Editor's Note

ASSA's Director of Comets and Meteors, Tim Cooper, was very involved in locating the meteors impact site, locating the meteorite, and spent a great deal of time in doing so. Tim will produce a detailed article on his efforts in the next edition of *MNASSA* and publish his results.

Fig. 1 Meteorite from 2018LA found in Botswana desert

The Royal Observatory Rainfall Records

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Introduction

The Cape Town site of the SA Astronomical Observatory, formerly the Royal Observatory, Cape of Good Hope, is responsible for the longest set of rainfall records in South Africa, the series having started towards the end of 1841.

In its early days, the Royal Observatory was regarded as the main source of scientific information in the Cape Colony. Besides its astronomical work it provided the standard time and was the custodian of the standard set of weights and measures. It is unsurprising therefore that they also recorded the weather conditions.

In view of the current interest in climate change and the drought of the last few years in Cape Town, I thought it would be interesting to draw more attention to this long-term set of data. No great originality is claimed for this paper.

The Data

Unfortunately I have not so far found all the Observatory's own records for the whole period. Up to about the 1960s most of them are available. In fact, the average annual rainfall was published in the Annual Reports of the Royal Observatory for many years, together with the minimum and maximum months. Detailed month-by-month figures are also available in certain ledgers but earlier and later years are missing. Fortunately, data were forwarded by the Observatory to the Weather Bureau in Pretoria in a prescribed form and since 2009 the Bureau has had an automatic monitoring station on the roof of the SAAO Technical Building.

The weather bureau has kindly made the records available to me.

The database that I have prepared for use with OpenOffice Calc includes the monthly and annual figures for the whole period, with some exceptions. There are a few dates for which they are slightly incomplete but at a level that should not affect the conclusions significantly.

The average annual rainfall and its standard deviation were calculated from the database and are shown in Fig 1. A straight line was fitted and its slope and probable error calculated.

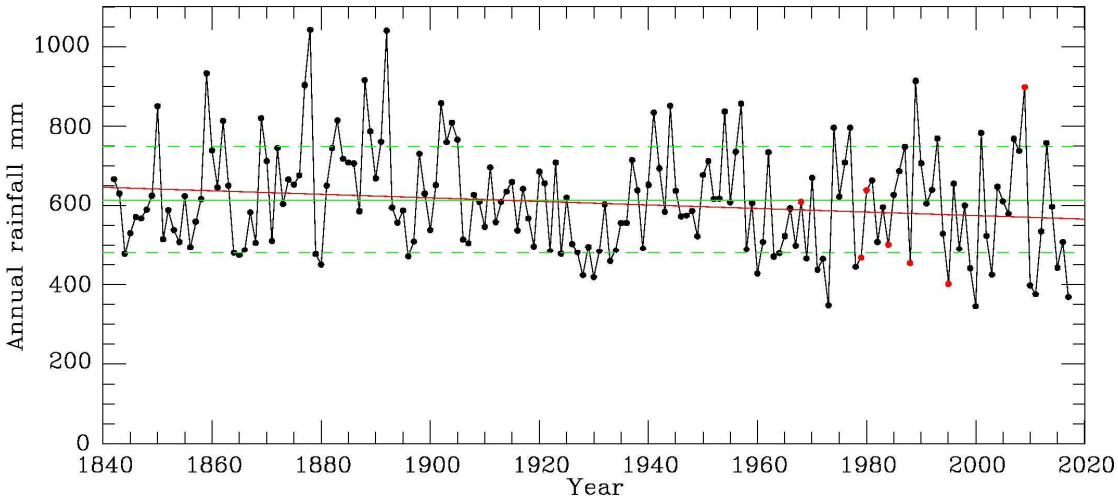

Fig 1. Annual rainfall from 1842 to 2017. Red points may be slight underestimates. The mean rainfall (solid green line) was 614 mms and the standard deviation (dashed green lines) was 135 mms. The red line is the linear regression whose slope implies an annual decline in average rainfall of -0.45±0.20 mms.

Fig 2 shows the monthly averages and their standard deviations as well as the figures for the wettest and driest years since 1842.

