 days	6548	2016/05/19 - 2021/05/20
Sauveur Pedranghelu (France)	5.576 days	7063	2017/05/26 - 2020/12/03
Ethan Chappel (USA)	5.294 days	3863	2013/09/01 - 2020/12/15
Thomas Ashcraft (USA)	5.192 days	6538	2013/10/09 - 2020/10/17
Bernd Gaehrken (Germany)	4.707 days	6273	2016/03/06 - 2020/09/19
Jose Luis Pereira (Brazil)	4.195 days	5706	2019/01/30 - 2021/05/22
Alan Coffelt (USA)	4.011 days	2962	2013/10/04 - 2020/10/20
Marc Delcroix (France)	3.877 days	3010	2006/04/13 - 2020/11/18
Agapios Elia (Cyprus)	2.493 days	3037	2013/11/09 - 2020/08/19
Christophe Pellier (France)	2.374 days	906	2012/02/20 - 2019/07/28
Xavier Dupont (France)	2.062 days	1867	2012/08/16 - 2015/04/25
Hampton University Sayanagi Group (USA)	2.028 days	1543	2018/03/23 - 2019/03/29
Grant Blair (USA)	1.988 day	1874	2013/08/20 - 2016/04/21
Jean-Luc Dauvergne (France)	1.822 day	1607	2016/05/04 - 2020/08/17
Michel Miniou (France)	1.695 day	1533	2003/04/18 - 2020/07/20
Trevor Barry (Australia)	1.615 day	2425	2009/07/06 - 2012/12/30
Pascal Bayle (France)	1.494 day	1702	2012/11/30 - 2017/05/21
David Domine (France)	1.450 day	907	2016/02/25 - 2017/04/10
Pic du Midi (Colas/Delcroix/Dauvergne/Sylla) (France)	1.312 day	1907	2010/09/29 - 2019/08/16
Torsten Mellenthin (Germany)	1.218 day	1416	2016/01/28 - 2017/06/24
Lammertus de Vries (Spain)	1.171 day	635	2009/08/03 - 2015/05/08
Ioannis Bouhras (Greece)	1.164 day	1734	2015/12/24 - 2021/03/27
Jocelyn Serot (France)	1.154 day	880	2014/01/10 - 2019/06/02
Stephane Gonzales (France)	1.131 day	1243	2013/12/20 - 2018/06/03
Martin Lewis (UK)	1.020 day	1509	2015/03/22 - 2019/09/05
Matic Smrekar (Slovenia)	0.956 day	1648	2009/07/29 - 2019/06/10
Arnaud Claisse (France)	0.941 day	842	2014/01/19 - 2016/05/03
David Hamilton (Puerto Rico)	0.908 day	674	2020/07/02 - 2020/09/26
Steve Dean (New Zealand)	0.852 day	609	2020/07/09 - 2020/10/24
Oleg Zaharcuic (Moldova)	0.822 day	1120	2016/05/19 - 2020/08/30
Paul Jones (USA)	0.819 day	723	2011/08/29 - 2015/04/05
Philippe Chatelain (France)	0.810 day	60	2017/03/28 - 2019/08/02
Wellington Pereira Fonseca (Brazil)	0.786 day	604	2019/08/03 - 2021/05/20
Jean-Jacques Poupeau (France)	0.759 day	1143	2013/02/05 - 2016/03/23

