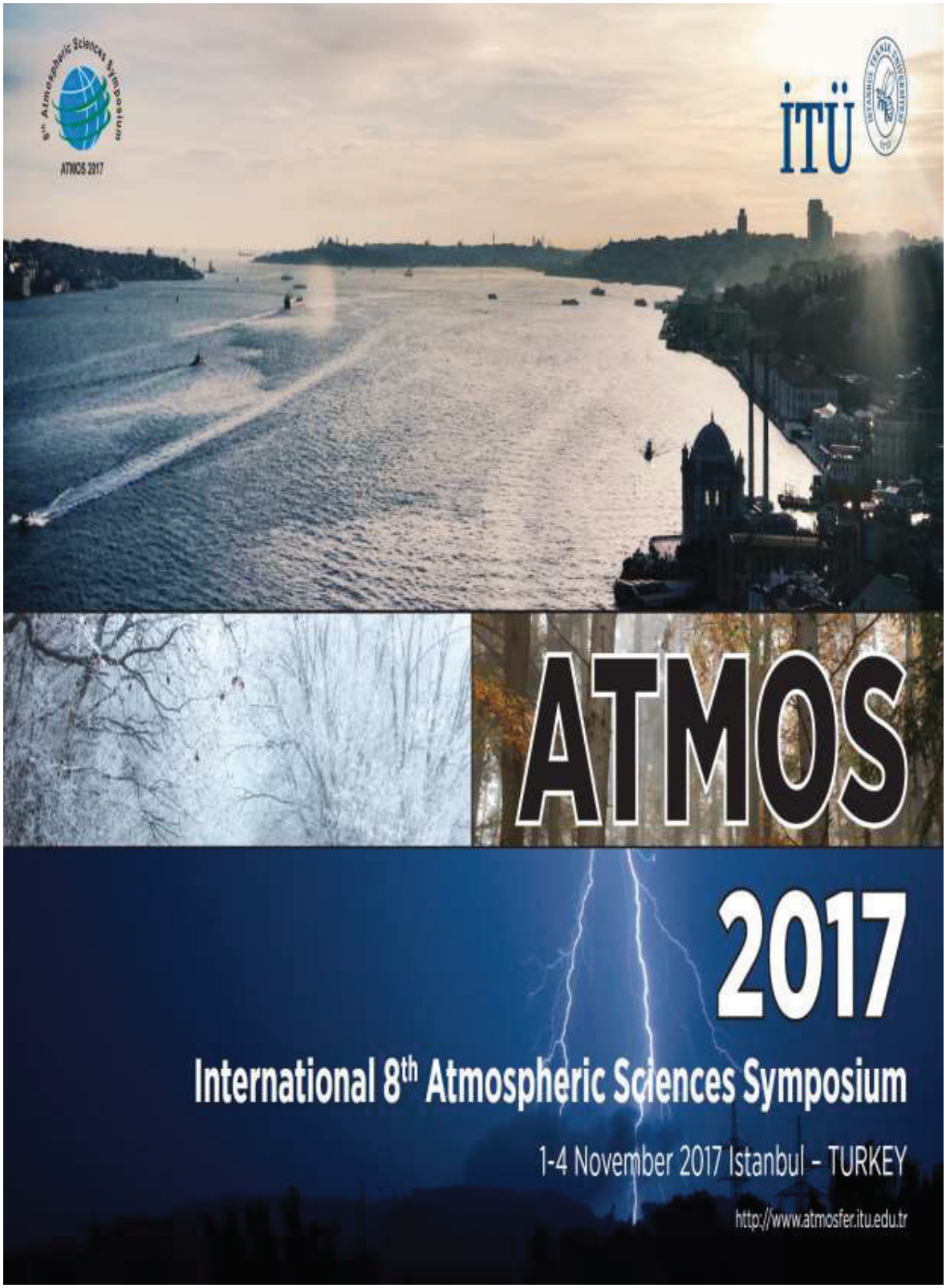
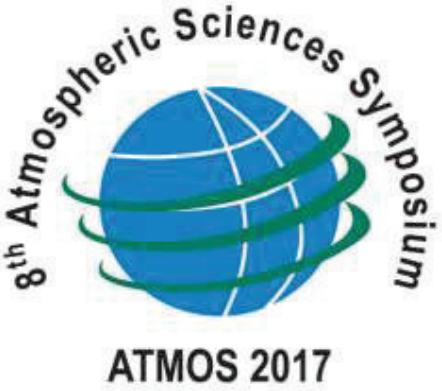

ATMOS
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8th Atmospheric Sciences Symposium
ATMOS 2017

PREFACE

This 8th Atmospheric Sciences Symposium; ATMOS2017 built upon the series that began at Istanbul Technical University, Department of Meteorological Engineering in 1981. Subsequent meetings have been held in 1991; 2003; 2008; 2011; 2013 and 2015 in Istanbul, Turkey.

