

# Thunderstorm distribution and frequency in Saudi Arabia

M H Shwehdi

Electrical Engineering Department, King Fahd University of Petroleum & Minerals, Dhahran, 31261, Saudi Arabia

E-mail: [mshwehdi@kfupm.edu.sa](mailto:mshwehdi@kfupm.edu.sa)

Received 10 December 2004

Accepted for publication 20 July 2005

Published 16 August 2005

Online at [stacks.iop.org/JGE/2/252](http://stacks.iop.org/JGE/2/252)

## Abstract

A new average annual thunder day map for Saudi Arabia is presented. Based on this map, the distribution of thunderstorms over Saudi Arabia is analyzed in terms of the factors related to the lightning performance of transmission lines such as thunderstorm days per year (Td/yr). Lightning activity continues for the present to be represented by thunderstorm frequency, which is routinely recorded at meteorological observation sites. Thunderstorm occurrence at a particular location is usually expressed as the number of days in a calendar year when thunder was heard, averaged over several years. This paper examines thunderstorm days in different areas of Saudi Arabia and specifically those areas where lightning strikes are more frequent; or this purpose, the software ArcGIS is used to produce contour maps which demonstrate areas of concern in Saudi Arabia in the period 1985–2003. Establishing the annual and seasonal Td/yr for Saudi Arabia enables transmission and distribution line engineers to calculate and better design a lightning protection system. Maps of thunder days/year (Td/yr) are constructed on the basis of the database records available on lightning incidence in Saudi Arabia at the Presidency of Meteorology and Environment (PME) (<http://www.pme.gov.sa/>). annual thunderstorms are most frequent over the southwestern parts of the country, and generally decrease towards the west and east. Due to its low latitude and less temporal change, the west coast of the Red Sea recorded the lowest Td/yr. A secondary maximum Td/yr is apparent in the southeast to central part of the country. Thunderstorm frequency does not, in general, appear to vary in any consistent way with rainfall. There appears to be no evidence of any widespread temporal trend in thunderstorm frequency. The southern region in general, and especially the cities of Abha, Taif and Al-Baha, has shown greater numbers of thunderstorm days all year round. Similarly, this variation did show higher frequency throughout the year. The development of lightning incidence and the counting of Td/yr, as well as the establishment of annual and seasonal lightning maps of Saudi Arabia, are initiating a new era of producing and archiving thunderstorm maps and data records which serve the PME, the utilities, industry and the public.