Observer	Duration	Number of videos	Date range
<b>Total : 44 observers</b>	<b>27.652 days</b>	<b>14988 videos</b>	<b>2003/11/07 - 2021/05/22</b>
Zac Pujic (Australia)	5.252 days	2131	2005/02/04 - 2018/04/21
Sauveur Pedranghelu (France)	3.716 days	1033	2019/06/03 - 2020/11/30
Clyde Foster (South Africa)	3.419 days	3323	2015/04/06 - 2021/04/27
Marc Delcroix (France)	2.983 days	1186	2007/01/20 - 2020/08/18
Paul Rolet (France)	2.284 days	635	2015/05/12 - 2020/09/08
Ethan Chappel (USA)	1.970 day	1136	2013/07/30 - 2020/11/08
Manos Kardasis (Greece)	1.069 day	713	2008/03/10 - 2018/10/27
Oleg Zaharcuic (Moldova)	0.649 day	325	2016/05/22 - 2020/08/30
Michel Miniou (France)	0.636 day	474	2003/11/07 - 2019/12/04
Wellington Pereira Fonseca (Brazil)	0.604 day	306	2020/08/10 - 2021/05/20
Benito Loyola (USA)	0.497 day	567	2018/07/11 - 2019/07/30
Pic du Midi (Colas/Delcroix/Dauvergne/Sylla) (France)	0.454 day	434	2012/08/06 - 2019/08/15
Grant Blair (USA)	0.445 day	255	2014/03/14 - 2016/04/24
Niall Mac Neill (Australia)	0.424 day	414	2020/05/27 - 2021/05/19
Philippe Chatelain (France)	0.421 day	43	2017/05/21 - 2019/08/02
Ioannis Bouhras (Greece)	0.360 day	297	2019/09/03 - 2021/03/27
Jose Luis Pereira (Brazil)	0.274 day	267	2019/05/22 - 2021/05/22
Arnaud Claisse (France)	0.260 day	62	2015/05/21 - 2016/05/04
Isaac Lozano Rey (Spain)	0.225 day	176	2020/06/24 - 2020/10/16
Societe Astronomique de Touraine (France)	0.223 day	92	2014/03/14 - 2016/07/16
Christian Pinter (Austria)	0.195 day	16	2019/06/29 - 2020/09/24
Stephane Gonzales (France)	0.195 day	89	2015/05/23 - 2017/06/05
David Domine (France)	0.171 day	35	2016/04/23 - 2017/04/08
Alan Coffelt (USA)	0.167 day	62	2015/05/03 - 2020/08/09
Martin Lewis (UK)	0.167 day	169	2015/05/21 - 2019/07/28
David Olivos (Mexico)	0.107 day	84	2020/05/25 - 2020/10/24
Emmanuel Thiers (France)	0.095 day	34	2016/05/06 - 2016/06/18
Matic Smrekar (Slovenia)	0.092 day	88	2011/06/27 - 2019/05/08
Denis Huber (France)	0.080 day	63	2019/07/20 - 2020/08/27
Charles Galdies (Malta)	0.078 day	82	2014/06/08 - 2015/07/17
Philipp Salzgeber (Austria)	0.072 day	55	2017/06/10 - 2020/08/08
Viamir da Silva Junior (Brazil)	0.064 day	53	2021/03/29 - 2021/05/04
Charles Triana (Colombia)	0.064 day	96	2017/08/10 - 2019/08/19
Blake Estes (USA)	0.055 day	79	2016/05/08 - 2016/05/13
Lee Keith (USA)	0.035 day	20	2020/07/25 - 2020/08/19
Michel Jacquesson (France)	0.031 day	4	2019/09/03 - 2019/09/04
Troy Tranter (Australia)	0.026 day	19	2019/08/03 - 2020/08/28
Adrien Marezac (France)	0.022 day	18	2017/06/11 - 2017/06/11
Garry Dymond (Canada)	0.017 day	20	2020/08/17 - 2020/09/08
Armando Vaccaro (Italy)	0.011 day	5	2020/08/08 - 2020/08/08

