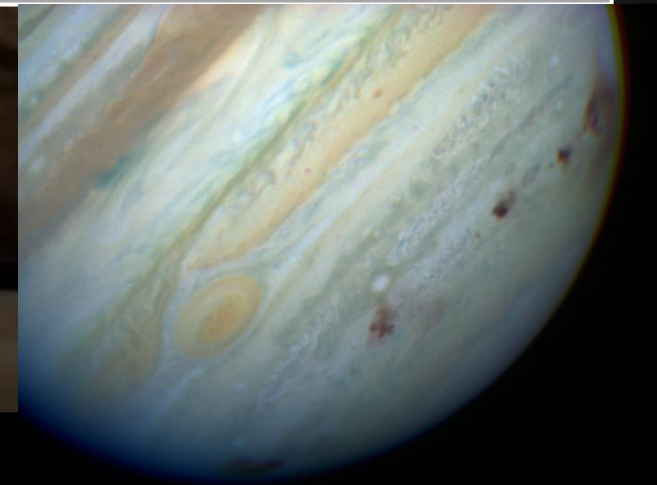




Detecting impacts in Jupiter
with amateur equipment and the DeTeCt software

**Marc
Delcroix**

[\(delcroix.marc@free.fr\)](mailto:delcroix.marc@free.fr)
Planetary observations section director
Société Astronomique de France

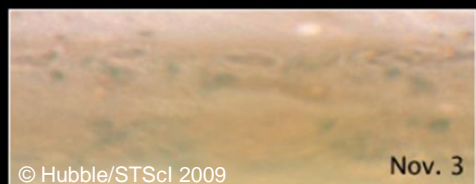
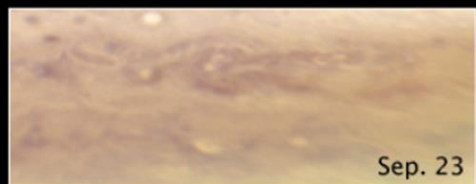


Impacts

Project

Scientific results

Conclusion



2009.07.19



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

Jul. 19, 2009:

impact trace discovered by amateur A. Wesley
~500m body, impact not seen live

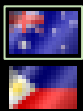
Impacts

Project

Scientific results

Conclusion

2010.06.03



(c) A. Wesley

2010.08.20



(c) K. Aoki

2012.10.09



(c) G. Hall

2016.03.17



(c) J. MacKeon

2017.05.26



(c) S. Pedranghelu

DeTeCt is a project and a software for:

- Helping amateurs to **discover impact flashes** on their Jupiter and Saturn videos
- **Estimating impact frequency**, by collecting results (either positive or négative) of analysis made with the software

(Hueso et al., A&A, 2013)

DeTeCt v3.7.2.20230602_x64 Analysis of Jupiter/Saturn videos to find impact flashes

File Settings Help

Folder/file selection and process automation
 auto processing auto exit when processed auto shutdown PC after exit
 Max instances: 10/12

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:
 AS! session
 dark file
 7 acquisitions with high probability impacts
 4 acquisitions with low probability impacts
 1 acquisition without any impact
 CHECK and SEND the RESULTS to: delcroix.marc@free.fr NO DETECTION also MATTERS!
 Date from:
 acquisition log
 SER
 timestamps
 FITS
 file date info

Progress
 Duration processed (total): 568s
 Total (12/12)
 File

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

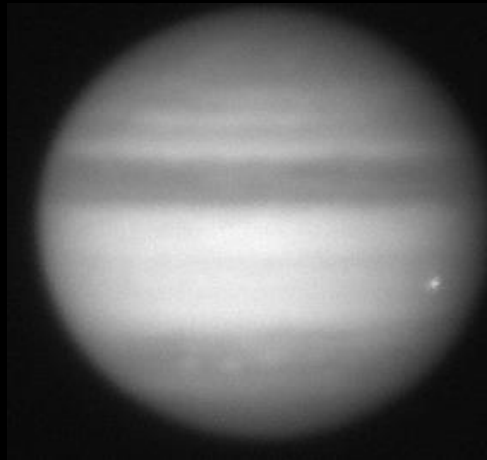
```

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 - =====
  
```

Two methods for detecting flashes:

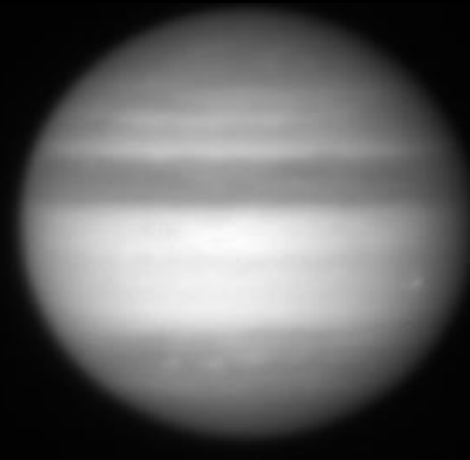
- through **differential photometry** between video frames
- through **detection images** to be analysed

