

Methods to measure the solar diameter

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ICRA and solar physics

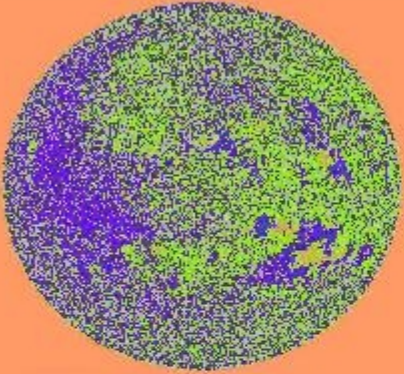
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-800 -600 -400 -200 0 200 400 600 800 Gauss

Solar Magnetogram with Magneto-Optical Filter [MOF](#) Kanzelhoehe Solar Observatory / Valoria La Buena annular eclipse expedition Oct. 3, 2005

[Prof. Costantino Sigismondi](#) (supervisor)

[CORSI ed ESERCITAZIONI 2009/2010](#)
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0.15

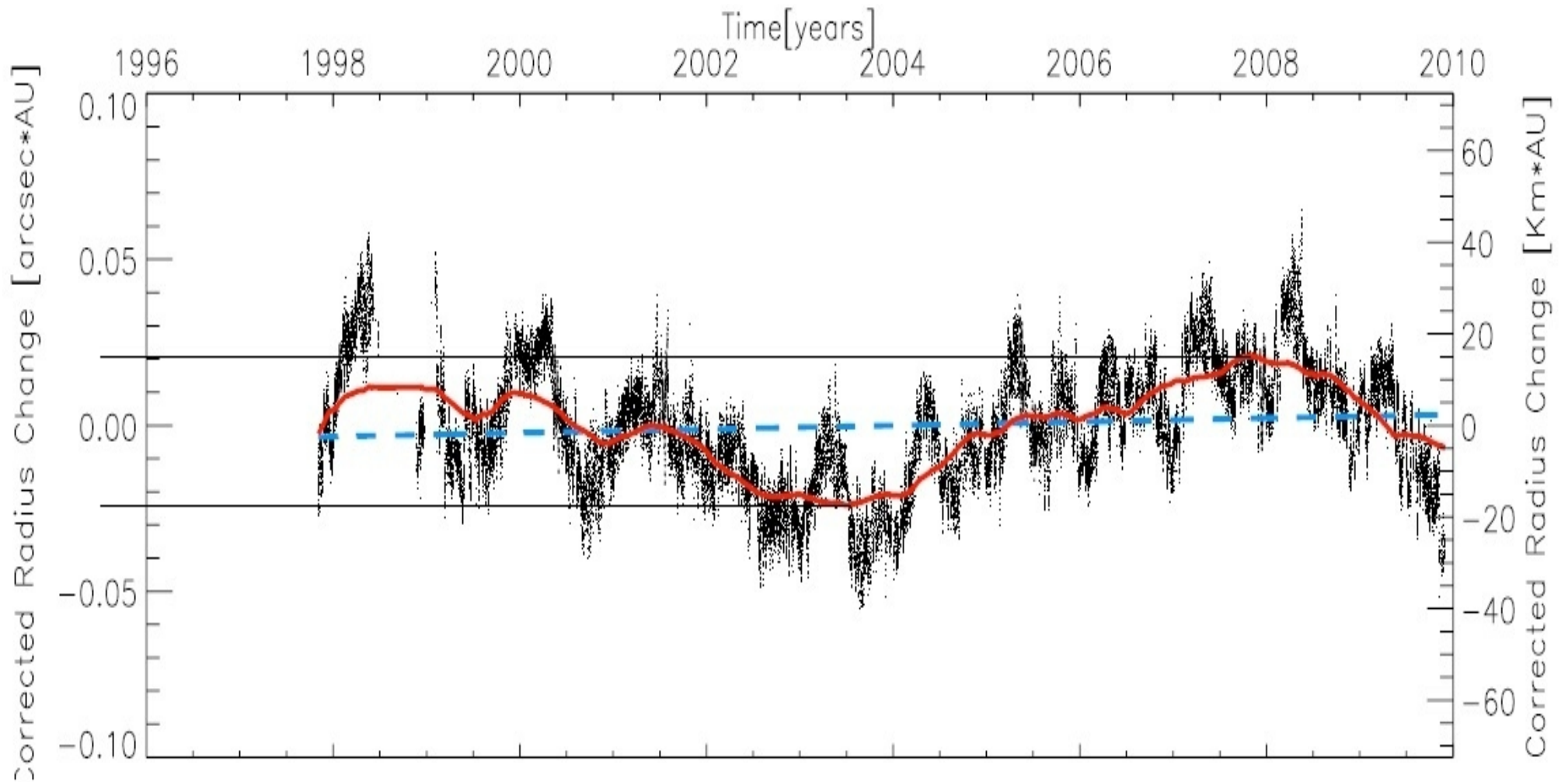
Participating institutions

- ICRA
- Osservatorio Astronomico di Roma #
- Basilica di Santa Maria degli Angeli, Roma *
- Yale Astronomy Department #
- Université de Nice-Fizeau Dept. #
- Observatoire de la Côte d'Azur (site de Calern) *
- Observatoire de Paris *
- Institut d'Astrophysique de Paris #
- IRSOL * #
- # data and analysis * observations (CLAVIUS)

