CHRONOFLASH

A simple device for asteroid occultations timing

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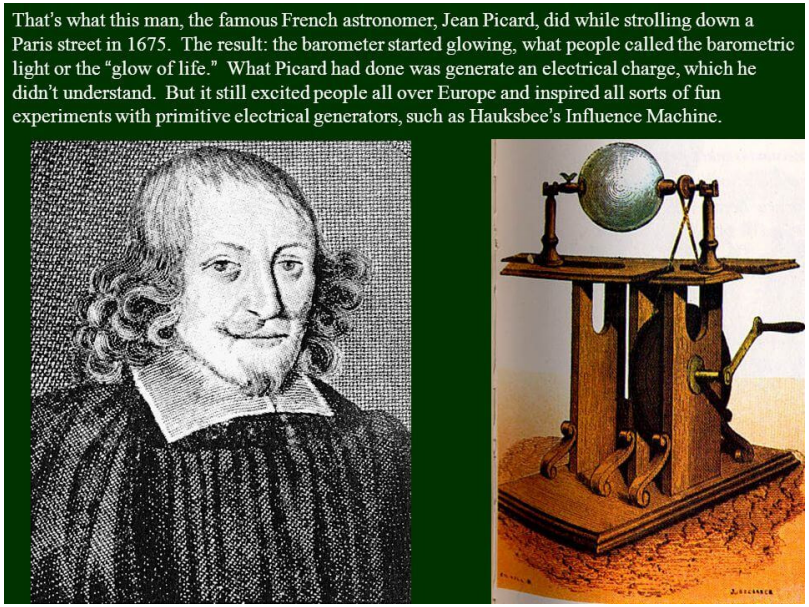
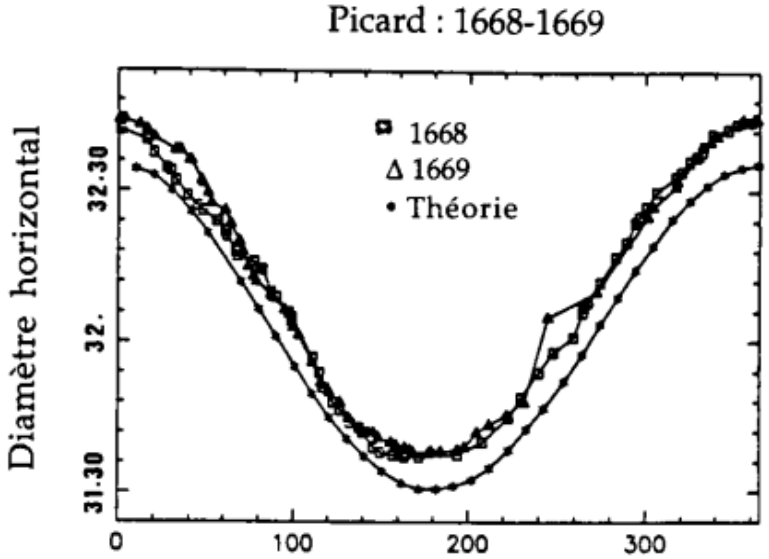
Measuring the diameter of the Sun: the Picard mission



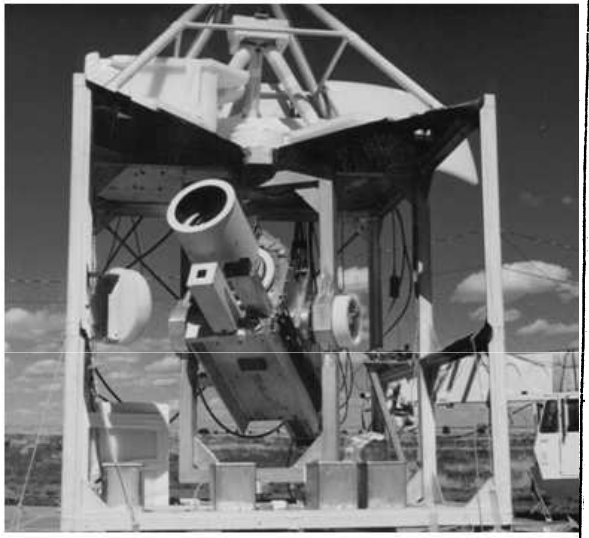
Jean Picard (1620-1682)
Member of the founding team of Observatoire de Paris