And it is not just enough to produce scientific data for people but it is also necessary to process the data and share the results of those data as a source for students and a starting point for all researchers, users and policy makers, it is a treasure for mankind.

We are very greatful and thankful to all the valuable researchers, session chairs and all participants who have contributed to ATMOS2017 from all around the world, whose valuable contributions made this event possible.

This e-Proceedings present a collection of 112 papers presented at the Symposium. The main themes covered in the Symposium include;

Agricultural and Forest Meteorology
Air Pollution and Modeling
Air Quality and Modeling
Air-Sea Interactions
Atmospheric Boundary Layer
Atmospheric Dynamics
Atmospheric Environment
Atmospheric Physics
Atmospheric Radiation
Aviation Meteorology
Biometeorology, Medical Meteorology
Causes of Climate Change
Chaos and Non-Linear Dynamics
Climate Change Impacts
Climate Change and Modeling
Climatology
Data Analysis
Extreme Weather Events (flood, storm, avalanche, drought …)
Hydrology and Hydrometeorology
Maritime Meteorology
Meteorological Disasters
Micrometeorology, Mesometeorology
Numerical Waether Prediction
Physics of Cloud and Precipitation
Remote Sensing in Atmospheric Sciences
Renewable Energy Sources
Solar and Wind Energy
Stratospheric Ozone
Solar and Climate System Interaction
Transportation Meteorology
Upper Atmosphere, Ionosphere
Magnetospheric Physics
Urbanisation Meteorology
Water Resources and Management
Weather Analysis, Prediction and Modeling

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Dr. Orhan ŞEN - Dr. Ceyhan KAHYA
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METEOROLOGICAL STATIONS AND METEOROLOGICAL SERVICES ESTABLISHED DURING THE FIRST WORLD WAR IN THE OTTOMAN EMPIRE

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ABSTRACT

As the Ottoman Empire entered war with Germany during World War I, the Germans did not ignore the importance of meteorological conditions and stated that a meteorological observation network should be established in the Ottoman state. Within this framework, a meteorological organization was established in Istanbul under the name of "Kuvva-i *Havaiye Müfettişliği Rasadat-ı Cevviye Müdürlüğü*". Professor Ludwig Weickmann, head of the organization, had brought with himself sixty German experts to be able to operate meteorological stations in a short period of time. Those experts were the first members of the established meteorological organization. Turks who served as reserve officers in the Ottoman Army were assigned to these experts. In some of the installed meteorological stations, pilot balloon observations for aeronautical and artillery purposes were made, while hydrological observations have been made at the stations in river and water basins. The meteorological measurements made in Germany, Austria-Hungary, Bulgaria and Ottoman territories were first sent to Istanbul, then to Sofia, Vienna and Berlin as encrypted priority with the help of radio and telegraph. In Berlin, the experts were working on these maps to prepare weather-forecasts, and the estimates were still coded in Vienna, then in Sofia and Istanbul. Two main centers were established in the Ottoman Empire. One of them was Istanbul, and the other was Jerusalem Meteorology Center. These centers were institutions where both military and climate climatological observations were collected and evaluated. With the capture of Jerusalem by the British in 1917, Istanbul continued to operate as the only meteorological center until the end of the war. The meteorological observations made in the Ottoman Empire during the First World War were also compared with the observations made in the surrounding countries, and the determination of the climate of the Ottoman lands has been tried. The records have been kept in Ottoman and German languages and have undergone very little evaluation so far. One of the most important negative reasons for this is that researchers do not know the Ottoman language and not access to a significant part of German records.