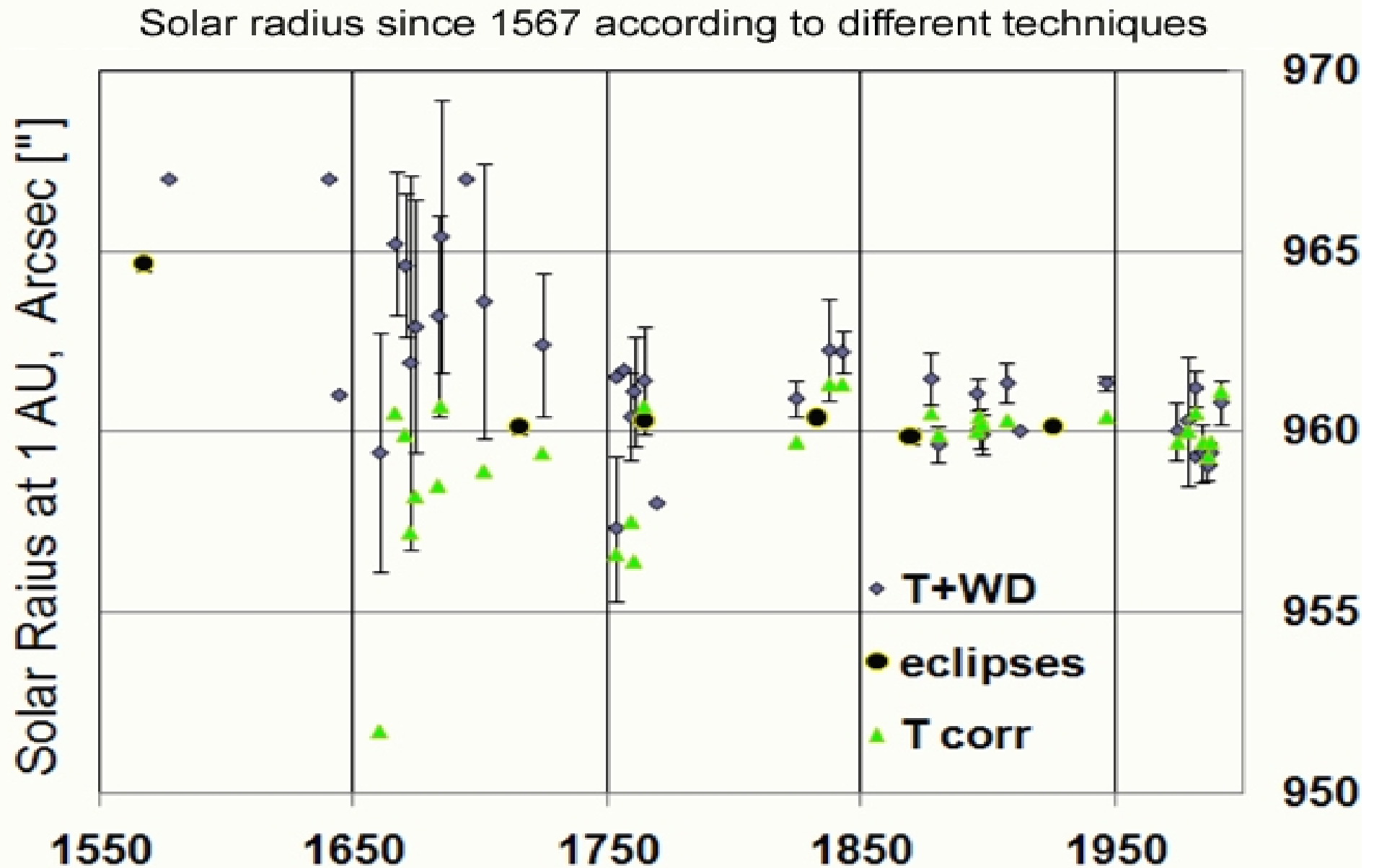
Classification of Solar diameter measurements

Solar Variability range 1919.26" standard @1AU	Solar Limb definition	FIXED telescope: timing Earth spin/seeing	DIRECT measure optics aberrations	SPACE - timings orbit/FSR/black drop/scint.
Seasonal, apparent $\pm 32''$ Cassini, 1655-6 bisection of eccentricity	1. LDF convoluted with PSF; maximum derivative of its FFTD 2. flash spectrum region (FSR) affects only eclipses data?	Meridian and hourly circle transits; sunsets SMA; Carte du Ciel and CLAVIUS	Heliometer 1838 2 half lenses moving	Eclipses + Baily beads Venus & Mercury transits- (SOHO Mercury transit)
Secular, real expected $\leq 0.1''$ ($\geq 5''$ for 1567 eclipse?) Halley-Brown-Eddy-Sofia	3. Atmospheric halo and seeing shift	Iso-Almucantar transits (Astrolabes and DORAYSOL). All are Drift-scan methods	Göttingen 1905, SDS 1992-2010 Fixed angle prism edu: 2 pinholes	PICARD satellite (4 prisms) for radius and oblateness RHESSI satellite-oblateness SDO satellite

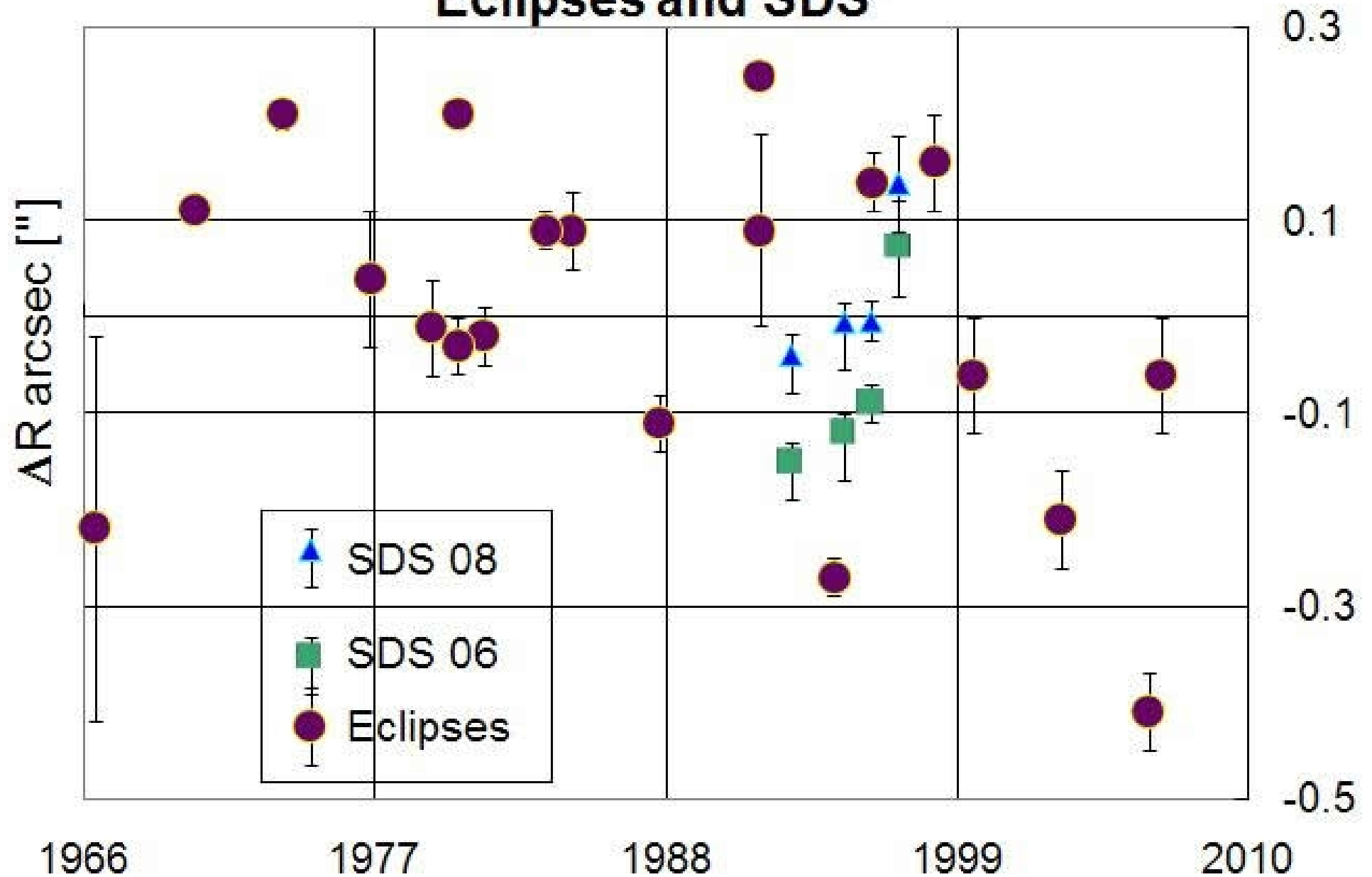
Last solar cycle: SOHO data (June 2010)