Solar diameter measurements to determine the eccentricity of the Earth orbit

CNES Space Mission based on a Myriade Platform
June 15,2010 => April 2014
Scientific team led by G. Thuillier from LATMOS

Earth based observations to be calibrated by the Picard spacecraft



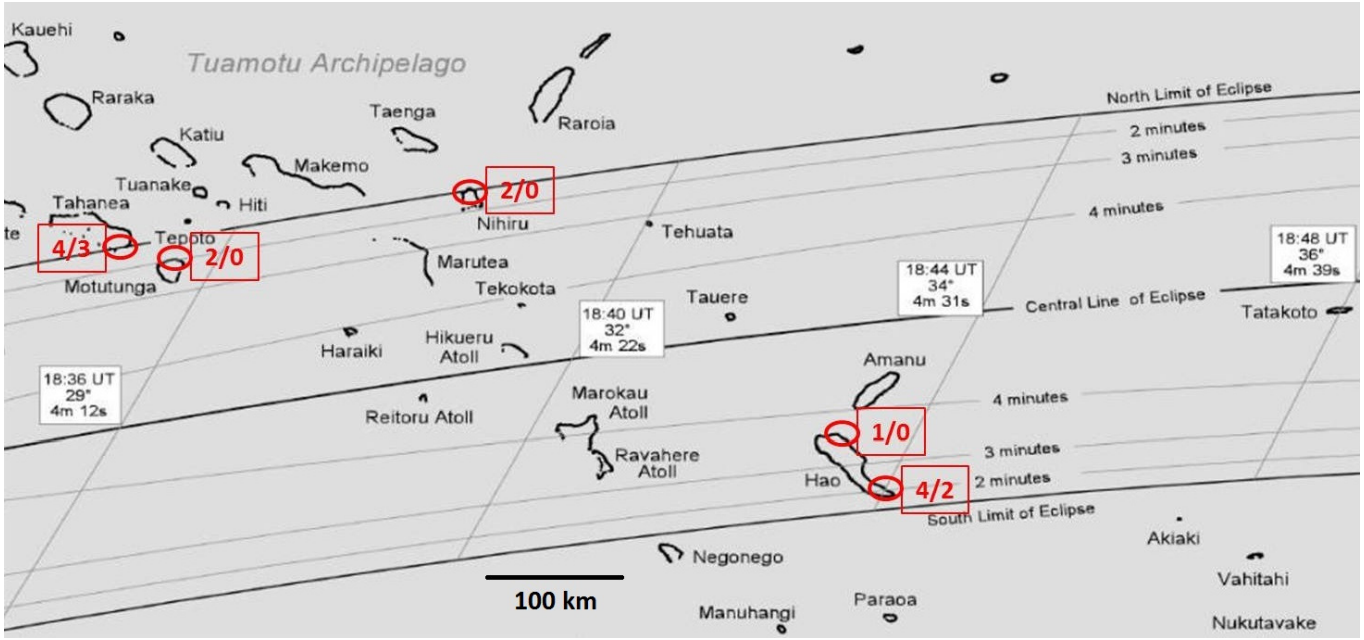
Solar Disk Sextant
S. Sofia Yale University

Occultation timing (Halley's eclipse 1715)

SODISM prototype
at Plateau de Calern

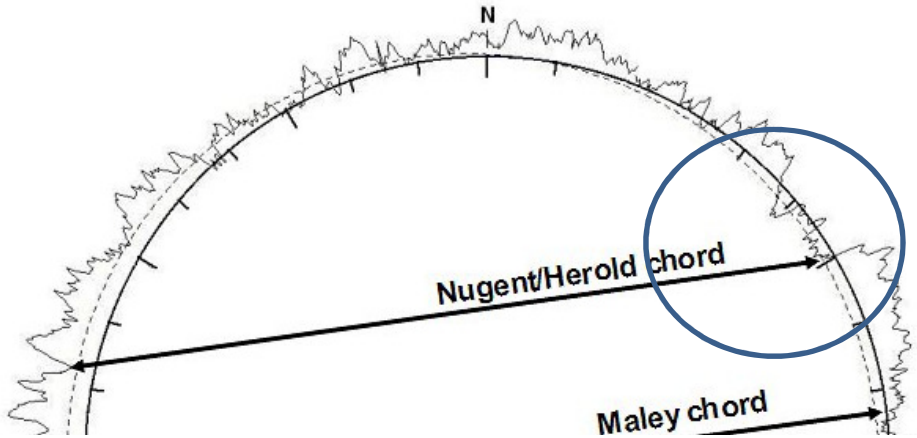
Convinced by David Dunham, we set up an observation campaign in 2010