© C. Go 2010/06
processing M. Delcroix



MAX

-



AVERAGE

=

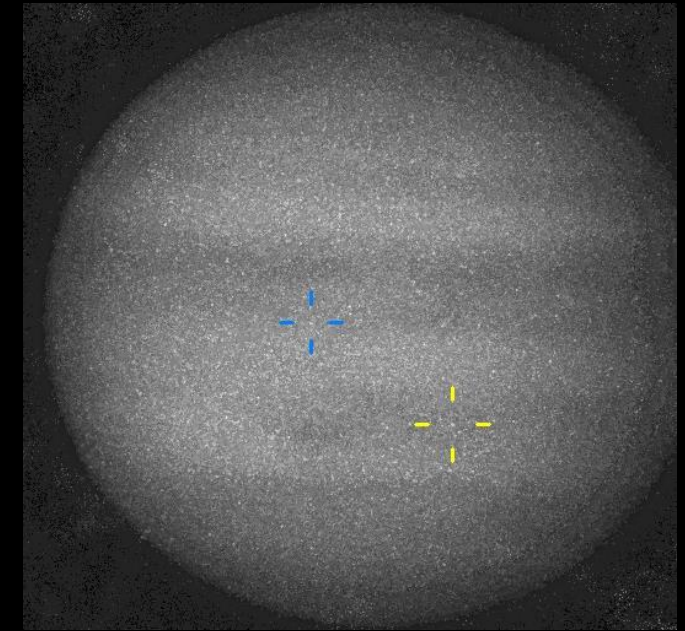


DETECTION IMAGE

All available information from videos, acquisition and processing software are used to characterize observations

Amateur astronomer analyse himself his videos, and send his results to the project for confirmation and to be taken into account

Consolidation and analysis of contributions enable impact frequency estimation



```
DeTeCt_jupiter_20210522_0634-0655_impact_detection_run@2021-05-22_04-37-57.log - Bloc-notes
[DeTeCt] Jovian impact detection software DeTeCt v3.4.0.20210518_x64
PLI458 SEND THIS FILE to Marc Delcroix - delcroix.mar@free.fr - for work on impact frequency (participants will be named if work is published) - NO DETECTION MATTERS!
confidence Rating | Start | End | Mid | DeTeCt 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 06:35,785184 UT | 2021/05/22 06:35,285400 UT | 2021/05/22 06:35,285400 UT | 60.0020 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_26\2021-05-22-0635_2-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 207.2 CH11-339.8 CH11-3
0.0000 Null | 2021/05/22 06:40,997767 UT | 2021/05/22 06:41,997767 UT | 2021/05/22 06:41,497817 UT | 2021/05/22 06:41,497817 UT | 60.0000 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_27\2021-05-22-0641_4-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;112.751;255.000; 0.000; 18.111; 41.000; 0.000;111.694;255.000; 0.000; 5.277; 12.000; 0.000; 22.441;255.000; 0.000; 0.440; 5.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 211.0 CH11-341.5 CH11-3
0.0000 Null | 2021/05/22 06:35,813283 UT | 2021/05/22 06:36,813550 UT | 2021/05/22 06:36,313550 UT | 2021/05/22 06:36,313550 UT | 60.0080 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_27\2021-05-22-0636_3-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;107.082;255.000; 0.000; 20.997; 50.000; 0.000;106.492;255.000; 0.000; 6.712; 18.000; 0.000; 18.520;255.000; 0.000; 0.510; 7.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 207.8 CH11-342.3 CH11-3
0.0000 Null | 2021/05/22 06:38,801100 UT | 2021/05/22 06:39,801217 UT | 2021/05/22 06:39,401158 UT | 2021/05/22 06:39,401158 UT | 60.0070 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_28\2021-05-22-0639_4-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 209.7 CH11-342.3 CH11-3
0.0000 Low | 2021/05/22 06:42,038750 UT | 2021/05/22 06:43,038750 UT | 2021/05/22 06:42,538750 UT | 2021/05/22 06:42,538750 UT | 60.0000 s | 114.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_30\2021-05-22-0642_5-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;110.412;255.000; 0.000; 19.484; 45.000; 0.000;113.422;255.000; 0.000; 6.183; 46.000; 0.000; 17.240;255.000; 0.000; 0.407; 6.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 211.6 CH11-342.2 CH11-3
0.0763 Null | 2021/05/22 06:45,366600 UT | 2021/05/22 06:46,366517 UT | 2021/05/22 06:45,866518 UT | 2021/05/22 06:45,866518 UT | 60.0070 s | 111.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_33\2021-05-22-0645_8-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 213.7 CH11-346.2 CH11-3
0.0000 Null | 2021/05/22 06:43,265816 UT | 2021/05/22 06:44,265816 UT | 2021/05/22 06:43,765816 UT | 2021/05/22 06:43,765816 UT | 60.0000 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_31\2021-05-22-0643_7-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 212.4 CH11-344.9 CH11-3
0.0000 Low | 2021/05/22 06:44,290883 UT | 2021/05/22 06:45,290883 UT | 2021/05/22 06:44,790884 UT | 2021/05/22 06:44,790884 UT | 60.0040 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_32\2021-05-22-0644_7-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 213.0 CH11-345.5 CH11-3
0.9999 Low (# 775) | 2021/05/22 06:46,704983 UT | 2021/05/22 06:47,705000 UT | 2021/05/22 06:47,204992 UT | 2021/05/22 06:47,204992 UT | 60.0010 s | 122.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_34\2021-05-22-0647_2-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;111.912;255.000; 0.000; 20.629; 47.000; 0.000;77.160;255.000; 0.000; 8.673; 20.000; 0.000; 19.221;255.000; 0.000; 0.454; 6.000; 174.485; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 214.5 CH11-347.0 CH11-3
1.5286 Low (# 342) | 2021/05/22 06:47,172700 UT | 2021/05/22 06:48,172700 UT | 2021/05/22 06:48,472701 UT | 2021/05/22 06:48,472701 UT | 60.0130 s | 123.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_35\2021-05-22-0648_4-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;113.710;255.000; 0.000; 22.342; 51.000; 0.000;83.247;255.000; 0.000; 7.340; 31.000; 0.000; 18.442;255.000; 0.000; 0.436; 6.000; 26.077; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 215.3 CH11-347.8 CH11-3
0.0000 Null | 2021/05/22 06:49,449550 UT | 2021/05/22 06:50,449550 UT | 2021/05/22 06:49,449474 UT | 2021/05/22 06:49,449474 UT | 60.0030 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_36\2021-05-22-0649_6-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;112.820;255.000; 0.000; 23.000; 52.000; 0.000;91.120;255.000; 0.000; 7.083; 18.000; 0.000; 16.922;255.000; 0.000; 0.466; 7.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 216.0 CH11-348.5 CH11-3
0.0000 Null | 2021/05/22 06:50,183300 UT | 2021/05/22 06:51,183300 UT | 2021/05/22 06:50,683300 UT | 2021/05/22 06:50,683300 UT | 60.0000 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_37\2021-05-22-0650_8-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 216.6 CH11-349.1 CH11-3
0.0000 Null | 2021/05/22 06:51,213550 UT | 2021/05/22 06:52,213550 UT | 2021/05/22 06:51,713544 UT | 2021/05/22 06:51,713544 UT | 60.0010 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_38\2021-05-22-0651_7-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;114.221;255.000; 0.000; 17.468; 39.000; 0.000;92.516;255.000; 0.000; 5.931; 16.000; 0.000; 20.580;255.000; 0.000; 0.523; 5.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 217.2 CH11-349.7 CH11-3
0.0348 Null | 2021/05/22 06:52,241583 UT | 2021/05/22 06:53,241583 UT | 2021/05/22 06:52,741542 UT | 2021/05/22 06:52,741542 UT | 59.9950 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_39\2021-05-22-0652_7-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;106.723;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; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 217.9 CH11-350.3 CH11-3
0.0000 Null | 2021/05/22 06:53,269984 UT | 2021/05/22 06:54,269980 UT | 2021/05/22 06:53,769916 UT | 2021/05/22 06:53,769916 UT | 60.0040 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_40\2021-05-22-0653_7-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;109.515;255.000; 0.000; 21.473; 50.000; 0.000;89.322;255.000; 0.000; 8.527; 21.000; 0.000; 17.554;255.000; 0.000; 0.484; 7.000; 9999.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 218.5 CH11-351.0 CH11-3
0.0000 Null | 2021/05/22 06:55,479613 UT | 2021/05/22 06:56,479283 UT | 2021/05/22 06:55,979256 UT | 2021/05/22 06:55,979256 UT | 61.7150 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_43\2021-05-22-0655_8-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;101.294;255.000; 0.000; 14.179; 31.000; 0.000;89.102;255.000; 0.000; 9.311; 20.000; 0.000; 16.401;255.000; 0.000; 0.311; 5.000; 0.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 219.7 CH11-352.2 CH11-3
0.0000 Null | 2021/05/22 06:56,015000 UT | 2021/05/22 06:56,015000 UT | 2021/05/22 06:56,015000 UT | 2021/05/22 06:56,015000 UT | 60.0000 s | 129.0000 ffr/s | D:\ASTRONOMIA - CAPTURAS\2021-05-22_275mmEQ6 ZMO Jupiter FC126 # 421IRVW_43\2021-05-22-0656_8-IRVW-imp.ser; DeTeCt v3.4.0.20210518_x64 (Firecapture 2.6); Mini8(or.above).64b; 0.000;100.600;255.000; 0.000; 14.488; 36.000; 0.000;88.102;255.000; 0.000; 8.000; 13.000; 0.000; 14.000;255.000; 0.000; 0.310; 6.000; 0.000; ; ; ZMO AS12900C; IRVW; Jupiter; 39.87; -2.36; 219.7 CH11-352.2 CH11-3
```

