

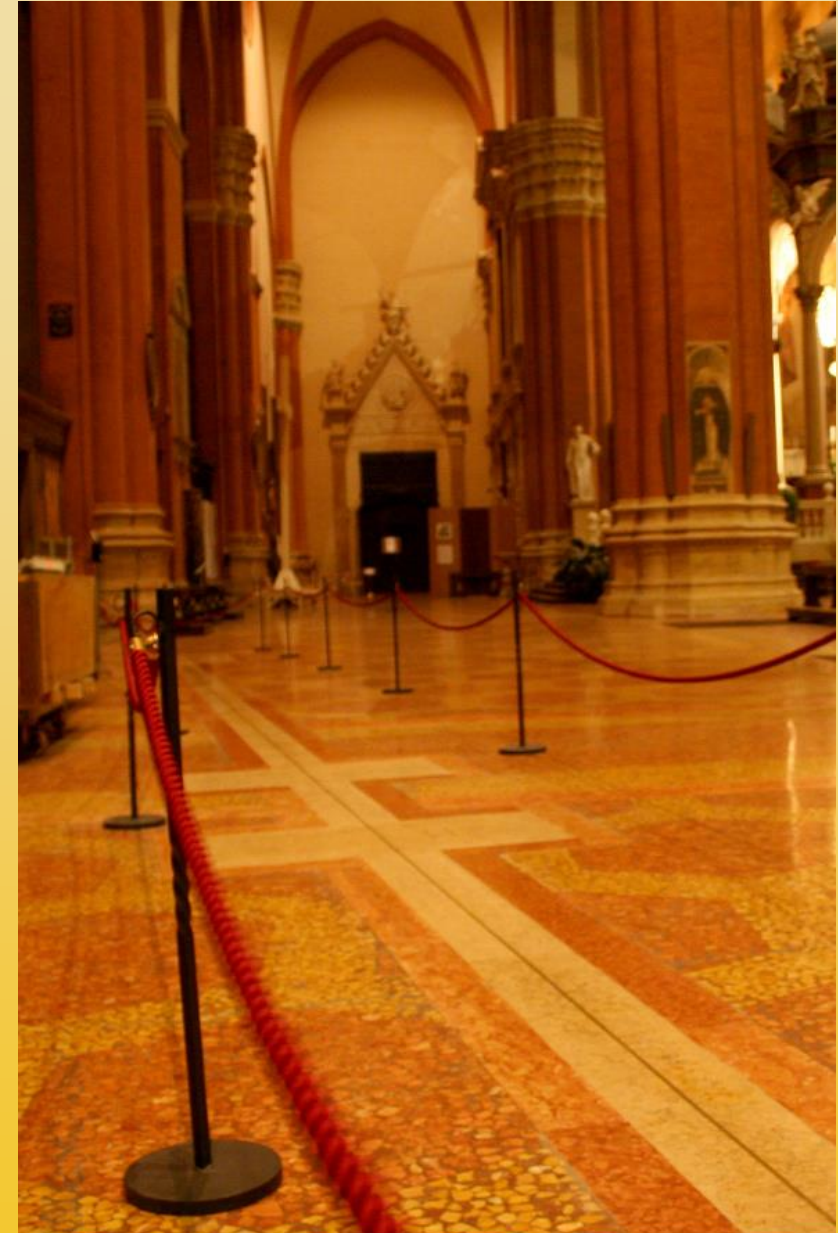
No evidence of a solar diameter change during the Maunder Minimum from measurements made in the Basilica of San Petronio

