

LIGHTNING-RELATED FATALITIES AND INJURIES IN TURKEY

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I. INTRODUCTION

In Turkey, a big portion of loss of lives and injuries related with convective storms occurs due to lightning, as it is in many parts of the globe. 24,000 casualties and 240,000 injuries from lightning per year is estimated globally (Holle and Lopez 2003). A research including data from 1997 to 2009 for China shows that fatalities and injuries per million people per year are 0.31 and 0.28, respectively (Zhang et al, 2011). Another study argues that 9-10 lightning-related deaths and 92-164 injuries occur every year in Canada (Mills et al, 2008). In USA, for the period of 1959-2006, it is suggested that around 76 people on average die due to lightning, with a decrease in time (Ashley and Gilson, 2009). What is more, Salerno et al. assert that lightning fatality rates in Malawi are higher than other countries, with 84 deaths per million people per year (2012). Another extreme, 15.5 people per million per year rate is suggested for Swaziland with a dataset including years 2000-2007 (Dlamini, 2009).

In this study, authors aim to present preliminary results for lightning-related fatalities and injuries in Turkey, using available data from various sources, between 1939 to 2012.

II. DATA

To create a database on lightning related fatalities and injuries in Turkey, station reports from Turkish State Meteorological Service (FEVK), newspaper archives, daily internet media and European Severe Weather Database (ESWD), eswd.eu, were searched. 289 records are obtained from sources and contributions from these are given at figure 1. Known lightning incidents resulted in 350 casualties, 228 seriously injuries and 62 other injuries from 1939 to 2012.

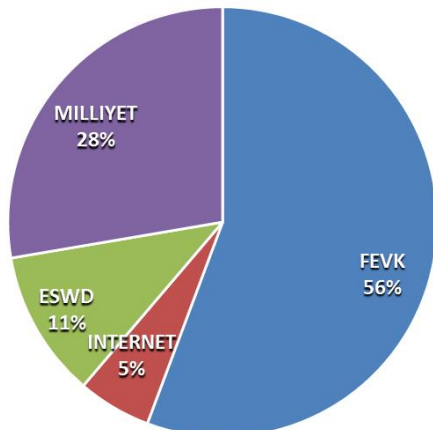


FIG. 1: Sources of records.

FEVK observations of Turkish State Meteorological Service are basically severe weather reports from all climatological stations including the information of phenomena and damage on human and properties. These observations are stored in Turkish State Meteorological Service headquarters as hardcopies since 1939. Pdf and jpeg formatted FEVK records are obtained and searched for lightning related ones. This database is not homogeneous and challenging to handle. Process of going through FEVK records is still going on, and data between 1979 and 1996 are missing in the current study. Figure 2 shows an example FEVK record page.

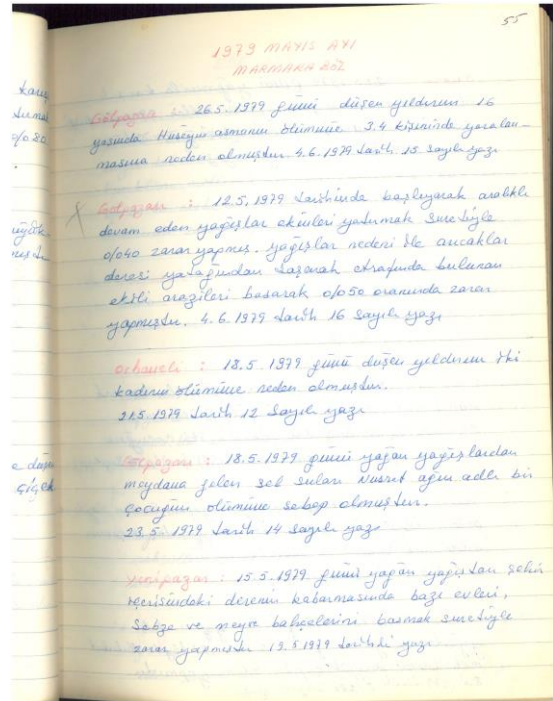


FIG. 2: An example FEVK record page.

Archive of national newspaper Milliyet is also explored for lightning events (Milliyet archive, 2013). This archive includes news between 1950 to 2004. Besides, internet searches and lightning related data from ESWD (damaging lightning phenomena is introduced in ESWD in 2011) are used to enrich the dataset.