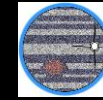
Impacts

Project

Scientific results

Conclusion

2019.08.17



*discovered by
DeTeCt*



(c) E. Chappel

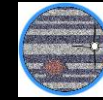
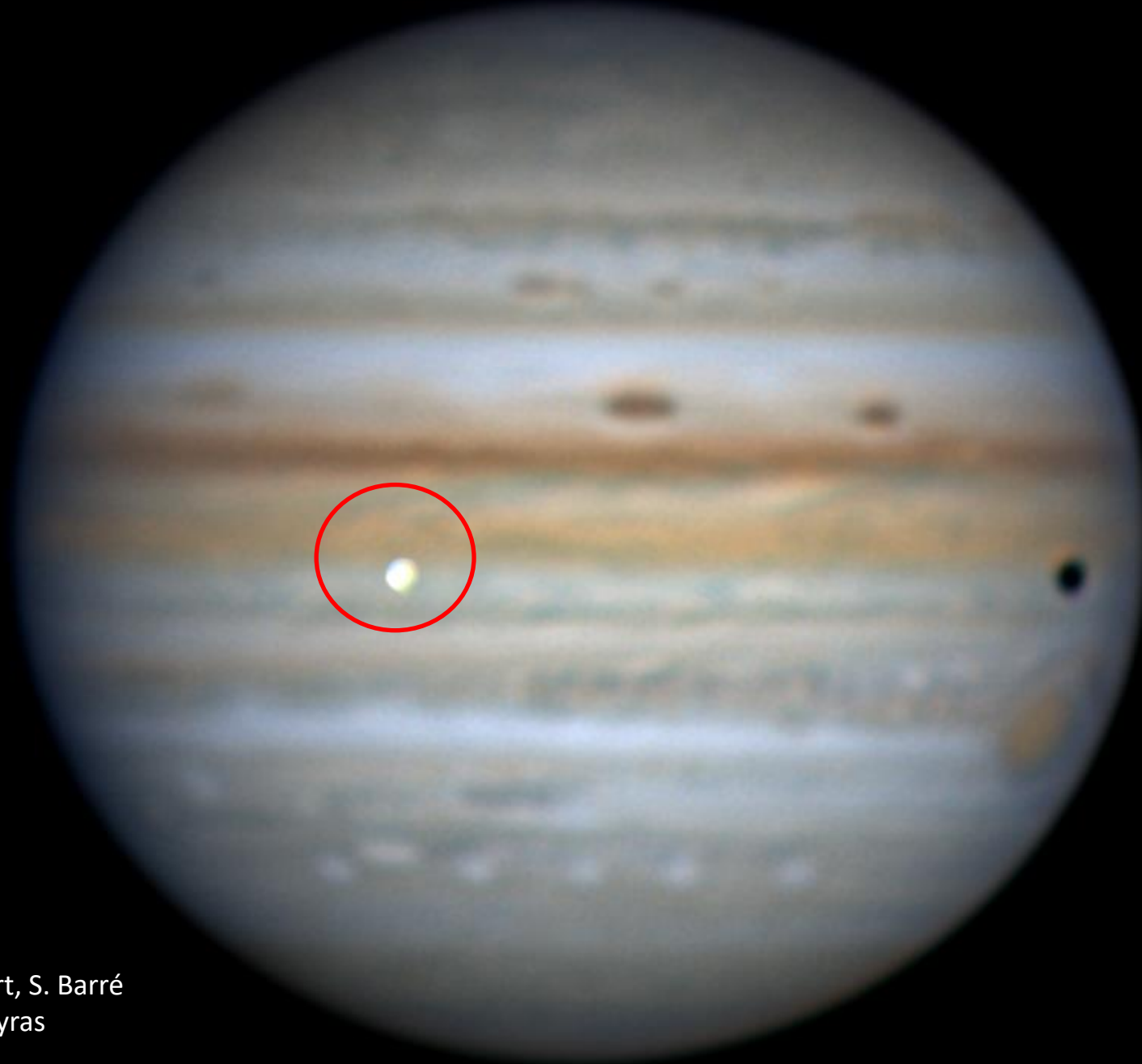
Impacts