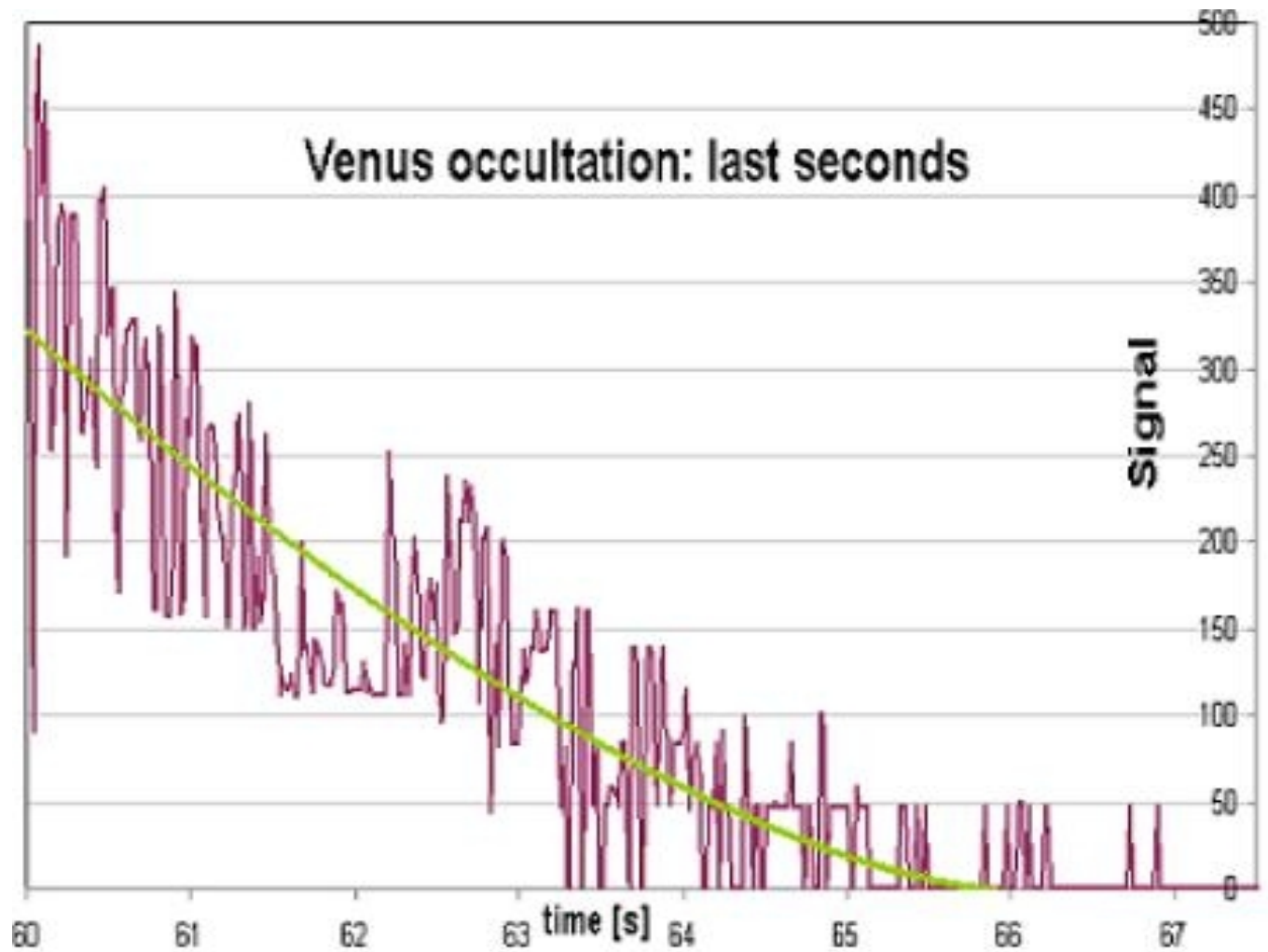
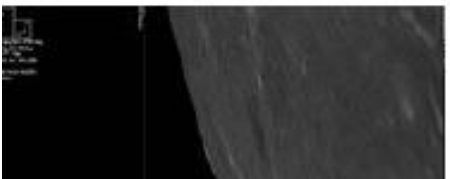
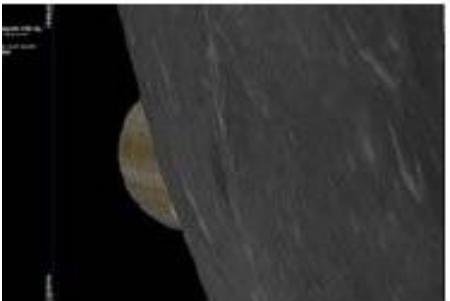
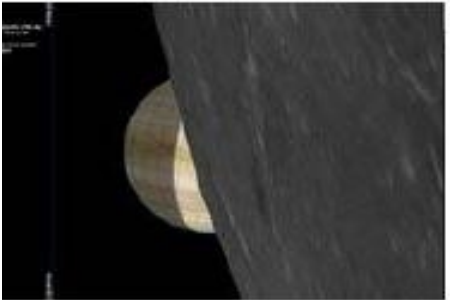
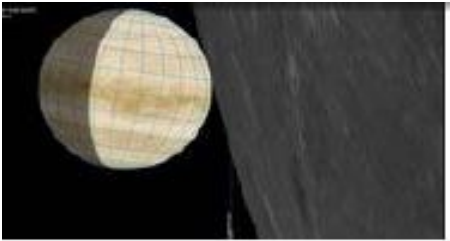
Calibrating eclipses for studying secular variations