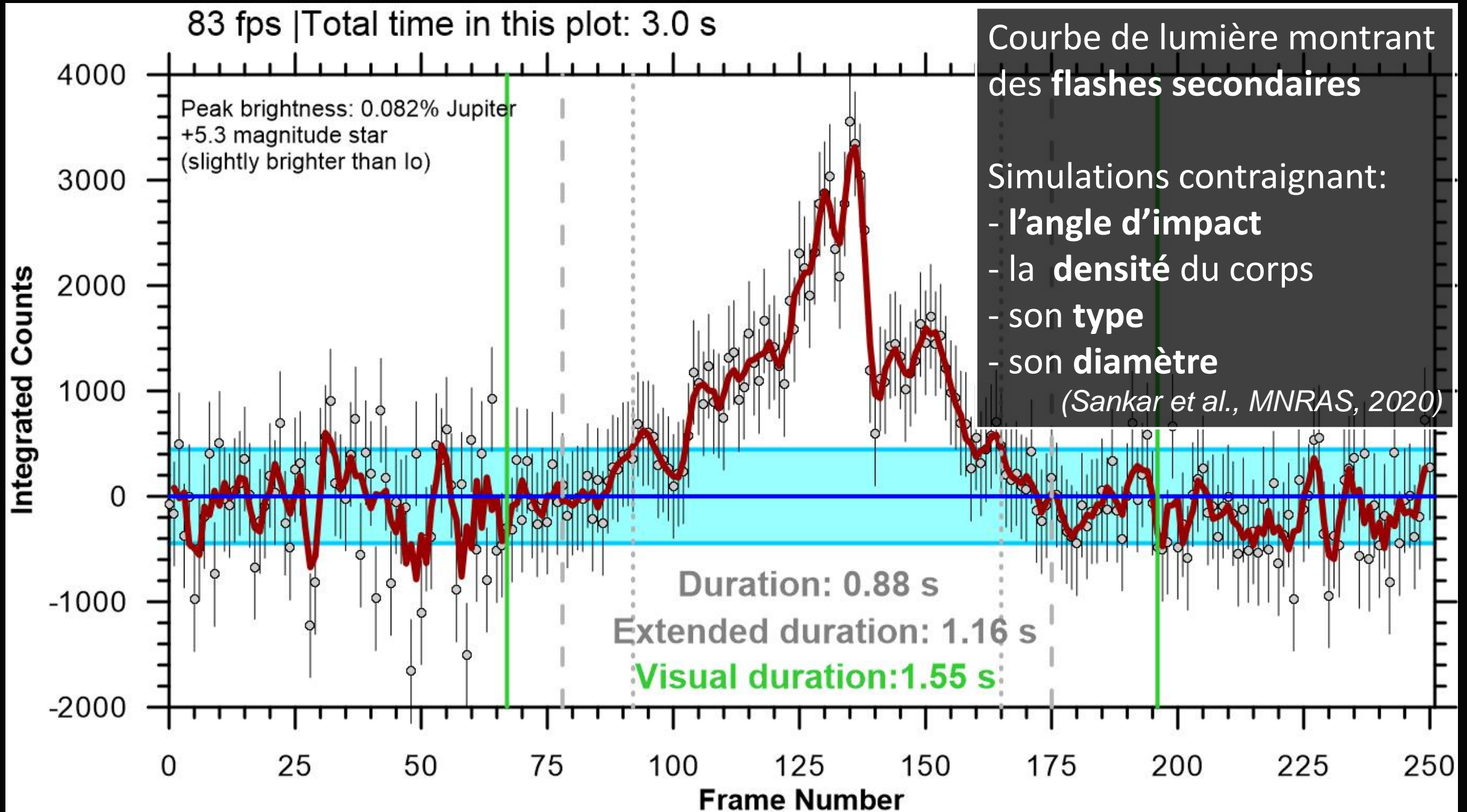


**~13 impacts/an sur Jupiter, cohérent