Project

Scientific results

Conclusion

2021.09.13



Confirmed by
DeTeCt

(c) D. Wallang, T. Humbert, S. Barré
A. Desmougin, AstroQueyras

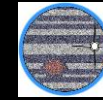
Impacts

Project

Scientific results

Conclusion

2021.10.15



*confirmed by
DeTeCt*

(c) V. PS Ang

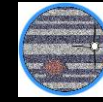
Impacts

Project

Scientific results

Conclusion

2020.08.11



*Discovered by
DeTeCt*



(c) V. PS Ang

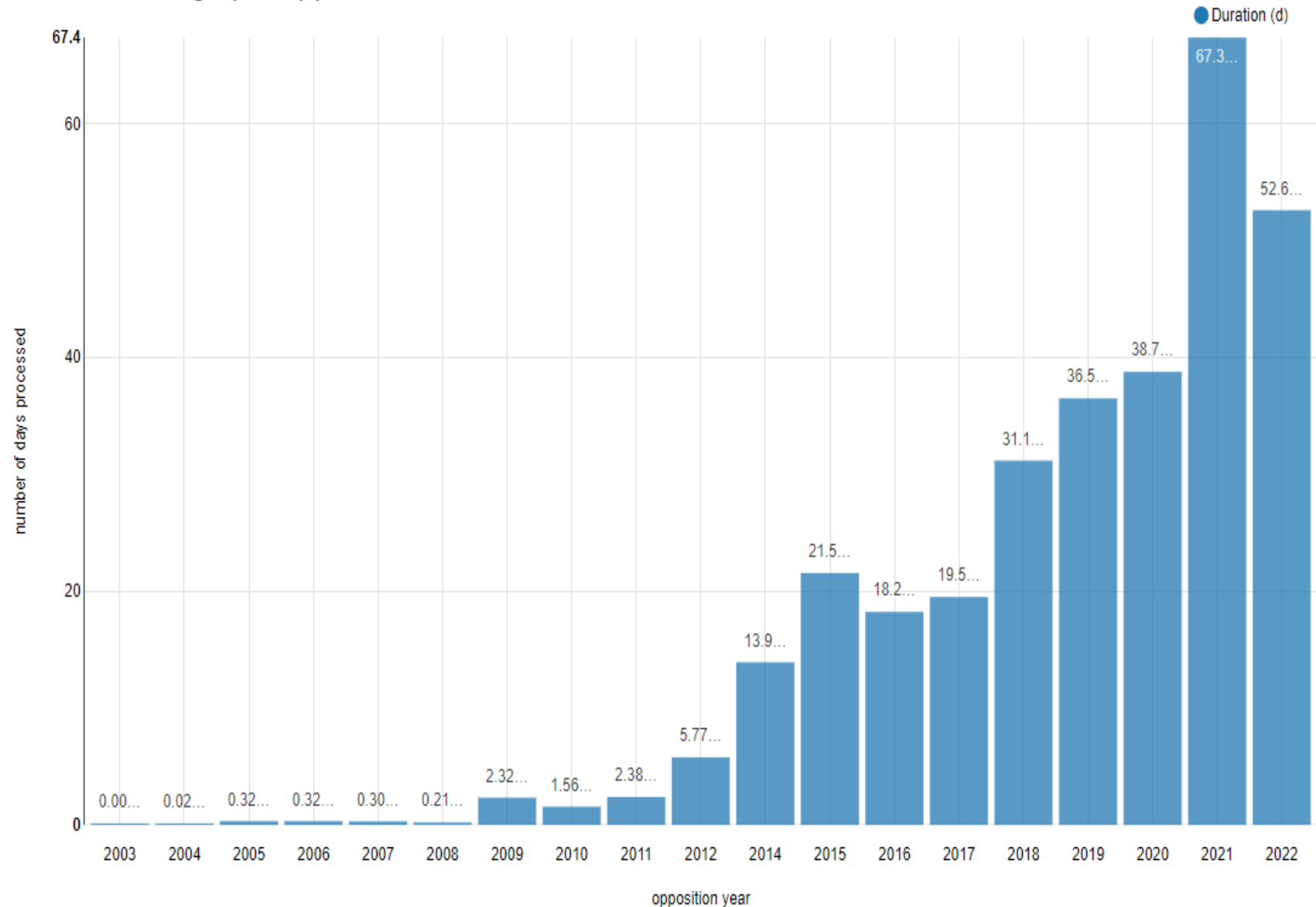
Increasing participation stimulated :