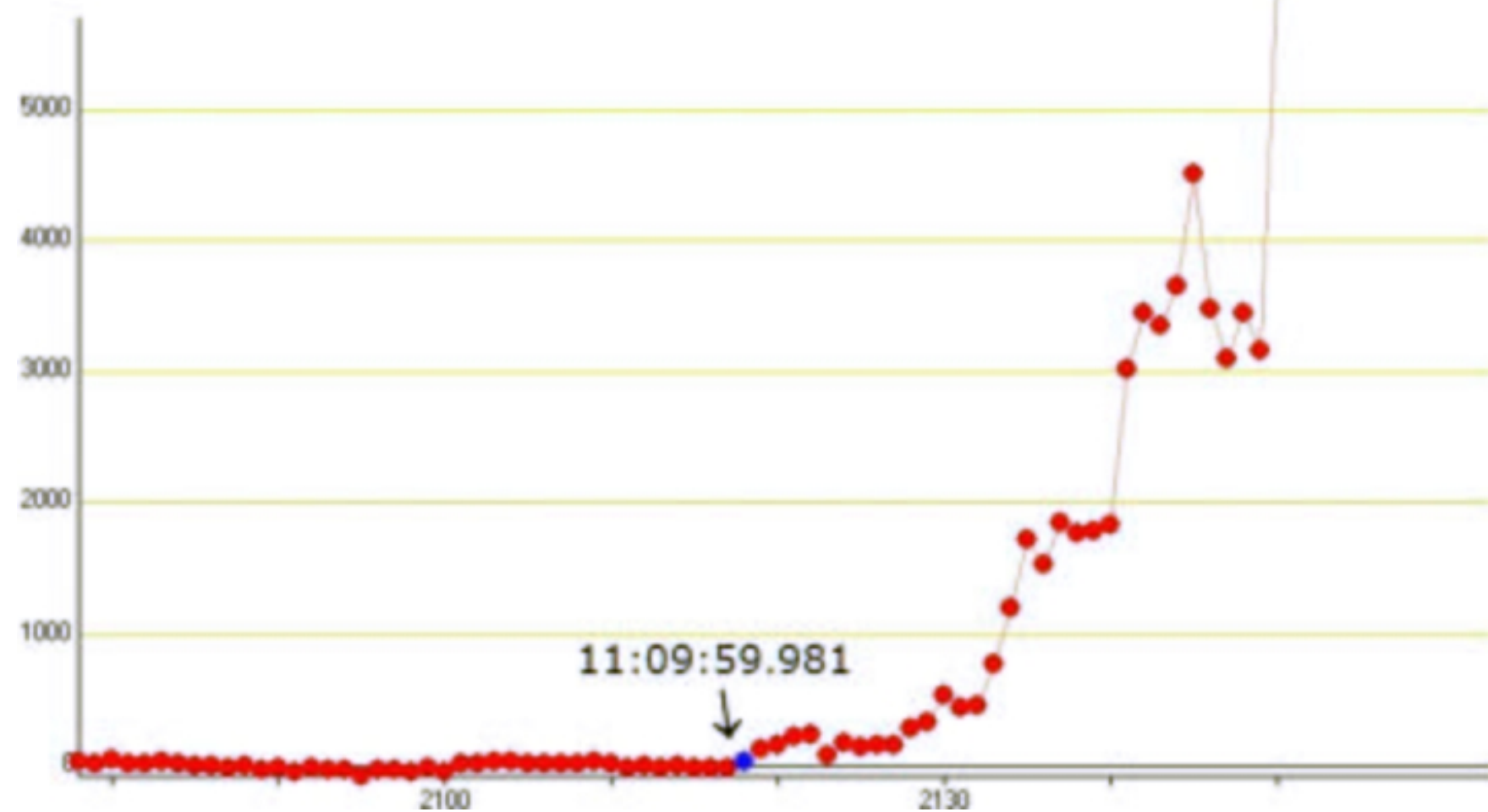
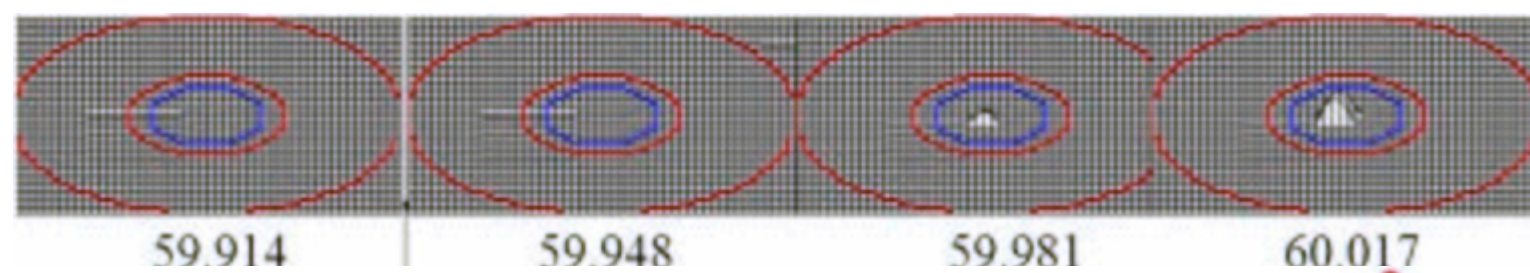