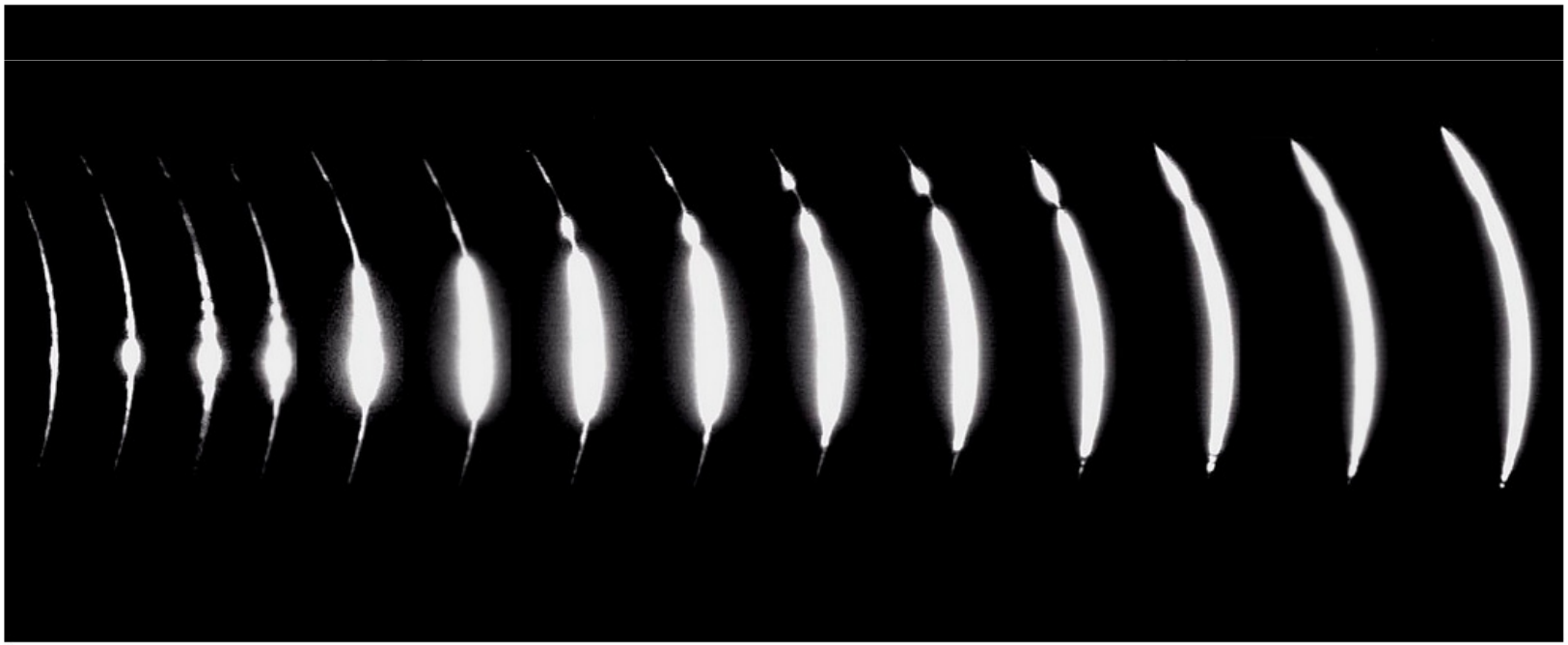
First observation campaign in French Polynesia
July 10, 2010 TSE



A dozen of dedicated photometers installed in advance on several atolls of the Tuamotous