- since 2019 by DeTeCt discovery of 2019.08.07 flash by Ethan Chappel

- since 2021 by Gemini price and a posteriori discovery of a 2020.08.11 flash by Victor PS Ang

(Delcroix et al., in work)

DeTeCt usage per apparition



Impacts

Project

Scientific results

Conclusion

2 monitored
planets



2 impact flashes discovered

Project running for **10** years

19 opposition years
studied

17 articles and conferences
185 participants presentations

350 full days of
observations

from **21** countries

27 000 lines of code

315 000 analysed videos

Impact flashes detection project with DeTeCt software /
 Projet de détection de flash d'impacts avec le logiciel DeTeCt [Marc Delcroix](#)



[Software download / téléchargement du logiciel](#) (self updating)
[DeTeCt quick user guide](#), [Presentation of the project](#) (EPSC2013, BAA workshop)
NEW! [Presentation du projet, \(vidéo\)](#) (Journées SF2A, prix Gemini 2021)

email address for distribution list to stay tuned & discuss about impact detection & DeTeCt

Subscribe

Wanna help me developing DeTeCt/running the project (takes a lot of my private time, computing power, storage, ...) ? That

Donate



Jupiter

estimation of 18,5 impacts per year*
 (total includes 48,101 days - 16,3% - of simultaneous observations)
 *absolute impact rate on all Jupiter globe - different from the impact rate observable from Earth

Observer	Duration	Number of videos	Date range
Total : 182 observers	295.887 days	280151 videos	2000/08/21 - 2023/06/10
Michel Jacquesson (#7) (France)	29.774 days	14314	2014/03/12 - 2023/01/02
Zac Pujic (Australia)	26.896 days	10872	2008/02/22 - 2022/08/15
Benito Loyola (USA)	24.238 days	27027	2018/02/17 - 2022/12/30
Paul Rolet (France)	20.591 days	18019	2012/09/07 - 2023/02/14
Manos Kardasis (Greece)	14.383 days	13040	2004/02/29 - 2023/03/04
Clyde Foster (South Africa)	14.032 days	16888	2015/01/30 - 2023/02/17
Jose Luis Pereira (#7) (Brazil)	10.527 days	14817	2008/08/28 - 2023/08/08
Sauveur Pedranghelu (#5) (France)	8.070 days	9844	2017/05/28 - 2021/09/30
Bernd Gaehrken (Germany)	7.706 days	9008	2018/03/08 - 2022/11/26
Andy Casely (Australia)	7.705 days	12203	2018/02/23 - 2023/05/23
Ethan Chappel (#6) (USA)	7.567 days	5170	2013/08/31 - 2022/11/30
Isaac Lozano Rey (Spain)	7.142 days	7638	2020/08/01 - 2023/01/06
Jean-Luc Dauvergne (France)	7.121 days	5751	2018/05/04 - 2022/09/20
Niall Mac Neill (Australia)	6.669 days	7810	2018/05/19 - 2022/08/21
Thomas Ashcraft (USA)	5.025 days	6497	2013/12/18 - 2020/10/17
Alan Coffelt (USA)	4.579 days	3437	2013/10/04 - 2022/10/15
Marc Delcroix (France)	4.085 days	3215	2008/04/13 - 2022/08/28
Thierry Garrel (France)	3.869 days	8523	2021/08/12 - 2022/12/10
Ioannis Bouhras (Greece)	3.374 days	5520	2015/12/24 - 2022/11/03
Philippe Chatelain (France)	3.374 days	1557	2000/08/21 - 2022/11/09
Agapios Elia (Cyprus)	3.013 days	3790	2013/11/09 - 2022/10/27
Alexandros Frantzis (Greece)	2.713 days	3842	2021/11/15 - 2023/02/24
Christophe Pellier (France)	2.576 days	962	2012/02/20 - 2021/10/22
Vlaminir da Silva Junior (Brazil)	2.510 days	2853	2021/03/29 - 2022/12/10
Zsolt Kereszty (Hungary)	2.263 days	558	2021/10/18 - 2022/09/07
Xavier Dupont (France)	2.061 days	1888	2012/08/18 - 2015/04/25
Wellington Pereira Fonseca (Brazil)	2.033 days	1502	2019/08/03 - 2021/12/21
Hampton University Sayanagi Group (USA)	2.028 days	1543	2018/03/23 - 2019/03/29
Grant Blair (USA)	2.010 days	1888	2013/08/20 - 2022/08/04
Mario Rana (USA)	1.987 day	2781	2021/08/19 - 2023/02/07
Michel Mahe (France)	1.986 day	2227	2018/03/22 - 2023/02/18
Armando Vaccaro (Italy)	1.901 day	2488	2014/01/08 - 2023/02/15
Michel Miniou (France)	1.697 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
Jocelyn Serot (France)	1.455 day	1089	2014/01/10 - 2023/01/02
David Domine (France)	1.450 day	907	2018/02/25 - 2017/04/10
Christian Viladrich (France)	1.351 day	812	2010/08/22 - 2022/10/15
Jean-Paul Oger (France)	1.346 day	782	2021/07/17 - 2022/10/12
Lee Keith (USA)	1.331 day	1882	2019/08/14 - 2022/11/25
Obs. du Pic du Midi (Colas/Delcroix/Dauvergne/Sylla) (France)	1.314 day	1934	2010/09/29 - 2019/08/16
Oleg Zaharcu (Moldova)	1.303 day	1803	2018/05/19 - 2022/11/12
Simon Walsh (Netherlands)	1.302 day	1184	2020/11/21 - 2022/12/26
Lucas Magalhaes (Brazil)	1.258 day	1444	2021/08/25 - 2022/10/19
Torsten Mellenthin (Germany)	1.218 day	1418	2018/01/28 - 2017/08/24
Lammertus de Vries (Spain)	1.171 day	835	2009/03/03 - 2015/05/08