Eclipses and SDS

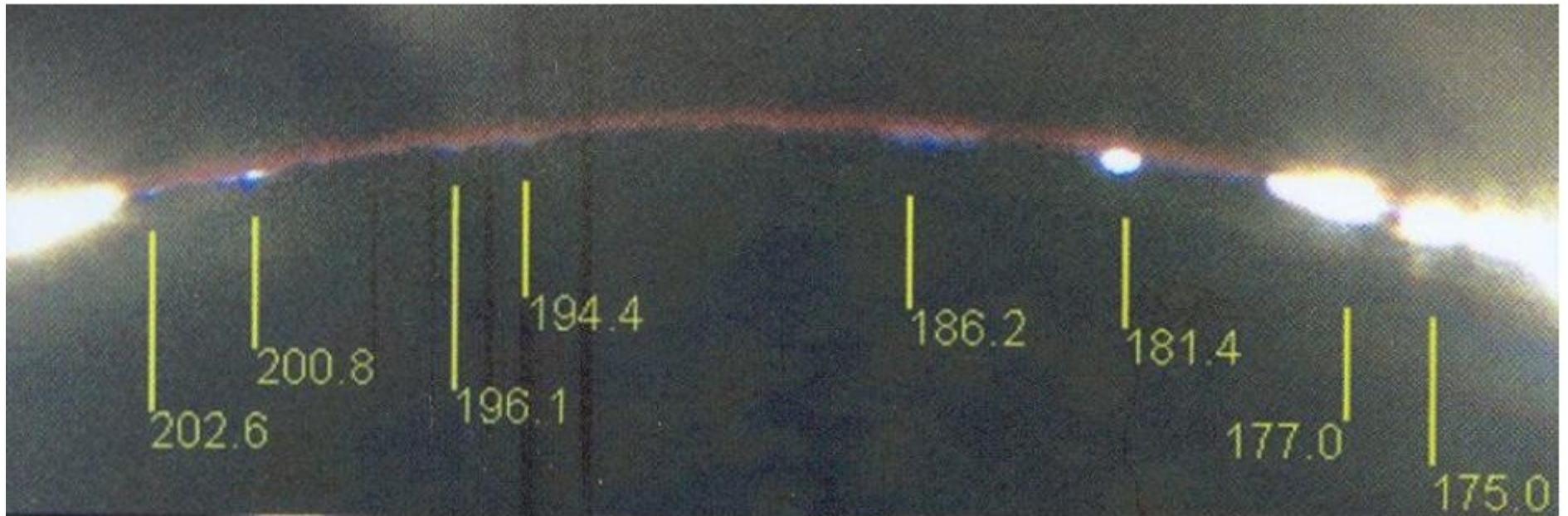


Eclipse Problem 1: scintillation

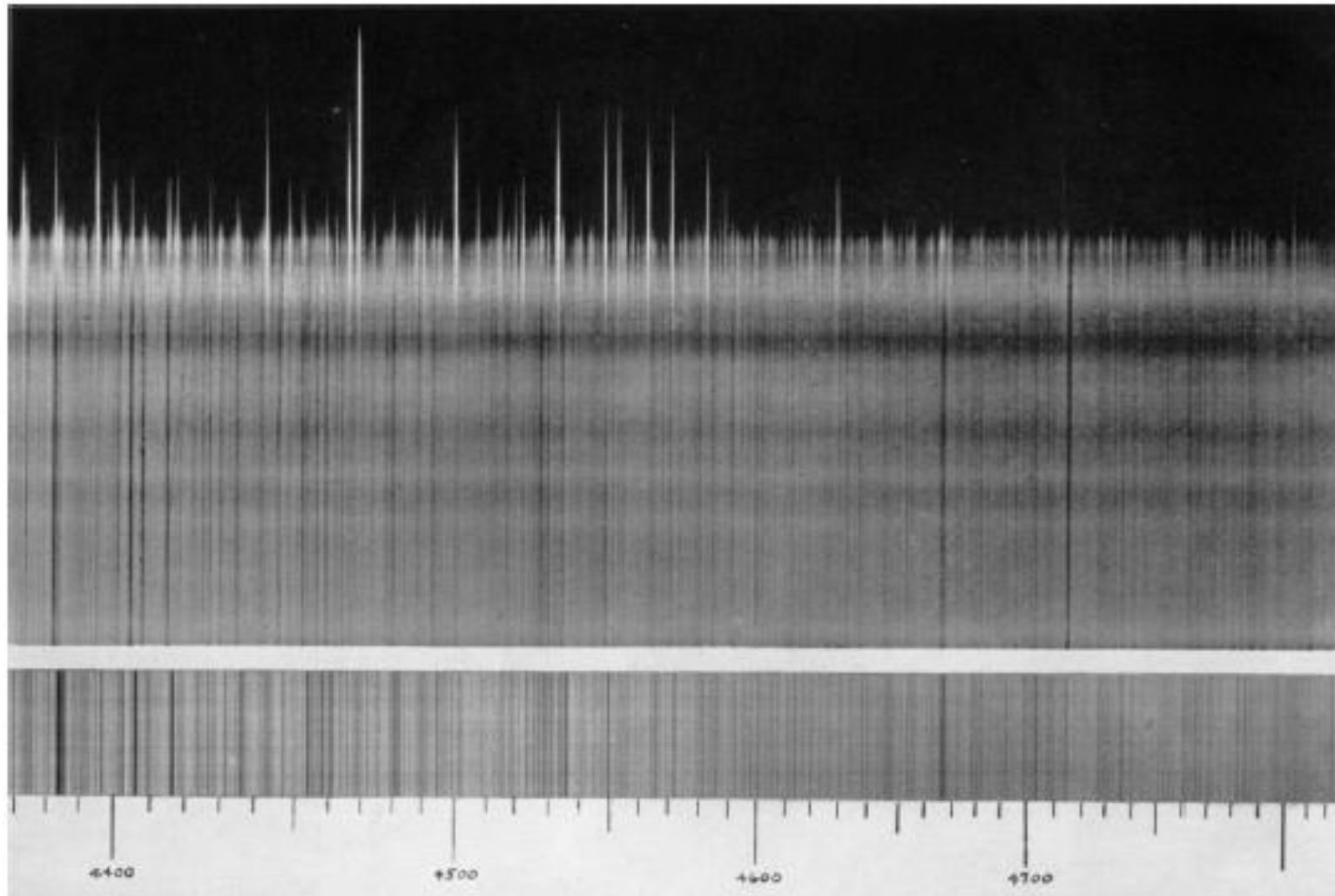




Problem 2: Flash Spectrum Region



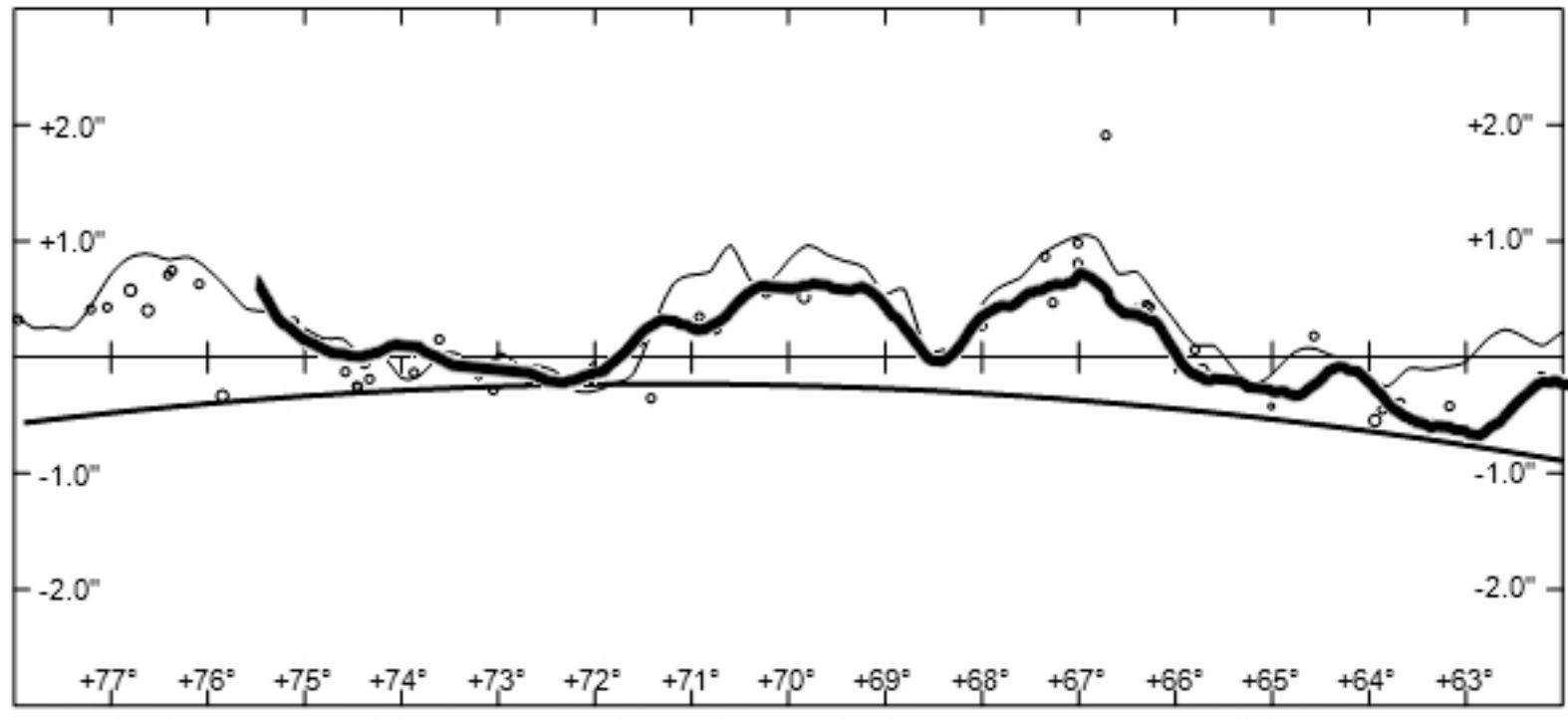
