Hellenic National Meteorological Service

Climatology-Applications Division

2016
SIGNIFICANT WEATHER and CLIMATIC EVENTS in GREECE

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Front Page Photograph

ThunderStorm 7 AUGUST 2016, Kerkira

Courtesy of Stathis Koutsiaftis

1rst award, 2016 Photography Contest, Hellenic Meteorological Society

SIGNIFICANT WEATHER and CLIMATIC EVENTS in GREECE during 2016

The definition of the weather categories and the selection of the cases of each category was done according to the instructions and recommendations of the World Meteorological Organization.

For the chosen cases the geographical extent, duration, severity, casualties and impacts of the event were taken into account.

ANALYTICALLY:

FLOOD (2 episodes)

EXTREME PRECIPITATION EPISODE

HAIL

AFRICAN DUST TRANSPORT

HEAT WAVE

TEMPERATURE CLIMATOLOGY:	**HOT month FEBRUARY 2016**
RAINFALL CLIMATOLOGY:	**WET month JUNE 2016**
RAINFALL CLIMATOLOGY:	**WET month SEPTEMBER 2016**
RAINFALL CLIMATOLOGY:	**DRY month APRIL 2016**
RAINFALL CLIMATOLOGY:	**DRY month DECEMBER 2016**

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WMO:	*World Meteorological Organization*
HNMS:	*Hellenic National Meteorological Service*
NOA:	*National Observatory of Athens*
WS:	*Weather Station*
AWS:	*Automatic Weather Station*
WMO-ID:	*World Meteorological Organization-IDentification Number*
R:	*Rainfall or Precipitation Height (in mm)*
R12:	*12-hour Rainfall Height*
R24:	*24-hour Rainfall Height*
R36:	*36-hour Rainfall Height*
R48:	*48-hour Rainfall Height*
R-*-monthly-average:	*monthly average Rainfall Height of a specific (*) month*
Tmean:	***mean Temperature (in ℃)***
Tmax:	***maximum Temperature (in ℃)***
Tmin:	***minimum Temperature (in ℃)***
Tmax-*-monthly-average:	*monthly average Tmax of a specific (*) month*

FLOOD

The MOST SIGNIFICANT EVENT of the year 2016 for Greece

DESCRIPTION

During **6-9 SEPTEMBER 2016** a cut-off upper level low located southwest of the country affected mainly its west part and caused severe thunderstorms with heavy rainfalls, floods, landslides, and locally tornadoes.

SEVERITY

RAINFALL HEIGHT (R)

Not recorded any new absolute records, but many WSs reported 12-hour precipitation height > 50 mm. Especially:

on **6 SEPT 2016**

at the HNMS-WS of **Kerkira** (WMO-ID: 16641): **R24** = **113.3 mm**

historical reference

(R-SEPT-monthly-average = 71.8 mm, reference period: 1971-2000).

at the HNMS-WS of **Andravida** (WMO-ID: 16682): **R12 = 54.0 mm**

historical reference

(R-SEPT-monthly-average = 28.7 mm, reference period: 1971-2000).

at the HNMS-WS of **Araxos** (WMO-ID: 16687): **R12 = 66.1 mm**

historical reference

(R-SEPT-monthly-average = 29.5 mm, reference period: 1971-2000).

at the HNMS-WS of **Kalamata** (WMO-ID: 16726): **R24 = 132.6 mm**

historical reference

(R-SEPT-monthly-average = 27.2 mm, reference period: 1971-2000).

at the NOA-AWS of **Karavostasi** (Thesprotia): **R24 = 156.0 mm**

on **7 SEPT 2016**

at the HNMS-WS of **Thessaloniki** (WMO-ID: 16622): **R12 = 51.1 mm**

historical reference

(R-SEPT-monthly-average = 25.4 mm, reference period: 1971-2000).

at the NOA-AWS of **Geraki** (Lakonia): **R24 = 200.2 mm**

at the NOA-AWS of **Nea Mihaniona** (Thessaloniki): **R24 = 198.2 mm**

It is worth mentioning that the **SEPTEMBER's 2016 monthly rainfall height** of some WSs is set as the **new UPPER record** or as the second in rank of **SEPT's rainfall**.