Key Words: *Ottoman, Germany, First War, Meteorology, Istanbul, Jerusalem*

THE FIRST METEOROLOGY SERVICE IN THE OTTOMAN EMPIRE

Weather conditions have played many roles both in favour of and against the armies in world history. The European Hun Emperor Atilla was construed as "God does not want Rome to be captured" because of a thunderstorm that suddenly occurrence of a storm and deafened ears while he was capturing the Rome, however due to those meteorological conditions Atilla abandoned from this encirclement. By the ending of the Second World War, there was a stormy, extremely rainy weather in Normandy. This weather condition was against the Germans, however favouring the running ally. Accordingly, the German-Italian bloc was defeated on all fronts in Europe, and on 7 May 1945 it was announced that the war in Europe was over. As the Ottoman Empire entered war with Germany during World War I, the Germans have not ignored the importance of meteorological conditions and established a meteorological observation network in the Ottoman state.

The meteorological service in Istanbul started its activity in August 1915, under the name of "Kuvva-i Havaiye Müfettişliği Rasadat-ı Cevviye Müdürlüğü" at Caferağa Mansion in Kuruçeşme. Professor Ludwig Weickmann (Figure 1) who was the first manager of the meteorology service has brought sixty German meteorology experts for establishing the organization of meteorology service in the Ottoman state. The related experts were the first members of this meteorology organization. In addition to these German experts, many Turkish officers in the Ottoman Army were selected to work in the meteorology service. Throughout the war, Professor Ludwig Weickmann and his assistant Dr. Erich Obst were the managers of this centre (Niyazi and Obst, 1932).



Figure 1. The first Military Observation System in the Ottoman Empire was founded by Professor Ludwig Weickmann.

These reserve officers were trained in meteorology at the Ottoman-German General Headquarters in Istanbul.General, Fatin (Gökmen) have given courses at Headquarters. Fatih Gökmen was the founder who changed the Kandilli Observatory to serve as an earthquake research institute. The reserve officers who completed their training started to work at meteorological stations established by the German state. These stations are Edirne, Gallipoli, Izmir, Seydiköy, Zonguldak, Sinop, Ankara, Eskisehir, Konya, Sivas, Diyarbakir, Adana, Brumana, Beirut, Jerusalem and Mosul (Atabay and Aytaç, 2002).

METEOROLOGY SERVICE DURING THE FIRST WORLD WAR

The first meteorological forecasts were made by processing the maps those constructed by the observations gathered from these meteorological stations, and in addition the cryptographic observations from Bulgaria (October 5, 1915), Austria-Hungary and Germany, which were allied by the Ottoman Empire (Atabay and Aytaç, 2002).

Erich Obst was born in Berlin on June 13, 1886, studied geography and geology at the University of Yena and Breslau, and became associate professor in 1910 in Hamburg. He studied in East Africa in 1910-1912 and worked as a professor of geography at Marburg University between 1912-1915. When World War I started, Istanbul Darülfünun was assigned to the Department of Geography and remained in Istanbul until 1918 and later resumed his studies at Breslau University and later at Hannover University in Germany. Professor Obst analyzed the meteorological data obtained from the military meteorological

stations established in the Ottoman Empire during the war by analyzing the weather maps and wrote a book called "Turkey and European Climate"(Niyazi and Obst,1932).

Professor Ludwig Weickmann focused on the location, information exchange and working conditions of the military meteorological stations to be established during the war in the Ottoman Empire. The military meteorological stations established by Professor Ludwig Weickmann included barometer, barograph, psychrometer, hygrograph, maximum and minimum thermometers, rain gauge (pluviometer) and anemometer. The observations were made with these instruments three times a day at 07.00, 14.00 and 21.00. Moreover, in İstanbul Vaniköy, Edirne, Gelibolu, Seydiköy, Adana and Jerusalem, high-level wind measurements were taken from ground level to 6,000 meters. For these measurements, the balloon filled with hydrogen gas and a theodolite seen in Figure 2 were used to follow the balloon (Atabay and Aytaç, 2002).



Figure 2. Theodolite used for pilot-balloon observations during the war.

During the First World War, German experts Aladar Guerle had made valuable work on the Red River and its vicinity, and Erich Leward in Edirne and the Balkans on the weather events. In addition, some German meteorologists lost their lives during the war. For example, Kurt Niehoff, who is responsible for the inspection of meteorological stations and Karl Klingebiel, the manager of Zonguldak Meteorological Station, died because of the febrile diseases seen in Turkey (Atabay and Aytaç).