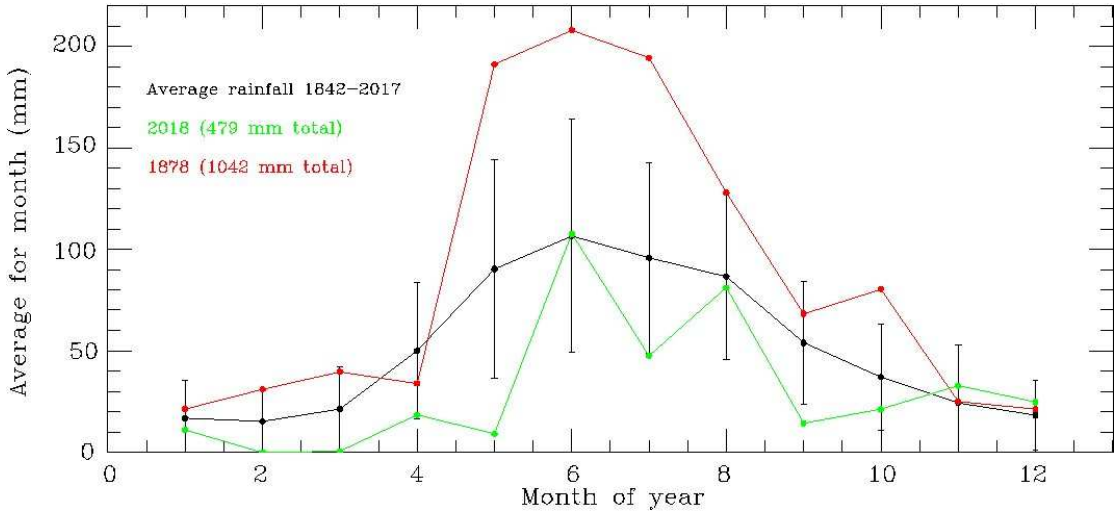

Fig 2. The average monthly rainfall and standard deviations of the individual monthly numbers. Also given are the figures for the years with the highest (1878) and lowest rainfalls (2017)

Discussion

The average annual rainfall at the Observatory over the past 176 years has been 614 mms. One might not expect this figure to be representative of the entire city because of the effects of Table Mountain and other geographical factors. However, please see the last paragraph of this section.

The wettest month on average is June. However, as the standard deviations show, the year-to-year variations are huge and probably reflect the fact that rainfall is often dominated by a small number of heavy storms, of which only one or two might fall in a particular calendar month.

The years 1878 and 1892 had rainfall of over three standard deviations greater than the mean! The highest rainfall in any single month was recorded in 1877 May, with 342 mms.

Intervals of several years of below-average rainfall are not unusual. Especially from 1925 to 1934 every year was below the mean. However, in recent years there have been more years than usual with rainfall almost two standard deviations below the mean.

It appears that there has been a slow decline in the rainfall amount on average. The linear regression suggests a long-term decrease of 0.45±0.20 mms per year, at least taken over the past 176 years. Obviously this rate of decline could not have persisted for millennia!

Some of these data have been discussed by Koopman, A. and de Buys, A., (2017) in conjunction with data from other stations in the general area. They also make the point that the recent drought is not as severe as that in 1925-1935. The main theme of their paper is that water storage in the city's dams has not kept up with the population increase in Cape Town and its surrounds.

The study "August 2004 Severe Storm Assessment" (2005; see references) discusses, in addition to the effects of the 2004 event, possible changes in the monthly distribution of rainfall over time, again relying on the Royal Observatory/SAAO data. The extreme variability of the year-to-year and monthly figures make these changes rather dubious. This study also gives rainfall figures for various weather stations around the Cape Peninsula with records exceeding 15 years, showing that the Observatory rainfall is only marginally higher that for most of the other suburbs.

Acknowledgments

I thank Abri de Buys (SA Environmental Observation Network) and Elsa de Jager Manager National Climate Centre, SA Weather Service for supplying data and other information.

Koopman, A. and de Buys, A., (2017). What do long-term data reveal about Cape Town's water shortage?
http://www.saeon.ac.za/enewsletter/archives/2017/october2017/doc01

August 2004 Severe Storm Post Flood Assessment, prepared by The Disaster Mitigation for Sustainable Livelihoods Programme (DiMP), University of Cape Town, May 2005.
http://www.riskreductionafrica.org/assets/files/CoCT2004_Complete%20Report.pdf

News Note: MeerKAT observes a rare burst of activity from a Magnetar

South Africa's MeerKAT radio telescope recently observed a rare burst of activity from an exotic star, demonstrating its outstanding capabilities as a new instrument for scientific exploration.

An article published today in the *Astrophysical Journal* presents the study of a magnetar -- a star that is one of the most magnetic objects known in the universe -- that awoke in 2017 from a 3-year slumber. Radio observations that could only be made with MeerKAT triggered observations with NASA X-ray telescopes orbiting the