

Telescopic sunspot observations during the last four centuries: a forgotten world heritage

José M. Vaquero 

Departamento de Física, Universidad de Extremadura,
Avda. Santa Teresa de Jornet, 38, 06800, Mérida, Badajoz, Spain
email: jvaquero@unex.es

Abstract. Sunspot observations, normally made with small telescopes during the last four centuries, should be considered a world heritage for many reasons including purely scientific aspects and other cultural and social reasons. Here, these aspects are briefly reviewed.

Keywords. Sunspots, Heritage, Literature, and Cultural Astronomy

1. Introduction

Sunspot observations, normally made with small telescopes during the last four centuries, should be considered a world heritage for many reasons including purely scientific aspects and other cultural and social reasons.

2. Science, literature, and society

The sunspot observations made by amateur and professional astronomers over the past four centuries are of crucial importance to today scientific community (Clette *et al.* 2014; Muñoz-Jaramillo & Vaquero 2019; Arlt & Vaquero 2020). They are the basis for reconstructions of solar activity. In particular, the *sunspot number* is constructed with the accumulation of these observations (Vaquero *et al.* 2016). Furthermore, the sunspot number has become the most famous time series in astronomy and statistics.

Sunspots have become an element of the culture of humanity including, for example, literature. Weiss & Weiss (1979), mention as an example the Andrew Marvel (1621–1678) satirical poem *The instructions to a painter* (published in 1689), which contains apparently the first mention in English language of the disappearance of the sunspots in the seventeenth century. Moreover, García Santo-Tomás (2014) has shown that the sunspots appear in other famous literary texts such as the satire *La hora de todos y la Fortuna con seso* by Francisco de Quevedo (1580–1645) or the moralistic novel *El diablo cojuelo* by Luis Vélez de Guevara (1579–1644). In 1641, Guevara quotes in his novel, first of all, Copernicus and Galileo, talking about the *Galileo's telescope* (the lens that Quevedo had already discussed without citing Galileo and presenting it as a Dutch invention). He also mention the *charms of Copernicus*. Quevedo only talks about the *optical tube*, an invention according him also Dutch, a long-sight telescope *that finds a spot in the Sun* (Hora de todos, 293. Ed. Felicidad Buendía: Obras Completas, Vol. I).

These works show how sunspots were quickly incorporated into European culture after their discovery with the telescope in 1610. A captivating example is the engraving (Fig. 1) that serves as the frontispiece to the work titled *Il Cannocchiale aristotelico* (The Aristotle's spyglass) by Emanuele Tesauro (1592–1675). It shows a paradoxical situation: Aristotle helps a woman to observe sunspots with a telescope.

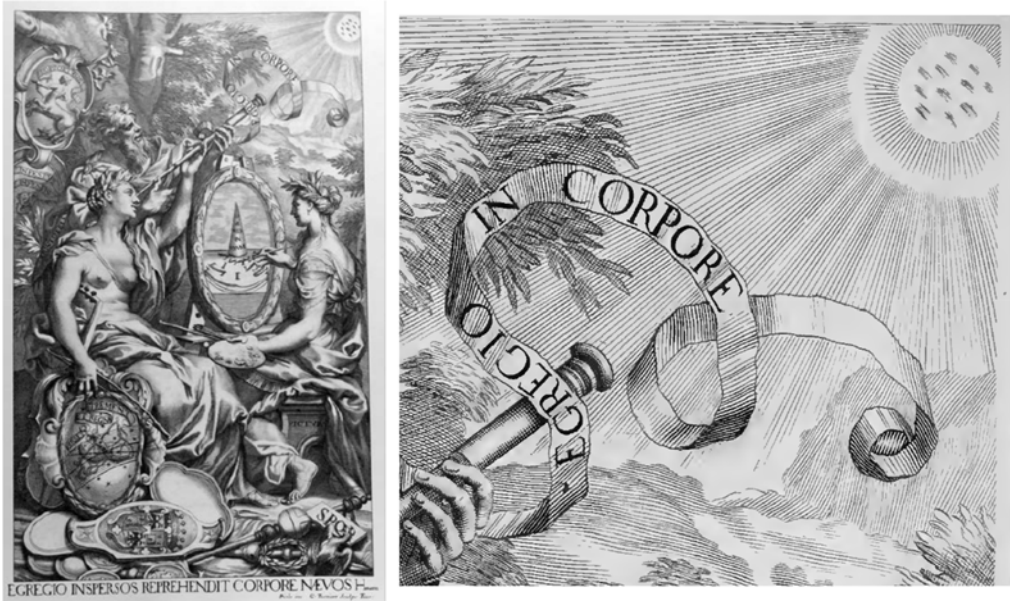


Figure 1. Frontispiece of *Il Cannocchiale aristotelico* (The Aristotle's telescope) by Emanuele Tesauro published in 1670 (and an enlarged detail). It is the second edition of this work.

Finally, these observations are essential for scientists to solve problems of greatest current interest to modern society such as space weather (Baker 2002) or climatic change (IPCC 2013) because the long-term solar activity is crucial to a better understanding our planet and the interplanetary medium (Hanslmeier 2007).

3. Conclusion

The telescopic sunspot records preserved in archives and libraries are a forgotten world heritage that the astronomical community must preserve for the future generations. Furthermore, these observations are a clear example of how astronomy influences the culture of societies (López & Giménez Benítez 2010). Finally, this heritage can also be used in the field of general education and in the teaching of astronomy in particular.

References

- Arlt, R. & Vaquero, J.M. 2020, *Living Rev. Solar Phys.* 17, 1
 Baker, D.N. 2002, *Sci.* 297, 1486
 Clette, F., Svalgaard, L., Vaquero, J.M. & Cliver, E.W. 2014, *Spa. Sci. Rev.* 186, 35
 Hanslmeier, A. 2007, *The sun and space weather*, second edition (Dordrecht: Springer), p. 315
 IPCC 2013, *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, United Kingdom and New York: Cambridge University Press), p. 1535
 López, A. & Giménez Benítez, S. 2010, *Ciencia hoy* 20, 17
 Muñoz-Jaramillo, A. & Vaquero, J.M. 2019, *Nature Astron.* 3, 205
 García Santo-Tomás, E. 2014, *The Refracted Muse. Literature and optics in early modern Spain* (Chicago: The University of Chicago Press), p. 320
 Vaquero, J.M., Svalgaard, L., Carrasco, V.M.S., Clette, F., Lefevre, L., Gallego, M.C., Arlt, R., Aparicio, A.J.P., Richards, J.-G. & Howe, R. 2016, *Solar Phys.*, 291, 3061
 Weiss, J.E. & Weiss, N.O. 1979, *Q. Jl. R. astr. Soc.*, 20, 115