avec les estimations précédentes**  
*(Hueso et al., A&A, 2018)*

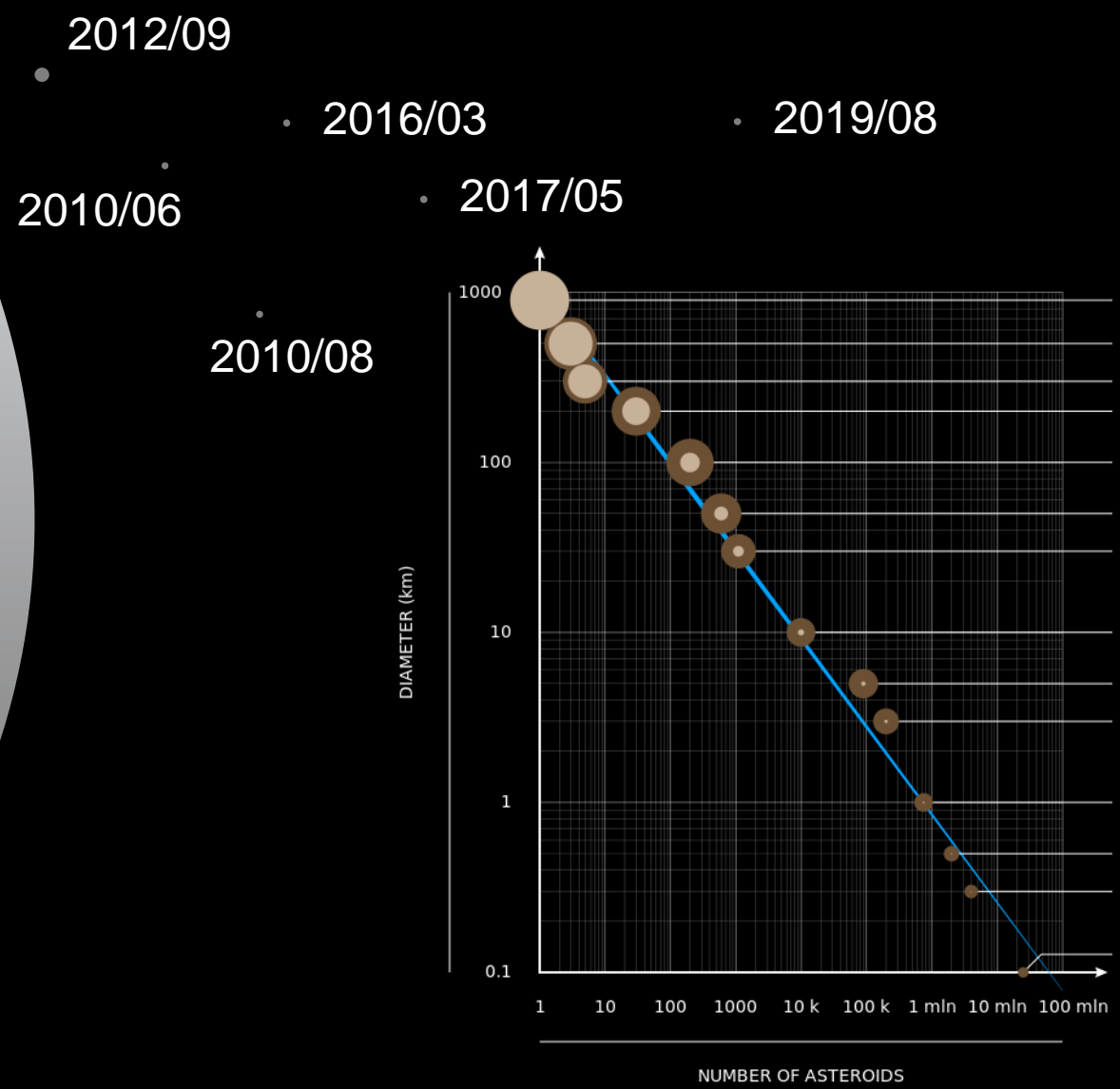
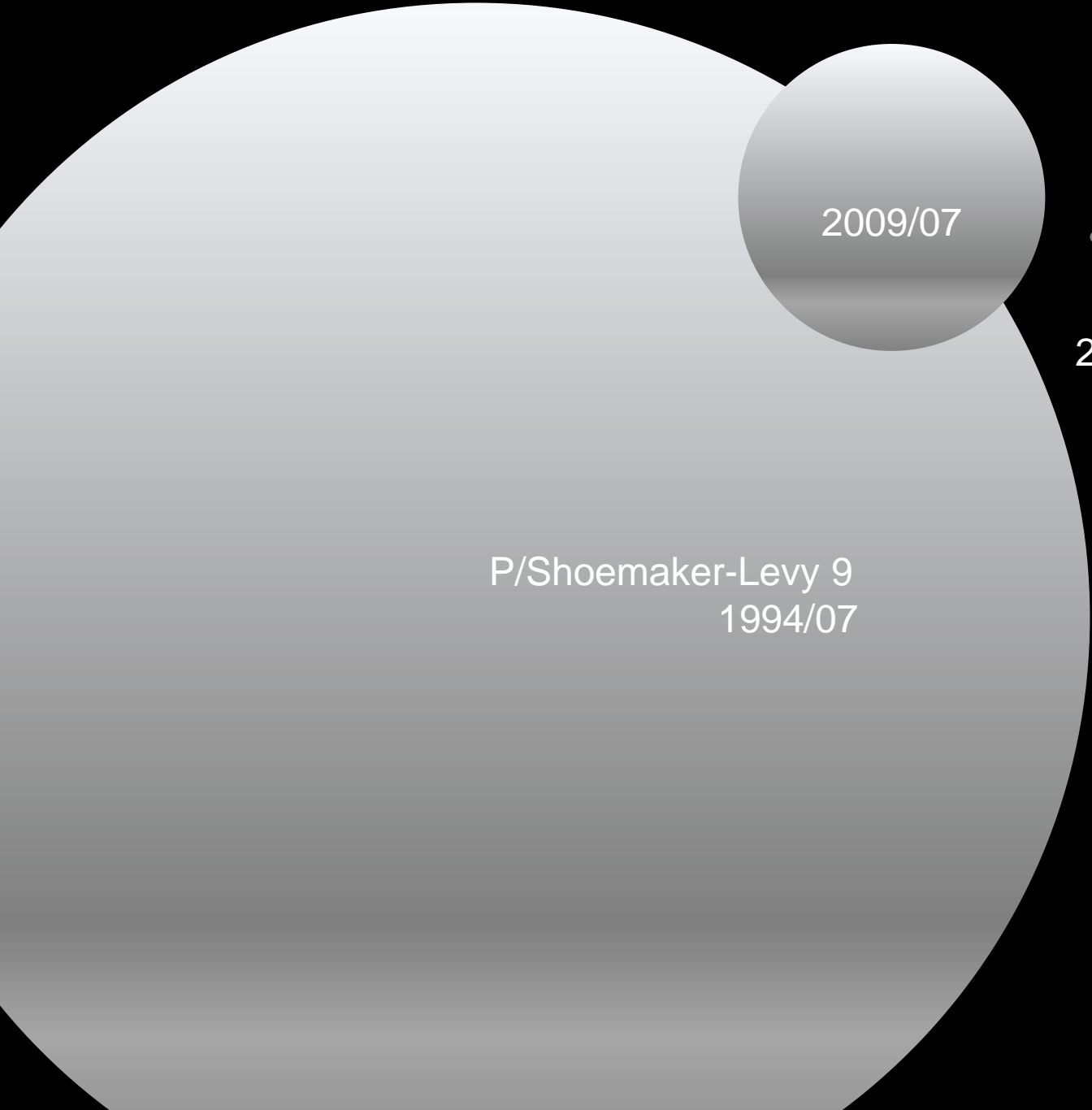