The observations made in Germany, Austria-Hungary, Bulgaria and Ottoman territories were first transmitted to Istanbul, then to Sofia, Vienna and Berlin as first priority and scrambled by radio transmission. Experts in Berlin were preparing maps of the weather and their forecasts were again encrypted and then delivered to Vienna, then to Sofia and Istanbul. These estimates were sent from Istanbul to the Army Commands in the Ottoman territory and necessary measures were taken.

Undoubtedly, one of the most effective weapons during the war of Çanakkale was the artilleries. It was necessary to know the meteorological conditions on the route followed by the artillery to increase the performance of the hit rate to the target during the artilleries' shoots and to adjust the ball side / ascend angles considering these parameters. The effect of meteorological factors in the effective range of various calibres is so small that it cannot be ignored. In a survey conducted, the effects of factors affecting artillery shooting are seen in Table 1.

Table 1. Factors affecting of the artilleries (Atabay, 1997)

Factors	15 Km (%)	25 Km (%)	35 Km (%)	45 Km (%)
Initial velocity	36	38	44	40
Meteorological factors	52	47	35	32
Ammunition specifications	6	13	20	28
Other	6	2	1	< 1
Total	100	100	100	100

The use of general meteorological information during artillery has encountered the following problems:

1. Meteorological information cannot be obtained at sufficient frequency for artillery shooting
2. The absence of meteorological data in the operation area,
3. The fact that meteorological information reaches fire control systems,
4. The centres where the meteorological information is received are far away from the operation area (Atabay, 1997).



Figure 3. In 1915, a Turkish soldier and a German military pilot were conducting meteorological balloon observations in Gallipoli.

In Gallipoli, balloons were thrown every morning and noon every day, and high winds were detected, and this information was the most important information for both the launching of artilleries and the up and down of planes (Figure 3). Undoubtedly, the most important date in terms of weather conditions during the Gallipoli Wars was 25-28 November 1915. This date was also the most important factor in their decision to evict the enemy of the Gallipoli peninsula.

What happened on this date, which was the turning point in the process that led the enemy out of Gallipoli? A low pressure and rainy weather over the Mediterranean will affect the environment around Çanakkale and Istanbul, winds will be in the form of a southwest, and a day later they will return to the open sky and then the stars and pavilions and then the air would cool down quickly. When this information was reached from Istanbul to the 5th Army, the weather was very beautiful in Gelibolu and Çanakkale. It was like a day of summer. Nobody paid much attention to this information. After lunch on November 26, 1915, the weather began to cloud, and the wind gradually began to increase in speed and turned into a storm around 4 pm. The torrential rain that started towards the evening began to worsen after the dark pillow.

Thunder and lightning struck all over. The floods come with the rain, suddenly filled the trenches and shelters. The arrival and departure times were covered with water. Soldiers, animals floated. The goods drifted and disappeared with floods. Small Anafarta Plain, all the trenches on both sides of Azmak were flooded. All the shelters were destroyed. Many drowned in the seller. Most of the men had to leave the trenches to go up to the high places and fell into despair.

The two enemy sides have struggled to rescue themselves in the face of this common catastrophe, and they have stopped fighting. The guns and tools were left under water and sand. There were summer dresses on Turkish troops who did not expect such an event and felt the heat of the southwest wind during daytime. Soldiers get soaked in their underwear (Genelkurmay, 2012). Mustafa Kemal wrote in his notebook of -The Chief of Staff Major Izzettin Bey- "It was a great rain at night." (Çalışlar, 1993). The water on the front and the trenches invaded the water and the soldiers had a great deal of trouble. The precipitation continued November 26, 1915 and the weather was getting colder. Especially the 18th and 59th Regiments in Azmak and the 36th Regiment in Anafarta Plain gave great losses. Because of the storm in the sea, no ship came to shore. No food and aid material could be brought to land. The animals opened. Pertev Pasha had gone to the 7th, but he was so wet that the 11th Bottom had to take shelter (Çalışlar, 1993).



Figure 4. The snow stack on November 27, 1915 at Conkbayir on the Çanakkale Front

On November 27, the morning air opened but there was such a cold weather that no one could stand outside (Figure 4). The clothes of all of them were wet. At the same time, the Austrian Artillery Battalion threw a few shoots to the enemy. Easterly wind has become increasingly violent. The Turkish soldiers in the plain were replaced with unit reserves. The disease has started. 27/28 November 1915, the night began to snow with a violent storm. The snow storm continued until the evening of November 28th. The temperature fell to -10 degrees in the night. Thousands of Turkish soldiers were sick with rain, followed by violent cold, followed by a snow storm, and frozen to death.