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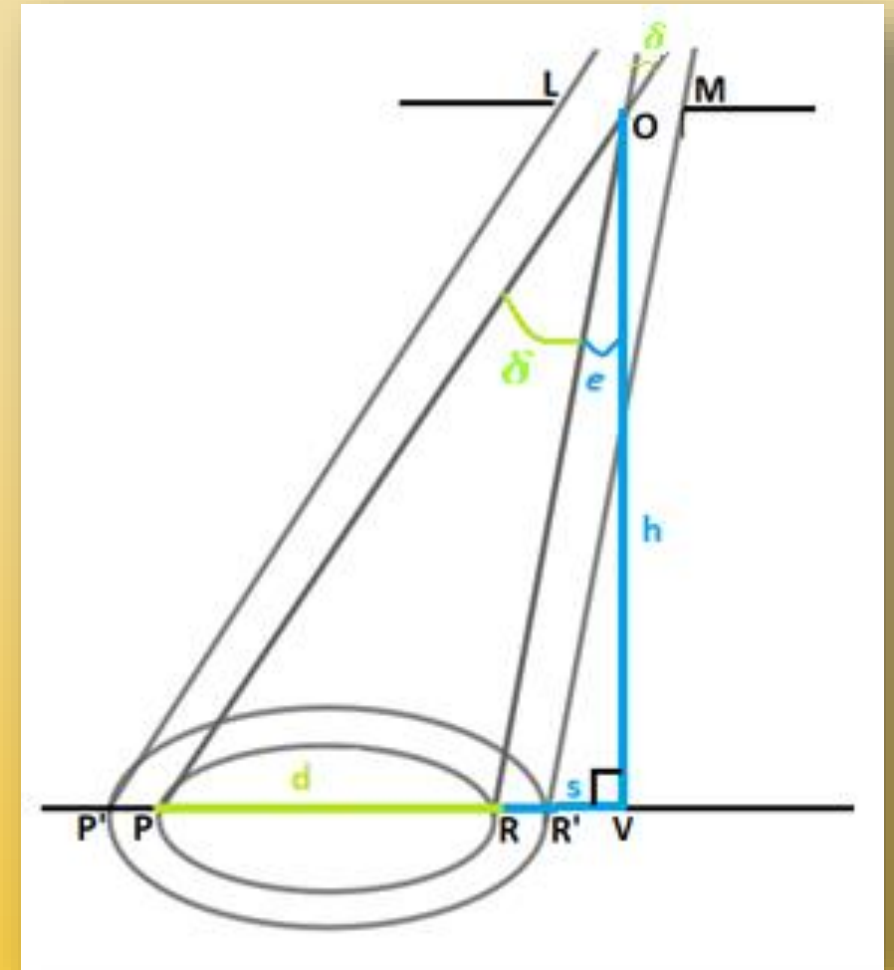
Analysis of a series of measurements taken on the meridian line of the Basilica of San Petronio during the years 1655-1736



Reference: Tovar, I., Aparicio, A. J. P., Carrasco, V. M. S., Gallego, M. C., and Vaquero, J. M. 2021, ApJ, 912, 122
<https://doi.org/10.3847/1538-4357/abefdb>

Measurement method

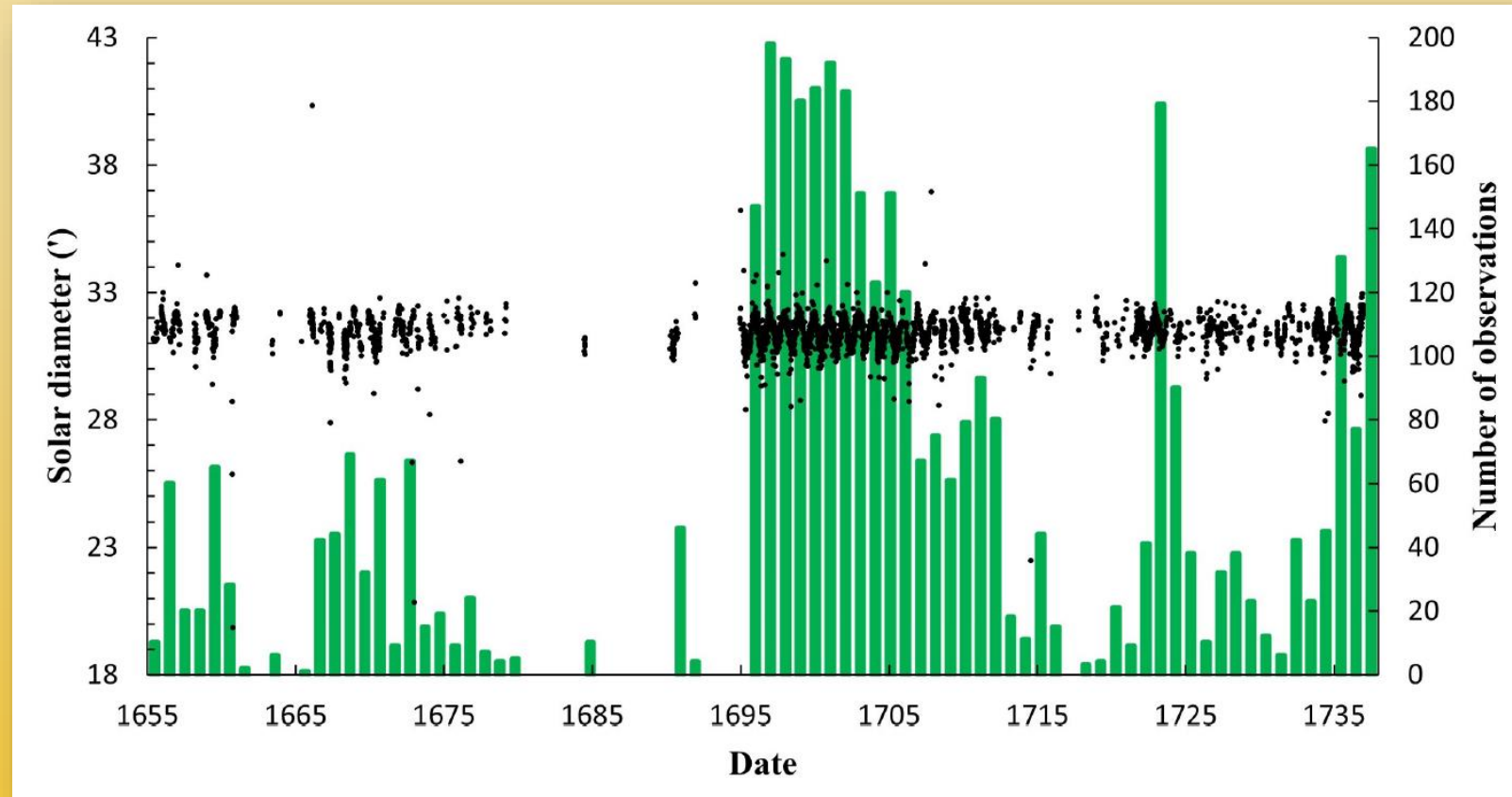
- The edges of the image of the Sun are marked and the distance between the marks is measured with the scale inscribed on the meridian and a nonius.