More details at the category of the climate event: **Wet month SEPTEMBER 2016** (page: 14).

CASUALTIES

6 people.

Specifically: 5 people at Peloponnese (3 at Messinia, 1 at Lakonia, 1 at Korinthia) and 1 woman at Nea Mixaniona (Thessaloniki/Macedonia).

IMPACTS

Continuous heavy rainfalls affected several areas of the country causing power outages, large damage to networks, crops, infrastructure, roads and public and private property due to flash floods.

Also, some regions at the western and northern part of the country were declared in states of emergency.

The Fire Brigade received hundreds of distress calls to rescued people in difficulty, but in some places the flood water was up to 2 meters deep, causing problems for emergency services to reach the affected communities.

There are many images showed cars washed out to sea or piled up from torrential rain.

http://www.newsit.gr/ellada/THeominia-kai-eikones-vivlikis-katastrofis-stin-Kalamata-apo-tin-kakokairia-Plirofories-gia-enan-nekro/647312

http://www.bbc.com/news/world-europe-37295180

FLOOD

DESCRIPTION

During **26-30 NOVEMBER 2016** a 5-day severe weather event affected mainly the west and eastern part of the country, including Attica the capital of Greece, and caused extended floods due to continuous rainfalls.

SEVERITY

RAINFALL HEIGHT (R)

Many WSs recorded a 12-hour precipitation height > 50 mm and some **new UPPER records** were set. Especially:

on **26-27 NOV 2016**

at the HNMS-WS of **Zakinthos** (WMO-ID: 16719): **R48 = 183.4 mm**

historical reference

(R-NOV-monthly-average = 158.3 mm, reference period: 20-year long term statistics).

on **28-29 NOV 2016**

at the HNMS-WS of Mitilini (WMO-ID: 16667): **R36 = 177.2 mm**

historical reference

(R-NOV-monthly-average = 101.3 mm, reference period: 1971-2000).

at the HNMS-WS of **Skiros** (WMO-ID: 16684): **R36 = 120.2 mm**

(analytically: R36 = 17.5 + 100.0 + 2.7 = 120.2 mm)

historical reference

*The **R12 = 100.0 mm** on 29 NOV 2016 is set as its **R12's new UPPER record**.*

*Moreover, the **R24 = 117.5 mm** (17.5 +100.0) is set as its **R24's new UPPER record** (period: 28 NOV 2016/**06 UTC**-29 NOV 2016/**06 UTC**).*

(2nd in rank R12 = 69.6 mm on 5 JAN 1973 and 2nd in rank R24 = 98.9 mm on 2 DEC 2002) (reference period: 1955-2016).

(R-NOV-monthly-average = 51.8 mm, reference period: 1971-2000).

on **29 NOV 2016**

at the HNMS-WS of **Kos** (WMO-ID: 16742): **R12 = 86.2 mm**

historical reference

*The **R12 = 86.2 mm** on 29 NOV 2016 is set as **R12's second in rank.***

(R12-UPPER-record = 133.1 mm on 13 JAN 1984) (reference period: 1982-2016).

(R-NOV-monthly-average = 83.9 mm, 20-year long term statistics).

on **30 NOV 2016**

at the HNMS-WS of **Souda** (WMO-ID: 16746): **R12 = 70.8 mm**

historical reference

(R-NOV-monthly-average = 86.7 mm, reference period: 1971-2000).

CASUALTIES

1 man was swept away in the flash floods (in Zakinthos island).

IMPACTS

Large damage occurred to infrastructure, crops, roads and public and private property.

Fire Service received a large number of calls with requests for pumping flood water, rescuing stranded drivers and evacuating people to safer locations.

Flooding also affected Athens the capital city of Greece, where several Metro-underground stations and roads had been closed.

EXTREME PRECIPITATION EPISODE

DESCRIPTION

During **25-26 JUNE 2016** a barometric low moved from northern part of Africa towards Greece, and affected the south Ionian Sea and Peloponnese prefecture causing severe thunderstorms with heavy rainfalls.

