Preface

The Sun is nowadays observed using different techniques that provide an almost instantaneous 3-D map of its structure. Of particular interest is the study of the variability in the solar output produced by the dissipation of magnetic energy on different spatial and temporal scales – the so-called magnetic activity. The 11-year cycle is the main feature describing this phenomenon. Apart from its intrinsic scientific interest, this topic is worth studying because of the interaction of such processes with the terrestrial environment. A fleet of space and ground-based observatories are currently monitoring the behaviour of our star on a daily basis.

However, solar activity varies not only on this decadal time-scale, as has been attested mainly through two methods: (a) records of the number of sunspots observed on the solar surface from 1610, and (b) the records of cosmogenic isotopes, such as ^{14}C and ^{10}Be, measured in tree-rings and ice-cores, respectively.

The study of the long-term behaviour of solar activity may be complemented by the study of historical accounts describing phenomena directly or indirectly related to solar activity. Numerous scientific and non-scientific documents have reported these events and we can make use of them as a proxy of solar activity in past times.

In this book we shall review these descriptions of solar activity in the past, providing, on the one hand, primary material for the history of astronomy and, on the other hand, verifying or rebuffing current ideas concerning the time variability of the Sun on the scale of centuries. We shall concentrate on documents that provide information on these topics before the discovery of photography around 1840. Modern drawings will also be included. The lower temporal limit of our study will be set by the archaeoastronomy of prehistoric sources.

The first chapter provides the necessary background on the Sun, with special emphasis on the observing techniques and the influences of the telescope and the Earth's atmosphere on the information obtained from solar observations. A list of books on solar physics is included at the end of this chapter.

Naked-eye observations offered the first possibility to distinguish certain structures, eventually called sunspots, on the apparently pure solar surface. In the second chapter we give an overview of these records and their adequacy to reveal long-term variations of solar activity.

The discovery of the telescope was a turning point in the history of science, with special impact on our knowledge of the Universe and, of course, of the Sun. For centuries the eye and the hand were combined by astronomers to produce excellent drawings of the observed solar structures, most of them on sunspots. This chapter summarizes the work of different solar astronomers until the invention of photography and its application to solar observations. These drawings can be used not only as a tool for informing us about the temporal variation of solar activity, but also to extract physical knowledge about the structures observed. The Wilson effect and the determination of solar rotation are two of these applications described at the end of the chapter.

Chapter 4 is dedicated to one of the most fascinating spectacles given by Nature, total solar eclipses. When the skies were clear, historical documents have always reported these phenomena. In the 18th century, the pioneering work of E. Halley made it possible to forecast solar eclipses with greater accuracy; this, together with the advances in navigation, enabled scientific expeditions to be carried out in order to observe these events.

Since the beginnings of astronomy, astronomers have tried to measure the relevant scales of our accessible vicinity, the Solar System. The development of trigonometry and the art of measuring small angles on the sky were essential tools for this purpose. In Chapter 5, we describe in some detail first the measurements of the solar diameter and then the transits of Mercury and Venus across the solar disk, a phenomenon that for centuries was essential to measuring the Earth–Sun distance. Nowadays, planetary transits in our Solar System are an excellent tool for calibrating current and future observations of exoplanets transiting the disk of other suns.

The mythology of several cultures of the people living in northern latitudes is connected with the aurorae, an event known to originate from transitory phenomena on the Sun. Step by step, the scientists brought this topic to the field of science, showing its relation with transitory events occurring on the solar atmosphere such as flares and coronal mass ejections.

The final aim of the present work is to complement previous studies on the reconstruction of solar activity in the past. The reference to the excellent work made by D.V. Hoyt and K.H. Schatten is our starting point. With this idea in mind, we summarize the available data in the last chapter, proposing tasks to be done in the future.

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