**Dynamical models of comets:**  
 Levison et al. (2000)  
 Bezaud et al. (2002)

**Galilean moons cratering record:**  
 Zahnle et al. (2003)  
 Schenk et al. (2004)



Tailles variables des corps impactants  
(plus petits que grands)



Et sur Saturne ?

Traces observées par Cassini dans les anneaux en 2005, 2009, 2012  
Taille de l'ordre du cm – m

software project /  
avec le logiciel DeTeCT

participating to the project / pour participer au projet  
guide  
3. BAA workshop

DeTeCT

computing power, storage, etc. Thanks a lot if you want to support this!



**Saturn**  
estimation of less than 26.4 impacts per year (absolute number)  
total excludes 0,214 days of simultaneous observations

Observer	Duration	Number of videos	Date range
<b>Total : 44 observers</b>	<b>27,652 days</b>	<b>1 4988 videos</b>	<b>2003/11/07 - 2021/05/22</b>
Zac Puij (Australia)	5.252 days	2131	2005/02/04 - 2018/04/21
Sauveur Pedranghelt (France)	3.716 days	1033	2019/06/03 - 2020/11/30
Clyde Foster (South Africa)	3.419 days	3323	2015/04/06 - 2021/04/27
Marc Delcroix (France)	2.983 days	1186	2007/01/20 - 2020/08/18
Paul Rolet (France)	2.264 days	635	2015/05/12 - 2020/09/08
Ethan Chappel (USA)	1.970 day	1138	2013/07/30 - 2020/11/08
Manos Kandas (Greece)	1.869 day	713	2008/03/10 - 2018/10/27
Oleg Zaharcic (Moldova)	0.649 day	325	2016/05/22 - 2020/08/30
Michel Miniou (France)	0.638 day	474	2003/11/07 - 2019/12/04
Wellington Pereira Fonseca (Brazil)	0.604 day	308	2020/06/10 - 2021/05/20
Benito Loyola (USA)	0.497 day	567	2018/07/11 - 2019/07/30
Pic du Midi (Colas/Delcroix/Dauvergne/Sylla) (France)	0.454 day	434	2012/08/06 - 2019/08/15
Grant Blair (USA)	0.445 day	255	2014/03/14 - 2018/04/24
Niall MacNeill (Australia)	0.424 day	414	2020/05/27 - 2021/05/19
Philippe Chatelain (France)	0.421 day	43	2017/05/21 - 2019/08/02
Ioannis Bouhras (Greece)	0.360 day	297	2019/09/03 - 2021/03/27
Jose Luis Pereira (Brazil)	0.274 day	267	2019/05/22 - 2021/05/22
Arnaud Claisse (France)	0.260 day	62	2015/05/21 - 2016/05/04
Isaac Lozano Rey (Spain)	0.225 day	178	2020/06/24 - 2020/10/16
Societe Astronomique de Touraine (France)	0.221 day	92	2014/03/14 - 2018/07/16
Christian Pinter (Austria)	0.195 day	16	2019/06/29 - 2020/09/24
Stephane Gonzales (France)	0.195 day	89	2015/05/23 - 2017/06/05
David Domine (France)	0.171 day	35	2016/04/23 - 2017/04/08
Alan Coffelt (USA)	0.167 day	62	2015/05/03 - 2020/08/09
Martin Lewis (UK)	0.167 day	169	2015/05/21 - 2019/07/28
David Olivos (Mexico)	0.107 day	84	2020/05/25 - 2020/10/24
Emmanuel Thiers (France)	0.095 day	34	2016/05/06 - 2016/08/18
Matic Smrekar (Slovenia)	0.092 day	88	2011/06/27 - 2019/05/08
Denis Huber (France)	0.080 day	63	2019/07/20 - 2020/08/27
Charles Galdies (Malta)	0.078 day	82	2014/06/08 - 2015/07/17
Philipp Salzgeber (Austria)	0.072 day	55	2017/06/10 - 2020/08/08
Viamir da Silva Junior (Brazil)	0.064 day	53	2021/03/29 - 2021/05/04
Charles Triana (Colombia)	0.054 day	96	2017/08/10 - 2019/03/19
Blake Estes (USA)	0.055 day	79	2016/05/08 - 2016/05/13
Lee Keith (USA)	0.036 day	20	2020/07/25 - 2020/08/19
Michel Jacquesson (France)	0.031 day	4	2019/09/03 - 2019/09/04
Troy Tranter (Australia)	0.026 day	19	2019/08/03 - 2020/08/28
Adrien Marezac (France)	0.022 day	18	2017/06/11 - 2017/06/11
Garry Dymond (Canada)	0.017 day	20	2020/08/17 - 2020/08/08
...	...	...	...

*Chaleureux remerciements à la centaine de participants au projet !*



*Rejoignez nous!*



# A retenir

- ✓ Projet de **collaboration pro-am** avec de **nombreux participants**, **mené** depuis plusieurs années par un **amateur Français** ;)
  - ✓ **Impact détecté** grâce au logiciel
  
  - ✓ **Des résultats scientifiques:**
    - La **fréquence** d'impacts est **cohérente** avec d'autres travaux
    - Les observations permettent de **remonter aux caractéristiques des corps** impactants
  
  - ✓ Participation facile et utile, rendez-vous sur [http://www.astrosurf.com/planetessaf/doc/project\\_detect.php](http://www.astrosurf.com/planetessaf/doc/project_detect.php)