SEVERITY

RAINFALL HEIGHT (R)

on **25-26 JUN 2016**

at the HNMS-WS of **Tripoli** (WMO-ID: 16710): **R24 = 157.7 mm**

(analytically: R24 = 86.5 + 71.2 = 157.7 mm)

historical reference

*The **R12 = 86.5 mm** on 25 JUN 2016 is set as its **R12's new UPPER record**,*
while the R12 = 71.2 mm precipitation height of the next 12-hours (on 26 JUN 2016) is the 5th in its rank.
*Moreover, the **R24 = 157.7 mm** is set as its **R24's new UPPER record**.*
(2nd in rank R12 = 76.0 mm on 18 AUG 1997 and
2nd in rank R24 = 110.7 mm on 30 DEC 1984) (reference period: 1957-2016).

(R-JUN-monthly-average = 17.2 mm, reference period: 1971-2000).

on **25 JUN 2016**

at the HNMS-WS of **Kalamata** (WMO-ID: 16726): **R12 = 64.1 mm**

historical reference

(R-JUN-monthly-average = 6.3 mm, reference period: 1971-2000).

at the NOA-AWS of **Megalopoli** (Arkadia): **R24 = 213.0 mm**

at the NOA-AWS of **Kalamata** (Messinia): **R24 = 129.0 mm**

It is worth mentioning that for the WS-**Tripoli** the **JUNE's-2016 monthly precipitation height** (R-JUN-2016 = 163.4 mm) is its **JUNE's new UPPER record**.

More details at the category of the climate event: **Wet month JUNE 2016** (page: 13).

IMPACTS

The heavy rainfalls caused extensive damage to infrastructure and to the public and private property at Peloponnese prefecture, while Megalopolis (central Peloponnese) was declared in state of emergency. In Tripoli (central Peloponnese) there was a power outage for several hours.

HAIL

DESCRIPTION

Severe thunderstorms occurred on **28 JUNE 2016** over the central mainland of Greece, including Attica prefecture, due to favorable weather conditions produced intense electrical activity, gale force downdrusts, floods and many cases of hailfalls large hailstones (upto walnut sized).

SEVERITY

RAINFALL HEIGHT (R)

Locally, some WSs recorded **precipitation height > 15 mm in less than 2-hour period**.

on **28 JUN 2016**

at the HNMS-WS of **Hellinikon** (WMO-ID: 16716): **R = 18.0 mm**, in 30-minutes period

historical reference

(R-JUN-monthly-average = 5.7 mm, reference period: 1971-2000).

at the HNMS-WS of **Tatoi** (WMO-ID: 16715): **R = 13.8 mm**, in 80-minutes period

historical reference

(R-JUN-monthly-average = 8.8 mm, reference period: 1971-2000).

at the NOA-AWS of **Drosia** (Attica): **R24 = 46.6 mm**

at the NOA-AWS of **Penteli** (Attica): **R24 = 23.6 mm**

IMPACTS

The hailfalls caused extensive catastrophes to the crops in Trikala and Karditsa (Thessalia prefecture).

Also, the big hailstones combined with the strong winds resulted in large damage to public and private property.

Moreover, only for the area of Attica, the Hellenic National Meteorological Service was asked to certify more than 3000 cases of hail occurrence.

http://www.newsit.gr/topikes-eidhseis/Mpoyrini-sarose-ta-Trikala-Epese-xalazi-se-megethos-koromiloy-VINTEO/631519

http://static.larissanet.gr/wp-content/uploads/2016/06/2016062813215357 92.jpg

AFRICAN DUST TRANSPORT

DESCRIPTION

During **22-23 MARCH 2016** an episode of Sahara dust transport affected the whole country.

SEVERITY

On **23 MARCH 2016**, the recorded **PM-10 dust concentration of 2190 mg/m^3** was one the most severe dust episodes of the last years (allowable limit: 50 mg/m^3).

IMPACTS

The transport of Sahara dust combined with the weather conditions (gale force south winds, high values of both ambient temperature and relative humidity) produced a bad air quality that influenced the human health adversely.

Furthermore, in Athens locally the visibility was lower than 1 km, a very rare event in the area concerned.