Baily Beads signature on the light curves





Composite of video frames of Baily's Beads at 3rd contact. These frames represent a 20 second time interval. From Hao Atoll-Richard Nugent

Results from 4 eclipse observation campaigns

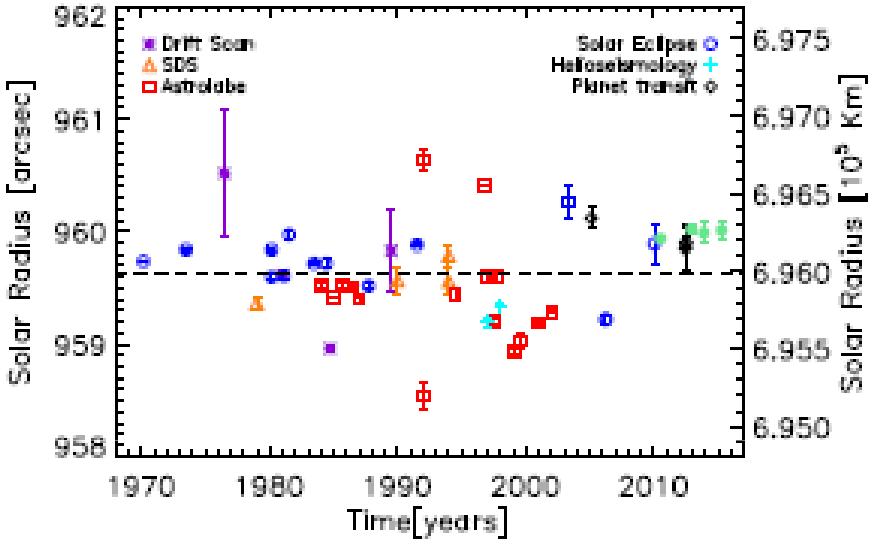


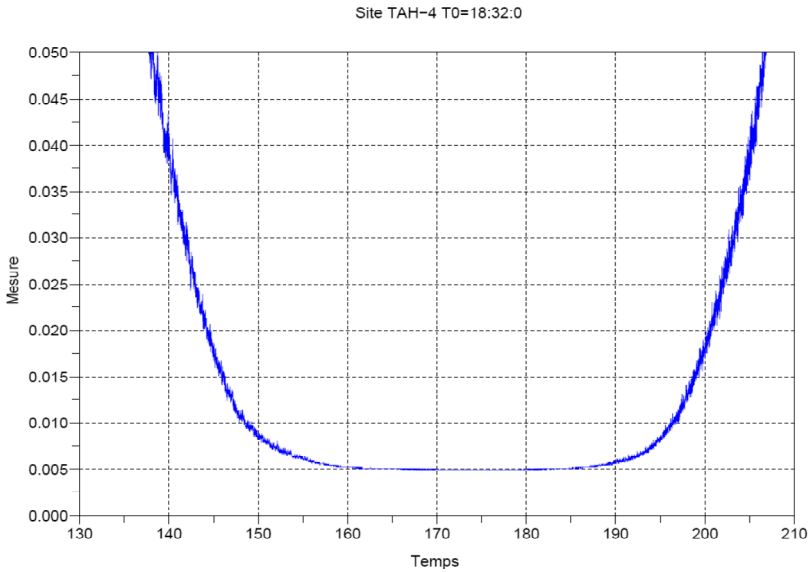
Figure 1. Published measurements of the solar radius during the last 34 years adapted from Figure 1 of Emilio *et al.* (2012) where references to the individual measurements can be found. Abscissa values are the mean observation dates and SDS stands for *Solar Disc Sextant*. The blue square corresponds to the Kuhn *et al.* (2004) value from SOHO/MDI revised by Emilio *et al.* (2012) based on their result obtained during the 2003 and 2006 Mercury transits. Recently published measurements by Hauchecorne *et al.* (2014) and Meftah *et al.* (2014) are included (see text for detail) as well as the results of the present study (green symbols). The dashed line indicates the currently adopted IAU value.