Flash Spectrum (1905)



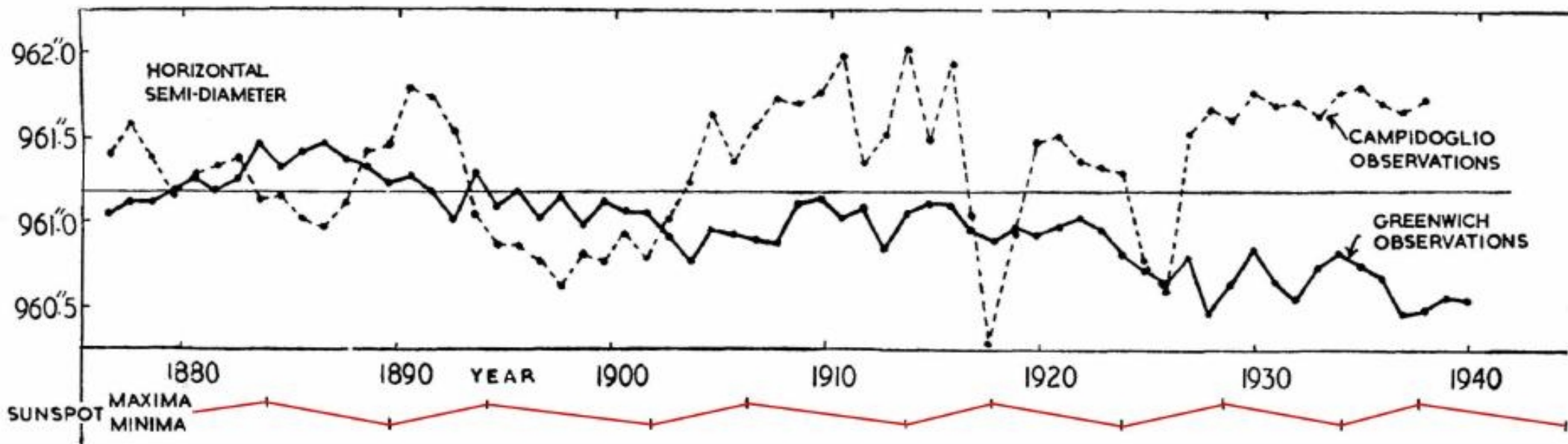
Problem 3: lunar profile

- Watts (1962) $\sigma > 0.2''$ random
- Kaguya (2009) $\sigma \ll 0.01''$ sampling each $0.5''$ - $5''$
 - Sampling 1-10 km