PM-10: *Particulate Matter up to 10 micrometers in diameter size*

(PM-10 measurements from NOA's station)

HEAT WAVE

DESCRIPTION

During **18-21 JUNE 2016**, a 4-day Heat Wave event (Tmax ≥ 40 °C) affected the eastern part of the Greek mainland.

SEVERITY

MAXIMUM TEMPERATURE (Tmax)

Not being any record, but many WSs recorded Tmax >39 °C. Some examples:

on **18 JUN 2016**

at the HNMS-AWS of **Tithorea** (WMO-ID: 16649): **Tmax = 42.9 °C**

historical reference

*The Tmax = 42.9 °C on 18 JUN 2016 is its **Tmax's new absolute UPPER record** since its operational use from autumn 2012.*

at the HNMS-AWS of **Argos** (WMO-ID: 16724): **Tmax = 41.7 °C**

historical reference

(Tmax-UPPER-record = 46.4 °C on 27 JUL 2007).

(Tmax-JUN-monthly-average = 31.7 °C, reference period: long term statistics).

at the HNMS-WS of **Tripoli** (WMO-ID: 16710): **Tmax = 40.3 °C**

historical reference

(Tmax-UPPER-record = 43.0 °C on 12 AUG 1994).

(Tmax-JUN-monthly-average = 28.3 °C, reference period: 1971-2000).

at the HNMS-WS of **Larissa** (WMO-ID: 16648): **Tmax = 40.1 °C**

historical reference

(Tmax-UPPER-record = 45.4 °C on 5 JUL 2000).

(Tmax-JUN-monthly-average = 31.4 °C, reference period: 1971-2000).

at the NOA-AWS of **Sparti** (Lakonia) **Tmax = 43.4 °C**

at the NOA-AWS of **Mires** (Iraklio) **Tmax = 43.2 °C**

at the NOA-AWS of **Thiva** (Viotia) **Tmax = 42.9 °C**

TEMPERATURE CLIMATOLOGY

HOT month FEBRUARY 2016

DESCRIPTION

i) The **mean monthly mean Temperature of FEBRUARY 2016** was above the 1971-2000 climatology for all over the country (estimated by the tercile method from representative HNMS-WSs).

The positive anomalies were varying from 3.3 °C for mean Tmin up to 4.4 °C for mean Tmax, while locally the deviations for the Tmax exceed the 5 °C.

ii) Also, at many WSs during **FEBRUARY 2016** were set the **Tmax's new UPPER record**.

And it is worth mentioning that in several cases this record was broken more than once during this month.

iii) Moreover, ranking the FEBRUARY's mean monthly Tmax of various WSs, the **FEBRUARY's 2016 mean Tmax is mainly ranked in the first place** and at the rest of the WSs in the second or third.

SEVERITY

MAXIMUM TEMPERATURE (Tmax)

(examples of the larger difference from the previous record)

on **23 FEB 2016** at the HNMS-WS of **Kastoria** (WMO-ID: 16614): **Tmax = 24.7 °C**

historical reference

*The Tmax = 24.7 °C on 23 FEB 2016 is **FEBRUARY's Tmax new UPPER record**.*
(2nd in rank: 23.3 °C on 18 FEB 2014) (reference period: 1981-2016).

(Tmax-FEB-monthly-average = 8.0 °C, reference period: long term statistics).

on **16 FEB 2016** at the HNMS-WS of **Mitilini** (WMO-ID: 16667): **Tmax = 26.2 °C**

historical reference

*The Tmax = 26.2 °C on 16 FEB 2016 is **FEBRUARY's Tmax new UPPER record**.*
(2nd in rank: 22.0 °C on 27 FEB 1958, reference period: 1955-2016).

(Tmax-FEB-monthly-average = 12.3 °C, reference period: 1971-2000).

on **16 FEB 2016** at the HNMS-WS of **Zakinthos** (WMO-ID: 16726): **Tmax = 22.8 °C**

historical reference

*The Tmax = 22.8 °C on 16 FEB 2016 is **FEBRUARY's Tmax new UPPER record**.*
(2nd in rank: 20.6 °C on 14 FEB 1998, reference period: 1983-2016).