Figure 3 shows the number of incidents per year for current dataset. Since our dataset is not homogeneous throughout the period, it is not possible to talk about the incident trend.

With the inclusion of the internet sources and ESWD records, there are 35 incidents in 2012 which is far higher than other years.

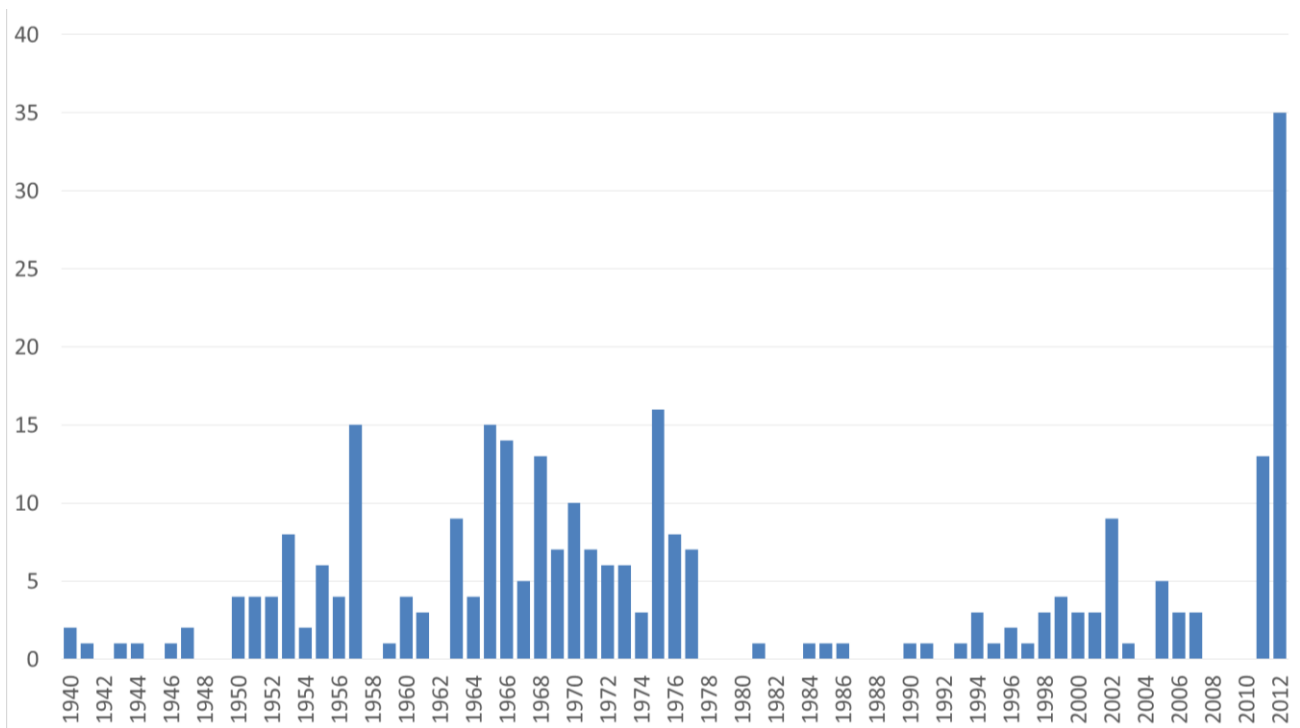


FIG. 3: Number of records per year.

III. RESULTS AND DISCUSSIONS

Monthly and diurnal distributions of the records and some other aspects of the incidents are analysed. Monthly distribution of lightning fatalities and injuries show maxima at late spring and minima at winter months, with a sharp peak at May (Figure 4). Number of records at this month is around 90, which is approximately one third of all records.