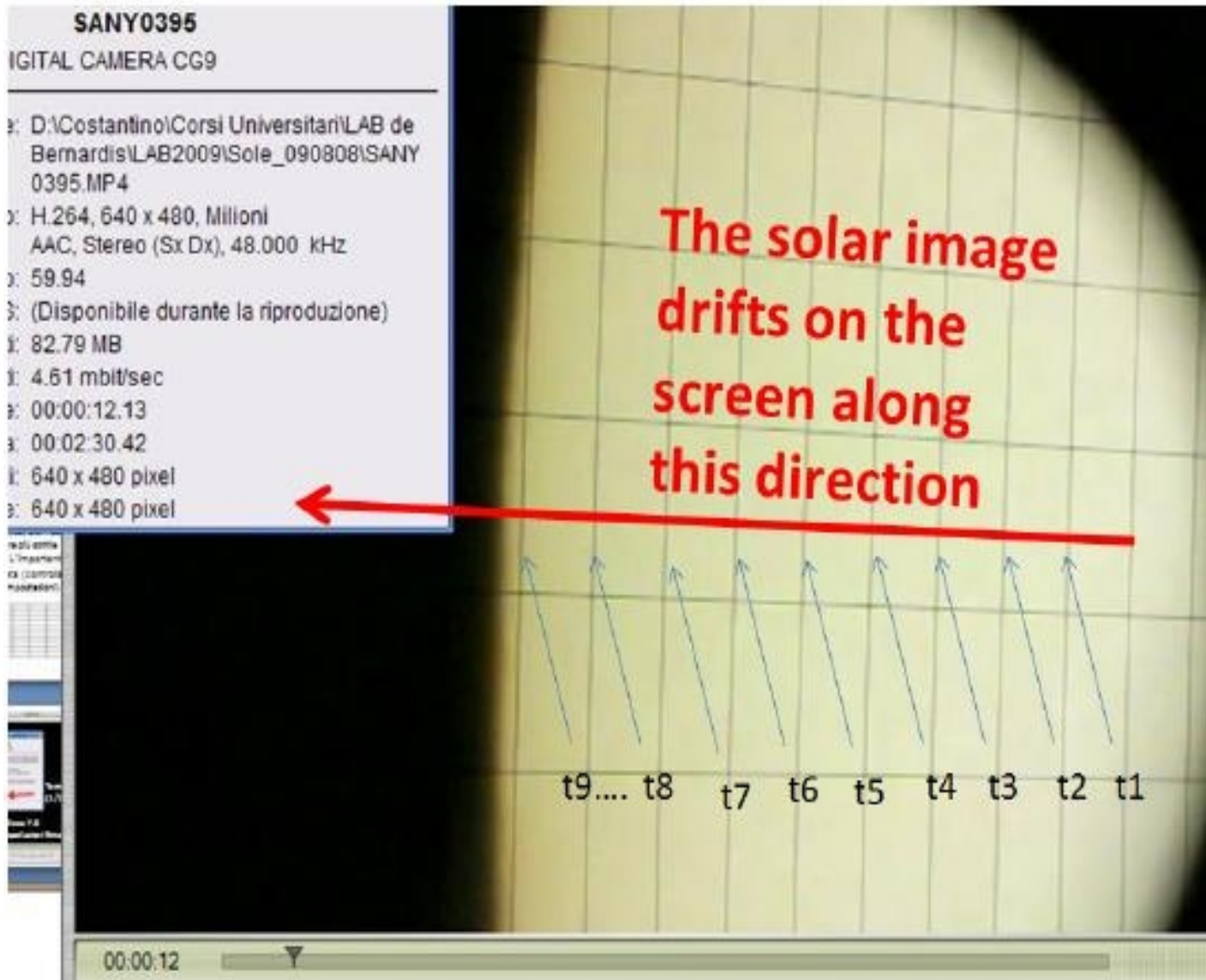
Real lunar limb vs Watts profile



Meridian transits



Problem: seeing e limb shift



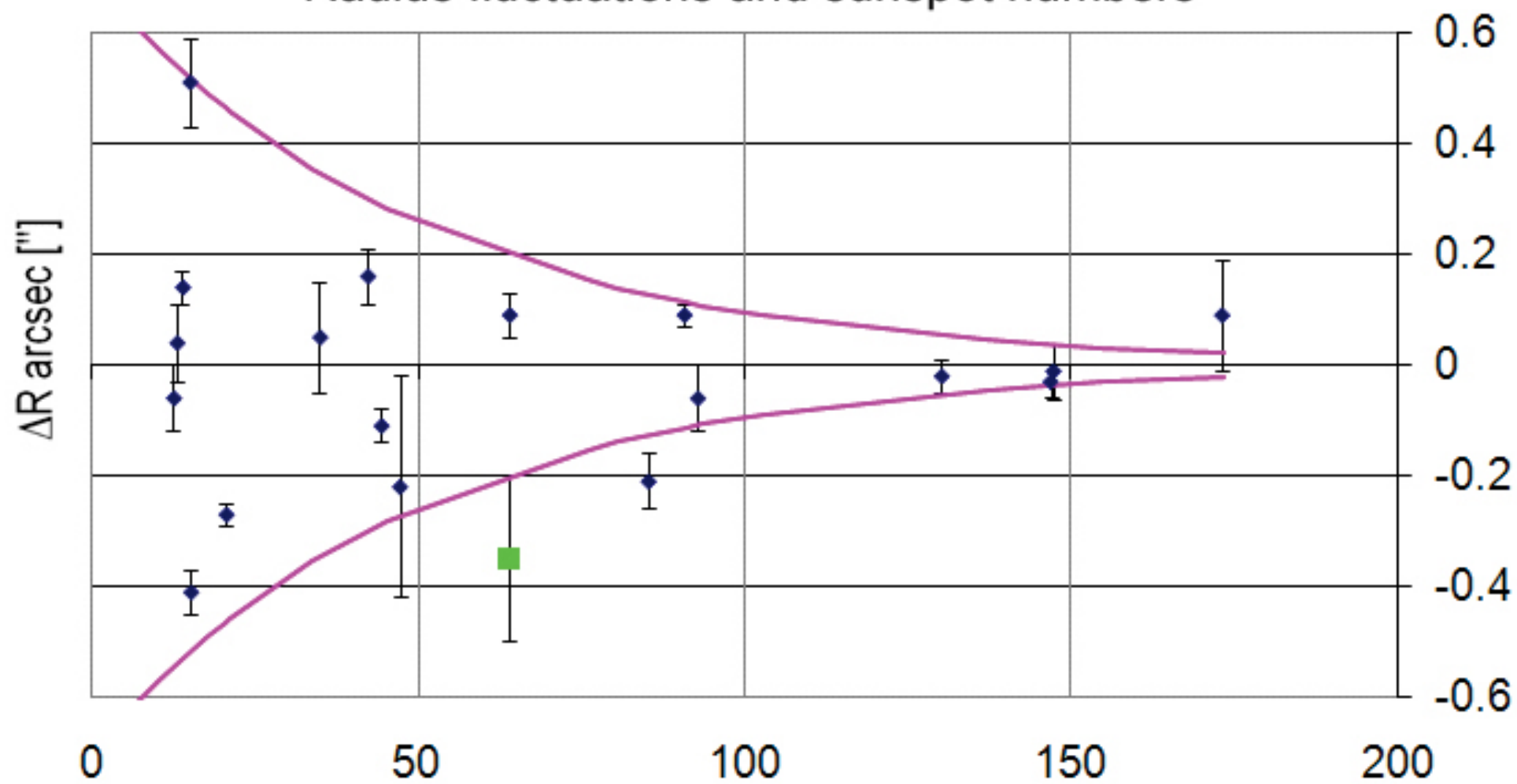
$\rho=1''$	$\Delta\theta=-0.07''$
2''	-0.17''
3''	-0.28''