Saturn

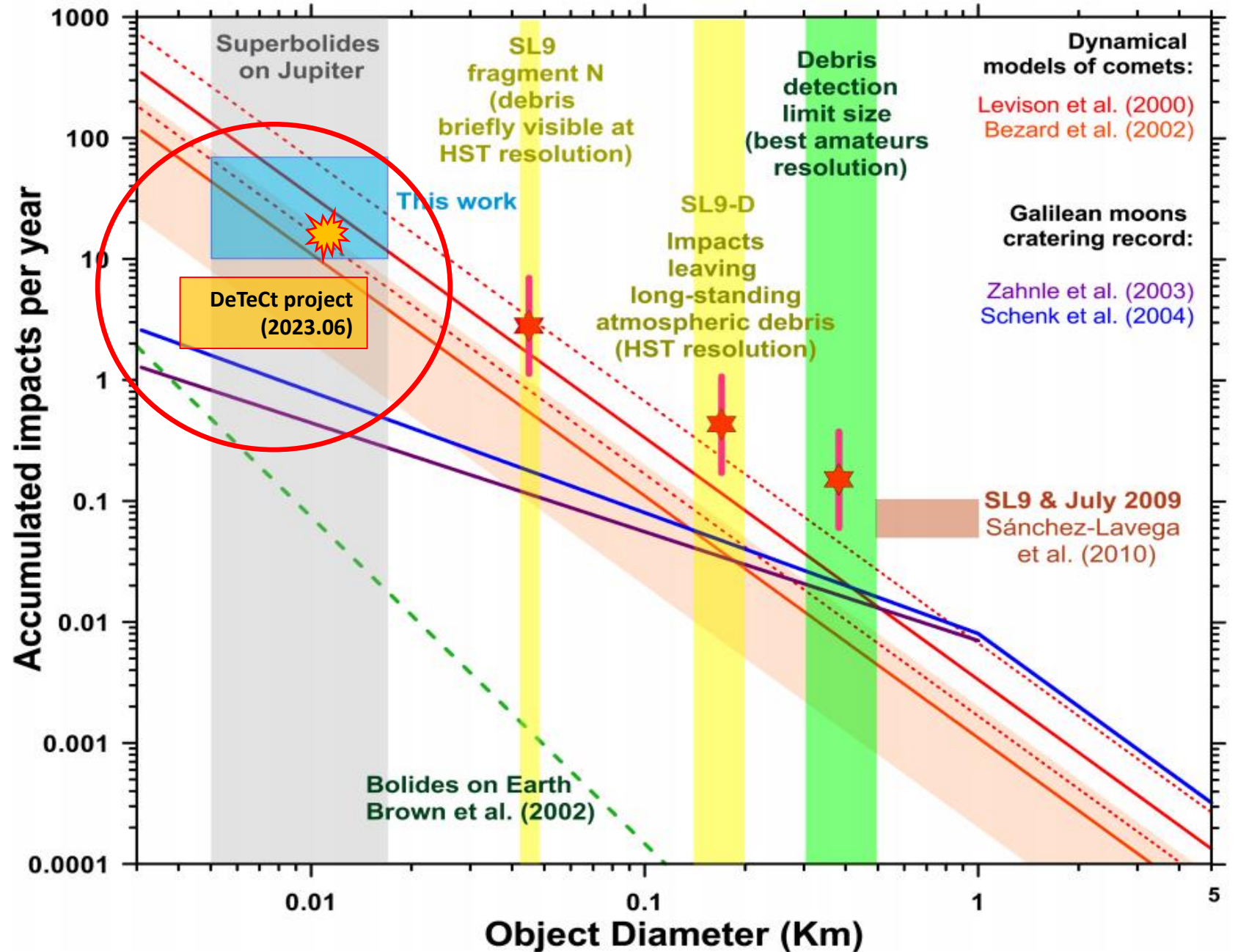
estimation of *less than* 14,6 impacts per year*
 (total includes 2,051 days - 3,8% - of simultaneous observations)
 *absolute impact rate on all Saturn globe - different from the impact rate observable from Earth