A Novel Technique of Measuring the Solar Radius from Eclipse Light Curves – Results for 2010, 2012, 2013, and 2015

PhilippeLamy[1] · Jean-YvesPrado[2] · OlivierFloyd[3] · PatrickRocher[4] · GuillaumeFaury[1,3] · SergeKoutchmy[5]

Lamy, P., Prado, JY., Floyd, O. et al. Sol Phys (2015) 290: 2617.
https://doi.org/10.1007/s11207-015-0787-8

Accurate time-tagging requested for data processing



Nom du lieu : Nihiru (NIH-1/P009)
Latitude : 16° 39' 21.042" sud, -16.6558450°
Longitude : 142° 52' 17.040" ouest, -142.8714000°
Altitude : 0m.

Phase de l'éclipse	UT	P_sol	Z_sol	P_lune	Z_lune
Premier contact extérieur	17h 21m 9.131s	276°10' 5.689"	32°21'48.035"	97°11'12.899"	213°41'10.218"
Premier contact intérieur	18h 37m 43.799s	18° 4'30.413"	145°42'21.888"	18° 1'27.099"	145°39' 6.597"
Dernier contact intérieur	18h 38m 8.579s	3°16'29.724"	130°58'49.748"	3°25'31.380"	131° 7'31.126"
Dernier contact extérieur	20h 6m 20.852s	105°21'44.792"	253°38'14.152"	285° 3'42.250"	72°36'15.685"

Durée de la phase centrale : 0m 24.780s.
Instant du maximum : 18h 37m 58.916s
Obscuration : 100.0%
Magnitude : 1.000502

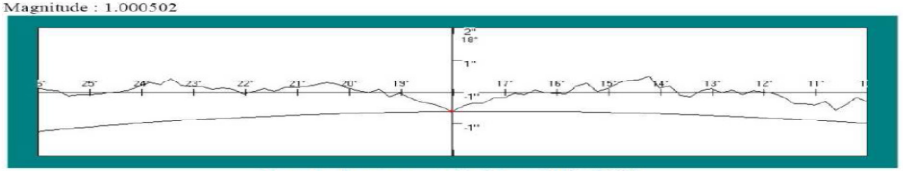


Figure 1 : Premier contact intérieur (NIH-1/P009)

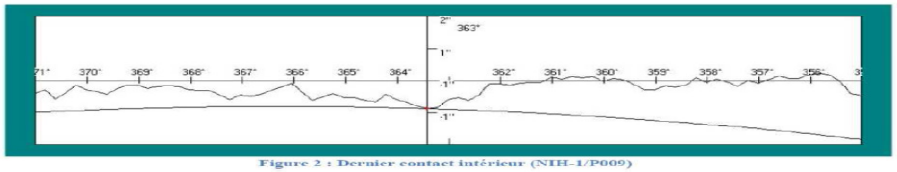


Figure 2 : Dernier contact intérieur (NIH-1/P009)

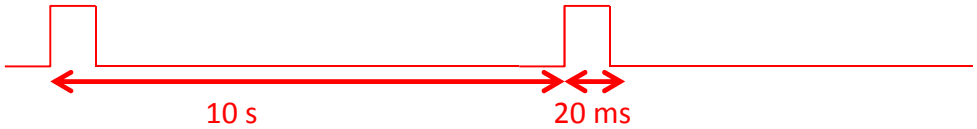
Attention, sur ces graphes l'axe des ordonnées est dilaté d'un facteur 3600 (l'échelle est la seconde d'arc) par rapport à l'axe des abscisses (l'échelle est le degré).

Crédit Patrick Rocher IMCCE

Chronoflash Version 3 Technical features

Waits until the first minute round to trigger a red flash

Square signal 20 ms duration every 10 seconds



Time accuracy better than 5 µs

Sound monitoring via a buzzer

Possibility to modify these parameters through a USB connection

Time tagging example

Jupiter from La Rochelle 28/8/19 through a Canon 600D/Celestron Nexstar 4SE

60 fps

Time tagged image

23:14:29 time from camera
23:14:30.00 after CF calibration

Chronoflash assets

Smaller, simpler, cheaper than alternative time tagging methods

Fully hardware and software independent

A single device can be used on a same site by several observers

Worldwide use thanks to GNSS global coverage

Can be ordered via Clef des Etoiles https://laclefdesetoiles.com/accueil-la-clef-des-etoiles/6429-chronoflash.html

Patented in France (FR 1261504), EU (13795216.4) and USA (9542418)