Between 25 and 28 November 1915, 11 soldiers were drowned in the 11th Army of the troops of the Anafartalar Group Command due to bad weather conditions and 17 soldiers were frozen. In the 12th division, the total number of died soldiers was 37, the number of martyrs who were frozen was 165, and the number of those who were stranded and lost was 147. The situations in the 9th division were very pain: 9 soldiers drowned, 37 soldiers frozen, and 86 soldiers have been lost. In the 6th division, 5 soldiers were drowned, 29 soldiers froze, and 22 soldiers lost

their lives. A total of 556 soldiers were cold and martyred (Genelkurmay, 2012). This corresponded to about 1% of the Turkish martyrs during the Gallipoli Wars (Moorehead, 2002). Because of the snow storm, the airplanes in Gallipoli were under the snow (Oglander, 2005). The snow was piling up with the wind and it was over 1.5 meters above the ground (Genelkurmay, 2012).

When the intensity of the wind decreased on November 30, the British had made a census. Entente Army lost 1/10 of your power. More than 5,000 soldiers from enemy troops were frozen and 2000 people were drowned. According to Hamilton's report: 12,000 soldiers from the Anafartalar Front and 2,700 soldiers from the Arıburnu Front, a total of 14,700 soldiers got sick.

During the Çanakkale War, the date of 25-28 November 1915 was a turning point, since the enemy made his final decision after this disaster: "Winter will not be passed in the Gallipoli Peninsula. The salvage will begin in ten days ". After the 26th of November, all the pontoon and alcoves in Anzac were sent to İmroz to get rid of the approaching storm. But from the ships that saw the breakwater, the ship in the middle was destroyed by the impact of the storm. The violent sea overflowed into the koya and began to hit the piers and docks. and all the water droplets and a torbidobot were either completely sunk or landed. At Anafartalar Port, which is sheltered against the north winds, the pontoon and scaffolds survived with little damage compared to the others.

On the other hand, Anzac and Seddülbahir were filled with water. There were so many casualties from the small transport facilities that even if the weather continuing good, there was no way to evacuate the three shores at the same time. Because of this three-day storm, a cycle of suffering for soldiers in the trenches began. The heavy thunderstorms that started after the November 26th lunch lasted 24 hours and even affected the soldiers' bones. The rain has suddenly turned into a snowfall. Two nights after this snow storm came the violent frost (Oglander, 2005).

Through the sheltered places that were completed during the summer months in Anzac, the military troops could find shelter from this storm. The hills surrounding the Anzac first line fenders protected part of the soldiers from the storm. The number of illnesses increased, especially among the Indian troops. Even in Seddülbahir, the soldiers were less affected by the storm when the trenches were located on the sloping terrain. The 9th British Corps in Anafartalar was the most affected troops. The troops on the Kireçtepe were completely exposed to the violent storm. The low-ranking soldiers were totally influenced. The dry and thirsty Anafartalar Plain flooded. Especially in the trenches near Azmakdere in the south, floods and muddy waters flowed in the trenches located at a few feet high, and the Turks who were saddled with floods, came to the English trenches. The trenches became unstoppable. In the trenches, the soldiers of the 29th division had to step backwards to the top of the trenches. The war has stopped for both sides.

The nights of 27-28 were two fearsome and troublesome nights in the entire Anafartalar. Many soldiers drowned on the front line. The extreme cold following the storm broke the health of the soldiers. Outside the Anafartalar Plain, those who went to the beaches lost their lives by freezing cold. All the warehouses, hospital tents, ammunition tents, briefly all the covered places became shelter for the people. The 86th division was completely out of the war. The doctors were desperate in disaster. Oglander has written those days as "it was not even possible to give soldiers hot food or even drinks." (Oglander, 2005). Meanwhile, all the excess material

was sent to Mondros, which included winter clothes. After 5000 soldiers had frozen and 2000 drowned, the sun came out on November 30, 1915 (Genelkurmay, 2012). The weather was clear, and the sea was stagnant. Important meteorological observations and services were also provided during the war in military meteorological stations established on other fronts than the Çanakkale Front.