Observer	Duration	Number of videos	Date range
Total : 92 observers	54.140 days	33926 videos	2003/11/07 - 2023/06/11
Zac Pujic (Australia)	7.331 days	2981	2005/02/04 - 2022/07/25
Ethan Chappel (USA)	5.681 days	3331	2013/07/30 - 2022/11/08
Sauveur Pedranghelu (France)	5.384 days	1452	2019/06/03 - 2021/09/30
Clyde Foster (South Africa)	4.749 days	4830	2015/04/06 - 2022/12/10
Marc Delcroix (France)	3.048 days	1183	2007/01/20 - 2021/08/28
Paul Rolet (France)	2.945 days	809	2015/05/12 - 2022/10/11
Jose Luis Pereira (Brazil)	2.937 days	2910	2005/03/02 - 2023/08/10
Manos Kardasis (Greece)	1.621 day	1068	2008/03/10 - 2022/12/28
Andy Casely (Australia)	1.462 day	1868	2018/08/21 - 2023/04/19
Isaac Lozano Rey (Spain)	1.282 day	989	2020/06/24 - 2022/10/01
Wellington Pereira Fonseca (Brazil)	1.050 day	514	2020/06/10 - 2021/09/22
Michel Mahe (France)	0.834 day	849	2018/07/06 - 2022/12/04
Ioannis Bouhras (Greece)	0.729 day	823	2019/06/03 - 2022/08/07
Oleg Zaharcu (Moldova)	0.727 day	418	2018/05/22 - 2022/10/31
Philippe Chatelain (France)	0.716 day	183	2017/05/21 - 2022/08/26
Thierry Garrel (France)	0.699 day	1124	2022/07/31 - 2022/10/04
Vlaminir da Silva Junior (Brazil)	0.697 day	598	2021/03/29 - 2023/08/10
Damien Kilmartin (Australia)	0.695 day	604	2021/08/17 - 2023/08/11
Jean-Paul Oger (France)	0.656 day	82	2021/07/23 - 2022/08/27
Michel Miniou (France)	0.616 day	474	2003/11/07 - 2019/12/04
Lucca Schwingel Viola (Brazil)	0.606 day	878	2021/06/19 - 2023/06/09
Niall Mac Neill (Australia)	0.577 day	582	2020/05/27 - 2022/05/26
Benito Loyola (USA)	0.497 day	587	2018/07/11 - 2019/07/30
Mario Rana (USA)	0.481 day	689	2021/08/19 - 2022/12/20
Grant Blair (USA)	0.463 day	282	2014/03/14 - 2022/08/04
Christian Pinter (Austria)	0.462 day	59	2019/08/29 - 2022/10/04
Obs. du Pic du Midi (Colas/Delcroix/Dauvergne/Sylla) (France)	0.451 day	418	2012/08/06 - 2019/08/15
Alexandros Frantzis (Greece)	0.445 day	295	2021/11/03 - 2022/11/19
Victor P S Ang (Singapore)	0.445 day	181	2021/07/31 - 2021/10/08
Alan Coffelt (USA)	0.410 day	150	2015/05/03 - 2022/08/14
Simon Labergere (France)	0.338 day	144	2021/08/02 - 2023/05/27
Christian Viladrich (France)	0.338 day	101	2007/04/08 - 2022/10/15
Lucas Magalhaes (Brazil)	0.269 day	256	2021/06/25 - 2023/05/25
Arnaud Claisse (France)	0.260 day	83	2015/05/21 - 2018/05/04
Luigi Morrone (Italy)	0.238 day	208	2020/12/19 - 2022/09/12
Societe Astronomique de Touraine (France)	0.223 day	82	2014/03/14 - 2018/07/16
Quentin Gineys (France (Reunion island))	0.212 day	79	2022/04/19 - 2022/08/08
Stephane Gonzales (France)	0.195 day	89	2015/05/23 - 2017/06/05
Christofer Baez (Dominican Republic)	0.171 day	117	2021/11/08 - 2023/05/19
David Domine (France)	0.171 day	35	2018/04/23 - 2017/04/08
Martin Lewis (UK)	0.166 day	168	2015/05/21 - 2019/07/28
Aaron Greenville (Australia)	0.166 day	85	2021/08/14 - 2021/06/23
David Olivos (Mexico)	0.160 day	117	2020/05/25 - 2021/10/27
Zsolt Kereszty (Hungary)	0.152 day	88	2021/10/24 - 2021/10/29
Armando Vaccaro (Italy)	0.113 day	37	2020/08/08 - 2022/07/05
Nicholas Eglestone (Australia)	0.113 day	210	2004/03/19 - 2021/09/19