(Tmax-FEB-monthly-average = 14.3 °C, reference period: long term statistics).

on **17 FEB2016** at the HNMS-WS of Kalamata (WMO-ID: 16726): **Tmax = 26.0 °C**

historical reference

*The Tmax = 26.0 °C on 17 FEB 2016 is **FEBRUARY's Tmax new UPPER record**.*
(2nd in rank: 23.8 °C on 19 FEB 1960, reference period: 1956-2016).
(Tmax-FEB-monthly-average = 14.9 °C, reference period: 1971-2000).

on **16 FEB 2016** at the HNMS-WS of **Kos** (WMO-ID: 16742): **Tmax = 24.6 °C**

historical reference

*The Tmax = 24.6 °C on 16 FEB 2016 is **FEBRUARY's Tmax new UPPER record**.*
(2nd in rank: 20.8 °C on 19 FEB 2010, reference period: 1982-2016).

(Tmax-FEB-monthly-average = 13.4 °C, reference period: long term statistics).

RAINFALL CLIMATOLOGY

WET month JUNE 2016

DESCRIPTION

The **monthly precipitation amount of JUNE 2016** was about equal or above the 1971-2000 climatology (estimated by the tercile method from representative HNMS-WSs), while locally at the Peloponnese prefecture the precipitation height was 5 times higher than the normal values.

Moreover, the **JUNE's 2016 monthly rainfall height** of **WS of Tripoli** was set as its **JUNE's new UPPER record**.

SEVERITY

MONTHLY RAINFALL HEIGHT (R)

at the HNMS-WS of **Tripoli** (WMO-ID: 16710): **R-JUN-2016 = 163.4 mm**

historical reference

*The **R-JUN-2016 = 163.4 mm** is its **JUNE's new UPPER record** of the **rainfall height.** (2nd in rank: 127.5 mm, JUN 1986) (reference period: 1957-2016).*

(R-JUN-monthly-average = 17.2 mm, reference period: 1971-2000).

RAINFALL CLIMATOLOGY
WET month SEPTEMBER 2016

DESCRIPTION

The **monthly precipitation amount of SEPTEMBER 2016** accounts for the 168% of the 1971-2000 climatology, that is approximately 1.5 times higher than the normal values (estimated by the tercile method from representative HNMS-WSs), while locally the precipitation height was 3 times higher than the normals.

Moreover, the **SEPTEMBER's 2016 monthly rainfall height** of some WSs was set as the **SEPTEMBER's new UPPER record** or as the second in rank.

SEVERITY

MONTHLY RAINFALL HEIGHT (R)

at the HNMS-WS of **Araxos** (WMO-ID: 16687): **R-SEPT-2016 = 139.3 mm**

historical reference

*The **R-SEPT-2016 = 139.3 mm** is the **new UPPER record** for its **SEPTEMBER's precipitation height**.*
(2nd in rank: 117.0 mm, SEPT 1959) (reference period: 1955-2016).

(R-SEPT-monthly-average = 29.5 mm, reference period: 1971-2000).

at the HNMS-WS of **Kozani** (WMO-ID: 16632) **R-SEPT-2016 = 129.2 mm**

historical reference

*The **R-SEPT-2016 = 129.2 mm** is the **new UPPER record** for its **SEPTEMBER's precipitation height**.*
(2nd in rank: 118.4 mm, SEPT 2014) (reference period: 1955-2016).

(R-SEPT-monthly-average = 28.1 mm, reference period: 1971-2000).

at the HNMS-WS of **Kastoria** (WMO-ID: 16614): **R-SEPT-2016 = 161.1 mm**

historical reference

*The **R-SEPT-2016 = 161.1 mm** is the **2nd in rank UPPER record** for its **SEPTEMBER's precipitation height**.*
(1rst in rank: 177.7 mm, SEPT 2002) (reference period: 1955-2016).

(R-SEPT-monthly-average = 45.5 mm, reference period: long term statistics).

at the HNMS-WS of **Kalamata** (WMO-ID: 16726): **R-SEPT-2016 = 158.3 mm**

historical reference

*The **R-SEPT-2016 = 158.3 mm** is **the 2nd in rank UPPER record** for its **SEPTEMBER's precipitation height**.*
(1rst in rank: 174 mm, SEPT 2009) (reference period: 1956-2016).