$$\delta = \arctan \frac{d + s}{h} - \arctan \frac{s}{h}$$

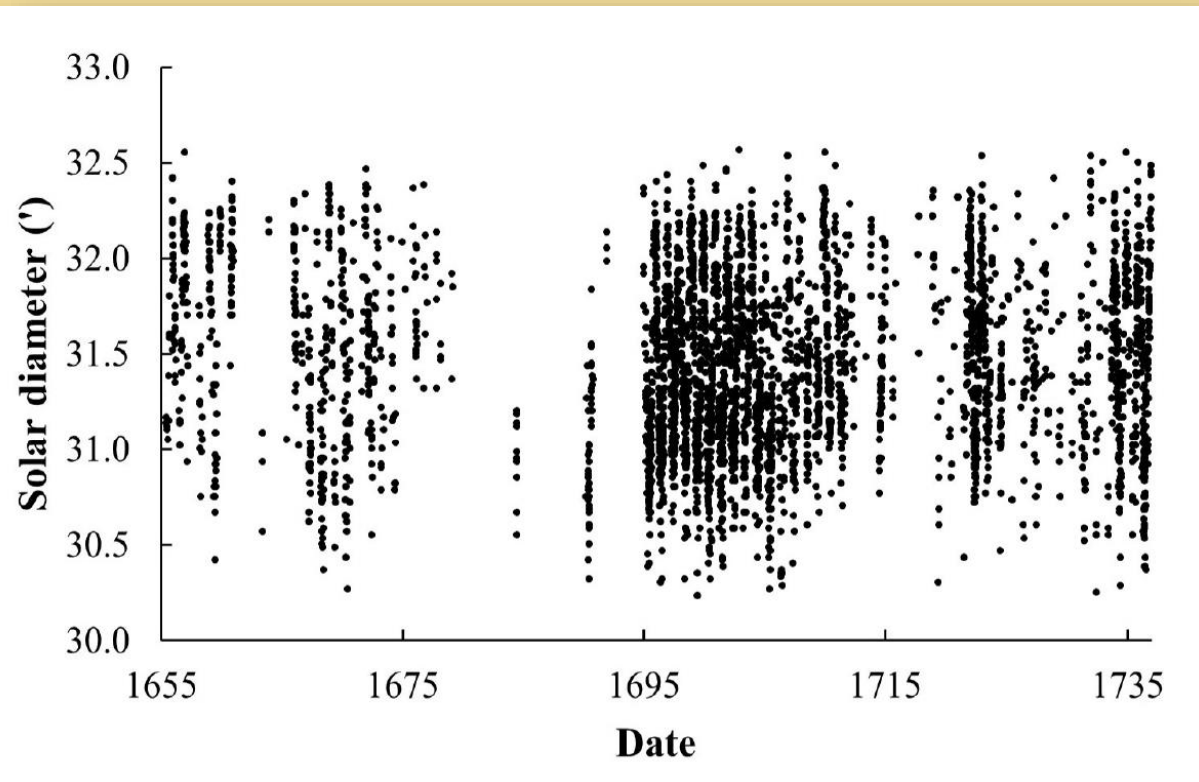
Data set

- 4033 measurements between 1655 and 1736
- Measurements are not distributed homogeneously over time
- There are outliers



Statistical analysis of measurements

- Results of the Mann-Whitney U tests for the periods 1655-1715 (sample 1) and 1716-1736 (sample 2).