Between 12 and 18 local time is the most frequent part of the day according to 86 records with time information (Figure 5). More than half of the incidents take place at these hours. Figure 6 shows the rural/urban distribution of records with relevant information. Within 155 records having this information, 18% of incidents occurred over urban areas and 82% over rural areas. 23 of the incidents occurred in the farms with 36 casualties, 16 seriously injuries and 15 other injuries. Approximately one tenth of the victims (32 casualties, 10 injuries) were shepherds, which contribute to the rural occurrences. A common behaviour during intensive rain and hail events, hiding under a tree resulted in 32 casualties, 8 seriously injuries and 38 other injuries due to lightning struck on trees. Surprisingly, 17 of the records are about in-building incidents with 12 casualties, 7 seriously injuries and 44 other injuries. There are two incidents with lightning struck on cars causing 5 fatalities and 1 injury. A horseman and his horse were killed around Sanliurfa in 17 May 1965. There is another incident caused by lightning struck on a fishing boat which took place in Dilburnu, Yalova in 21 August 2001 with 1 fatality and 1 injury.

Population of Turkey increased rapidly between 1939 to 2012, from 20 million to over 75 million (TUIK, 2013). Total fatality is 24 persons in 2012, which means approximately 0.32 per million per year. Due to the unrepresentativeness of the historical data and missing records, it is not possible to state average mortality rate, yet.

Peak of the incidents on late spring show a consistency with the severe storm climate of the country, as

the large hail and continental tornado frequencies increase in Turkey around May according to previous studies (Kahraman et al., 2011 and Kahraman, 2012). Another reason of this peak can be increasing human activities at open-air in this season, with agricultural and shepherding purposes.

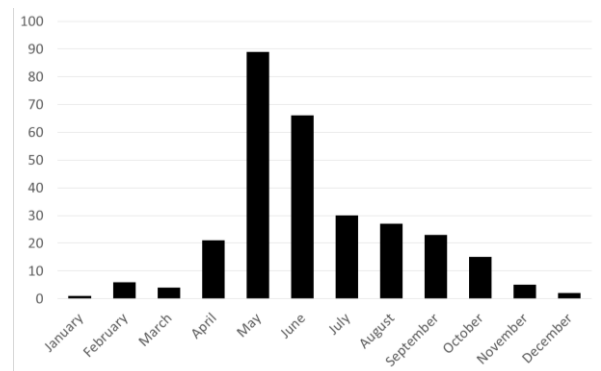


FIG. 4: Monthly distribution of records.

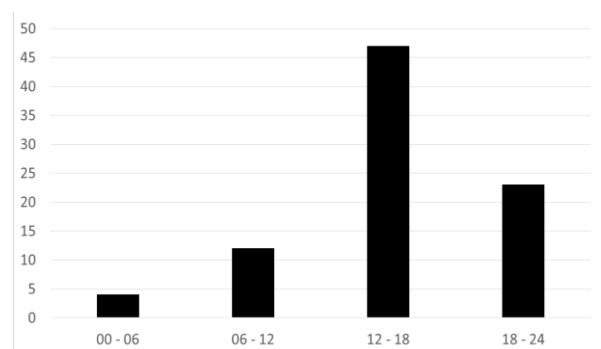


FIG. 5: Diurnal distribution of records.

Zhang W., Meng Q., Ma M., Zhang Y., 2011: Lightning casualties and damages in China from 1997 to 2009. *Nat Hazards* 57:465-476.

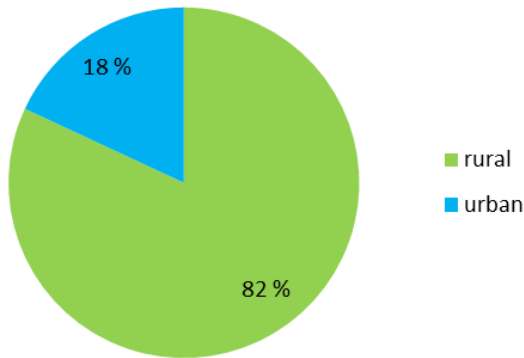


FIG. 6: Rural/urban distribution of incidents.

As future work, missing data from FEVK observations, as well as other newspaper archives such as Cumhuriyet archive will be searched for other incident records, and will be added to the dataset. Online news agencies as well as other sources from insurance companies, hospitals etc. can also be added to this study. Geographical distribution of the incidents will be examined and regional characteristics of the incidents will be investigated.

IV. ACKNOWLEDGMENTS

The authors would like to thank Turkish State Meteorological Service, volunteers, journalists and ESWD (European Severe Weather Database), for the lightning records.

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