CLAVIUS project

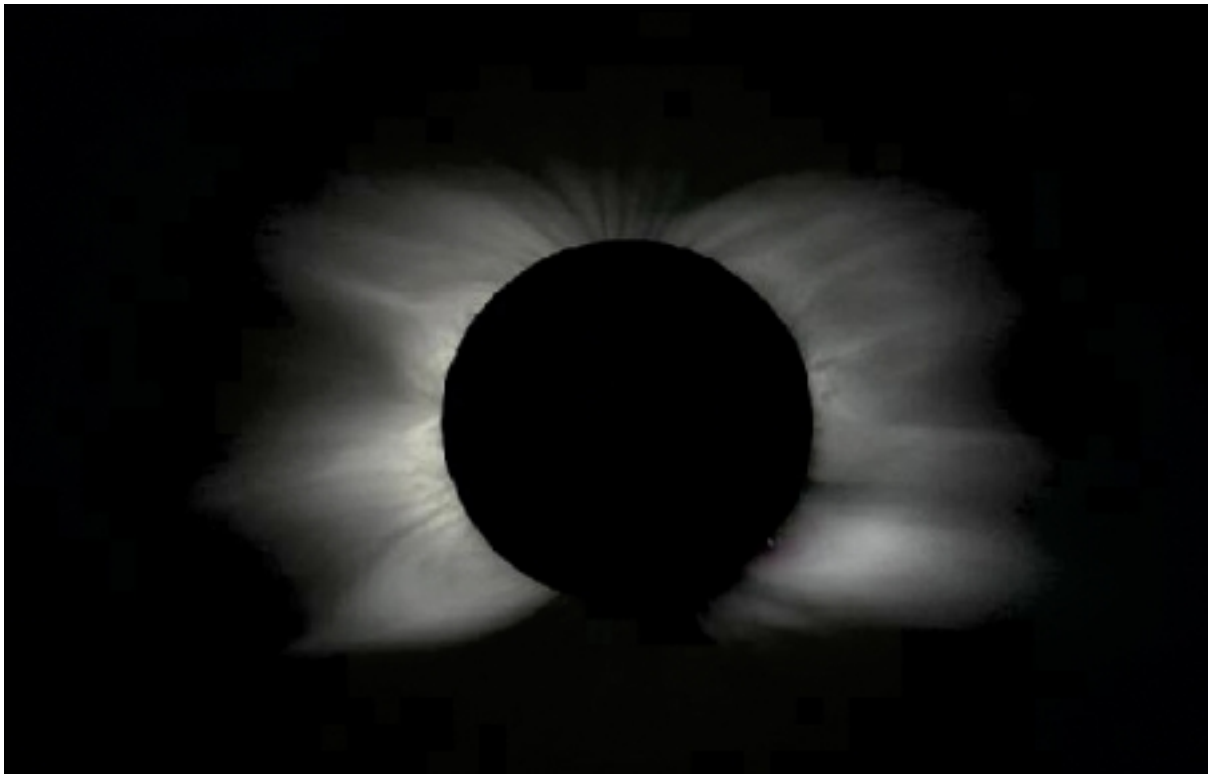


- Transits on hourly circles
at frame rate > 60 fps
- Instantaneous seeing measurement
- IRSOL (CH) Gregory coudé 45 cm f/50
- Carte du Ciel – IAP (F) refractor 33 cm f/10
- SMA (I) pinhole 2 cm f/1000

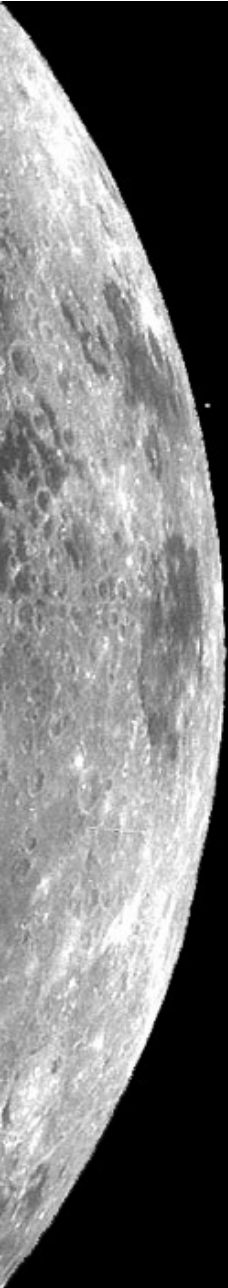
Radius fluctuations and sunspot numbers



$\delta R_{\odot} = -0.41''$ on 29 march 2006,
in good agreement with SOHO
data



Eclipse data:collaboration with



IOTA

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We also provide information on observing equipment and techniques, and we report to our members about observations made.