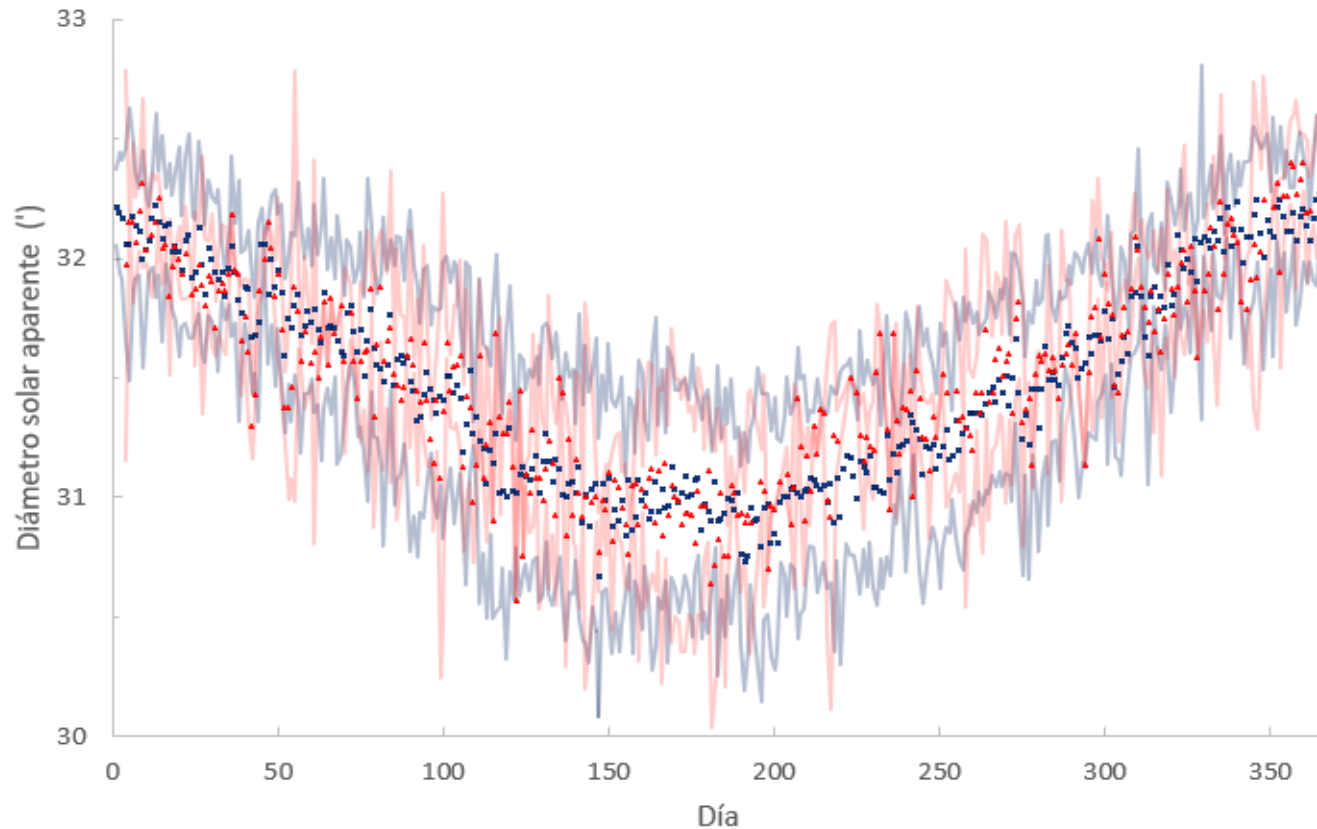


$H_0 = \eta_1 - \eta_2 = 0$	
$H_1 = \eta_1 - \eta_2 \neq 0$	
W value	P-value
5275832.5	0.000

Difference	Confidence interval for the difference	Confidence level
$-3.99''$	$(-7.00'', -0.99'')$	99%

Statistical analysis of measurements

- The mean and standard deviation are calculated for each day of the year for each period.



$H_0 = \eta_1 - \eta_2 = 0$	
$H_1 = \eta_1 - \eta_2 \neq 0$	
W value	P-value
112096.5	0.701

$$K = \frac{D_{max} - D_{min}}{D'_{max} - D'_{min}} = 0.806$$

Difference	Confidence interval for the difference	Confidence level
$-0.64''$	$(-5.21'', 3.46'')$	99%

Conclusions

- The results obtained in the present study indicate that there is no statistically significant difference in the solar diameter medians or averages of the periods.
- The difference between the calculated medians and means of the periods is around 0.6".

Acknowledgments:

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