In particular, the most noteworthy issue between 1915 and 1917 was the fact that a study on sudden pressure drop in barometers was made. The meteorological information obtained at Military Meteorological Stations in Edirne, Istanbul, Gallipoli, Zonguldak, Sinop, Giresun, Trabzon, İzmir, Antalya, Adana, Beirut, Jerusalem, Eskişehir, Ankara, Konya, Sivas, Diyarbakir, Mardin, Diagrams and maps were worked on regularly to establish a link between the effects of weather events on the stations (Figure 4).

The information obtained was published in monthly bulletins both in Ottoman (Turkish alphabet of Arabic origin) and German regularly. The names of the bulletins are "Memalik-i Osmaniye Military Rasadat-ı Miye Majması = Military Meteorology Magazine in Ottoman Territories". Between 1915 and 1918, these bulletins gave us valuable information about the meteorological conditions of the Ottoman country. Again, the forecast maps provide us to learn the meteorological conditions of the Mediterranean terrains, the Balkans, the North African coasts, the Anatolian and Basra Gulfs and the Gulf of Aden, starting with Spain in terms of navigation of air masses.



Figure 5. A Turkish soldier under snow on the Galician (Galiçya) Front

In 1918, the meteorological data obtained from Jerusalem and Baghdad was not seen in the bulletins because those places had been captured by Britishes. The most important issue that was observed in the military meteorological stations established in the Ottoman lands during the First World War and published in the bulletins was the thunderstorms. Actually, the records of all stations were given in the form of a table of daily thunderstorm days every month from 1915 to 1918. Another important issue was the presence of dust storms in meteorological bulletins observed in the south-eastern provinces of Anatolia, Syria and Iraq. For example; in the first week of January 1918, after a lunch in Mardin a powerful dust storm has suddenly started, and in the shortest time the dust even has entered the smallest holes, and Mardin's horizon has turned into a hell-like image. The vehicles have become unusable due to dust storms.

CONCLUSIONS

In Turkey, the observations measuring with modern meteorological instruments has begun in the 1930s. However, the historical weather events are made much more understandable with combining them with present-day observations by uncovering those old observations which are mostly in Ottoman and given in the meteorological bulletins. On the other hand, when it is desired to run the climate models backwards, these old records might be used for calibration and validation of the related models. If the old historical meteorological records belonging to the Ottoman state are taken out, we will have knowledge of the past weather events covering not only in Turkey day but in the geography of Europe, Middle East and North Africa.

REFERENCES

Antonio Sagona, Mithat Atabay, Richard Reid, Ian McGibbon, Chris Mackie, Muhammet Erat, Jessie Birkett-Rees, (2011) "The ANZAC (Arıburnu) Battlefield: New Perspectives and Methodologies in History and Archaeology," *Avustralian Historical Studies,* Nr:42, Issue:3, p.313-336.

Atabay, Mithat, Aytaç, (2002), Halil, *I.Dünya Savaşı Sırasında Osmanlı Topraklarında Almanların Kurduğu Askeri Meteoroloji Teşkilatı ve Buna Ait Bir Rapor,* DMİ Yayınları, Ankara (in Turkish).

Çalışlar, İzzeddin (1993), *Atatürk'le İki Buçuk Yıl, Orgeneral Çalışlar'ın Anıları,* yay. haz. İsmet Görgülü, Yapı Kredi Yayınları, İstanbul .1993 (in Turkish).

Genelkurmay Başkanlığı (2012), *Birinci Dünya Harbinde Türk Harbi, Çanakkale Cephesi Harekâtı, (Özetlenmiş Tarih),* c.V, Ankara (in Turkish).

Hamilton, Ian (2005), *Gelibolu Hatıraları 1915,* ed. Ö. Andaç Uğurlu, Örgün Yayınevi, İstanbul (in Turkish).

M. Niyazı ve Dr. Erich Obst (1932), *Boğazlar İstanbul-Çanakkale Mıntıkası İklimi,* Tefeyyüz Kitaphanesi, İstanbul (in Turkish).

Oglander, C. F. Aspinall (205), *Gelibolu Askeri Harekâtı,* 2.C., Yayına Hazıralayan: Metin Martı, Arma Yayınları, İstanbul (in Turkish).