**~19 impacts/year on
Jupiter**

**coherent with
previous estimations**

*(Hueso et al., A&A, 2018;
Hueso et al., JSWC, 2018;)*

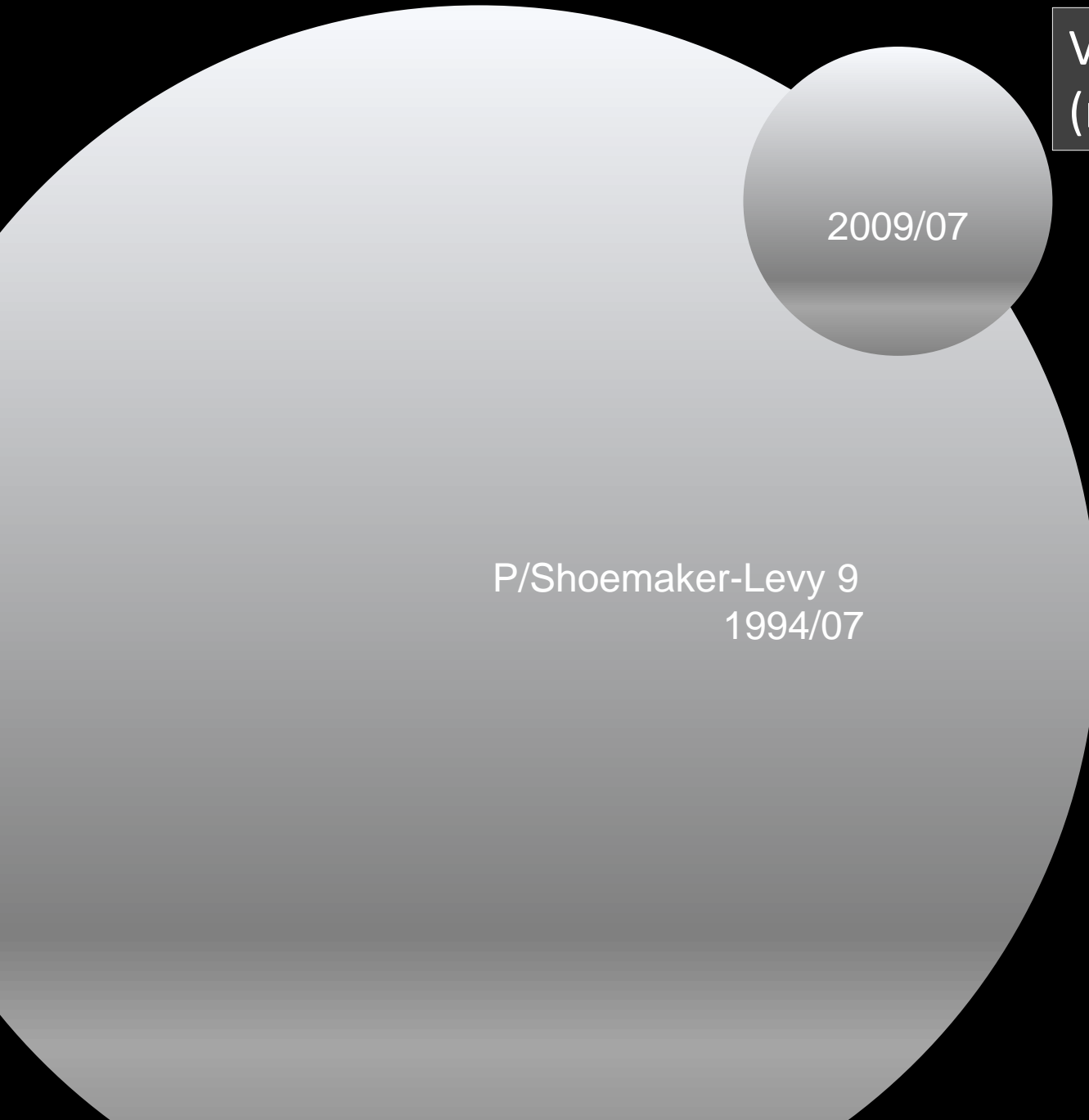


Impacts

Project

Scientific results

Conclusion

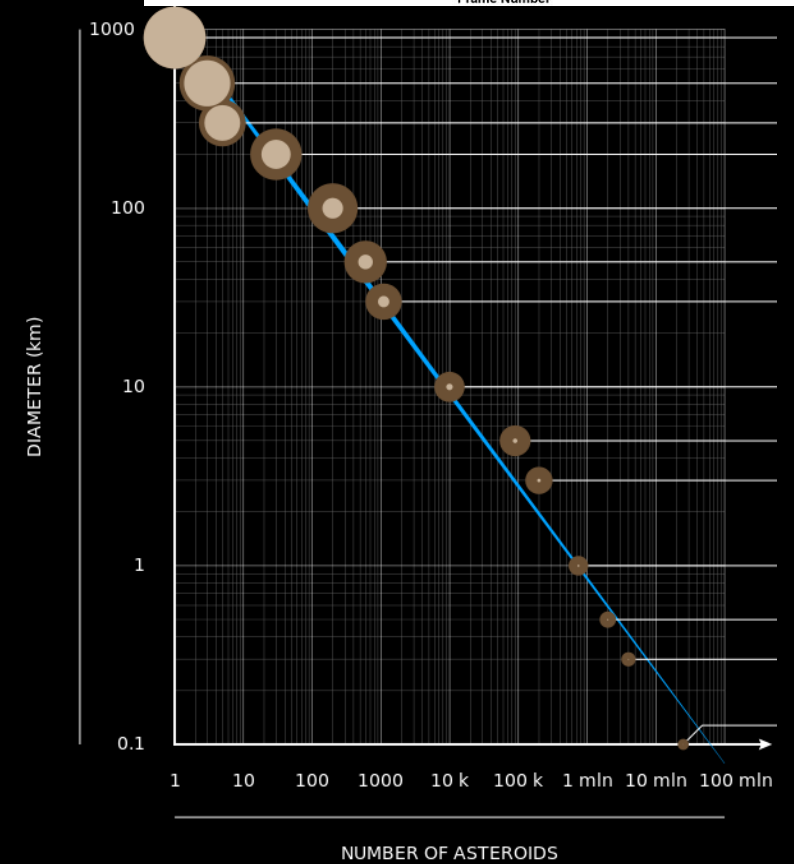
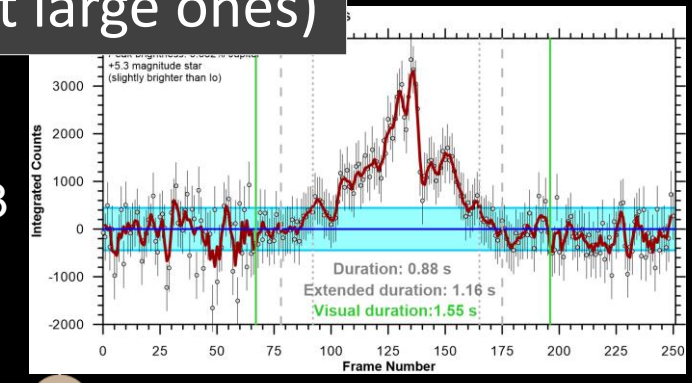


2009/07

P/Shoemaker-Levy 9
1994/07

Variable impacting body sizes
(more small ones than large ones)

- 2010/06
- 2010/08
- 2012/09
- 2016/03
- 2017/05
- 2019/08
- 2020/08
- 2021/09
- 2021/10



Warm thanks to the one hundred ninety participants !



Join us !