(R-SEPT-monthly-average = 27.2 mm, reference period: 1971-2000).

RAINFALL CLIMATOLOGY

DRY month APRIL 2016

DESCRIPTION

The **monthly precipitation amount of APRIL 2016** accounts for the 18% of the 1971-2000 climatology (estimated by the tercile method from representative HNMS-WSs), while in many places the precipitation anomalies were lower than 10% of the 1971-2000 climatology.

It is worth mentioning that at Attica area, the capital city of Greece, the monthly rainfall height was about zero.

Moreover, the **APRIL's 2016 monthly rainfall height** of some WSs was set as the **APRIL's new LOWER record** or as the second in rank.

SEVERITY

MONTHLY RAINFALL HEIGHT (R)

at the HNMS-WS of **Hellinikon** (WMO-ID: 16716): **R-APR-2016 = 0.0 mm**

historical reference

*The **R-APR-2016 = 0.0 mm** is the **new LOWER record** for its **APRIL's precipitation height**..*
(2nd in rank: 0.6 mm, APR 2010) (reference period: 1955-2016).

(R-APR-monthly-average = 29.3 mm, reference period: 1971-2000).

at the HNMS-WS of **Tatoi** (WMO-ID: 16715): **R-ARP-2016 = 0.0 mm**

historical reference

*The **R-APR-2016 = 0.0 mm** is **equal** with the previous **LOWER record** for its **APRIL's precipitation height**.*
(equal driest as APR 2010 and APR 1970) (reference period: 1956-2016).

(R-APR-monthly-average = 26.4 mm, reference period: 1971-2000).

at the HNMS-WS of **Mitilini** (WMO-ID: 16667): **R-ARP-2016 = 0.4 mm**

historical reference

*The **R-APR-2016 = 0.4 mm** is the **2nd in rank LOWER record** for its **APRIL's precipitation height**.*
(lower in rank: 0.4 mm, APR 1964) (reference period: 1955-2016).

(R-APR-monthly-average = 49.4 mm, reference period: 1971-2000).

RAINFALL CLIMATOLOGY
DRY month DECEMBER 2016

DESCRIPTION

The **monthly precipitation amount of DECEMBER 2016** accounts for the 14% of the 1971-2000 climatology (estimated by the tercile method from representative HNMS-WSs), while in many places the precipitation anomalies were lower than 10% of the 1971-2000 climatology. Only at Crete island the precipitation amount was above average.

Compared to the corresponding precipitation amount of DECEMBER 2015, the latter was drier about 10%.

Moreover, the **DECEMBER's 2016 monthly rainfall height** of some WSs was set as **DECEMBER's new LOWER record** or as the second in rank.

SEVERITY

MONTHLY RAINFALL HEIGHT (R)

at the HNMS-WS of **Preveza** (WMO-ID: 16643): **R-DEC-2016 = 0.6 mm**

historical reference

*The **R-DEC-2016 = 0.6 mm** is its **DECEMBER's new LOWER record** for the precipitation height.*
(2nd in rank: 4.9 mm, DEC 2015) (reference period: 1971-2016).

(R-DEC-monthly-average = 128.9 mm, reference period: 1971-2000).

at the HNMS-WS of **Kalamata** (WMO-ID: 16726): **R-DEC-2016 = 8.9 mm**

historical reference

*The **R-DEC-2016 = 8.9 mm** is its **DECEMBER's new LOWER record** for the precipitation height.*
(2nd in rank: 19.8 mm, DEC 1972) (reference period: 1956-2016).

(R-DEC-monthly-average = 141.0 mm, reference period: 1971-2000).

at the HNMS-WS of **Kerkira** (WMO-ID: 16641): **R-DEC-2016 = 5.9 mm**

historical reference

*The **R-DEC-2016 = 5.9 mm** is the **2nd in rank LOWER record** for its **DECEMBER's** precipitation height.*
(lower in rank: 5.7 mm, DEC 2015) (reference period: 1955-2016).

(R-DEC-monthly-average = 163.6 mm, reference period: 1971-2000).

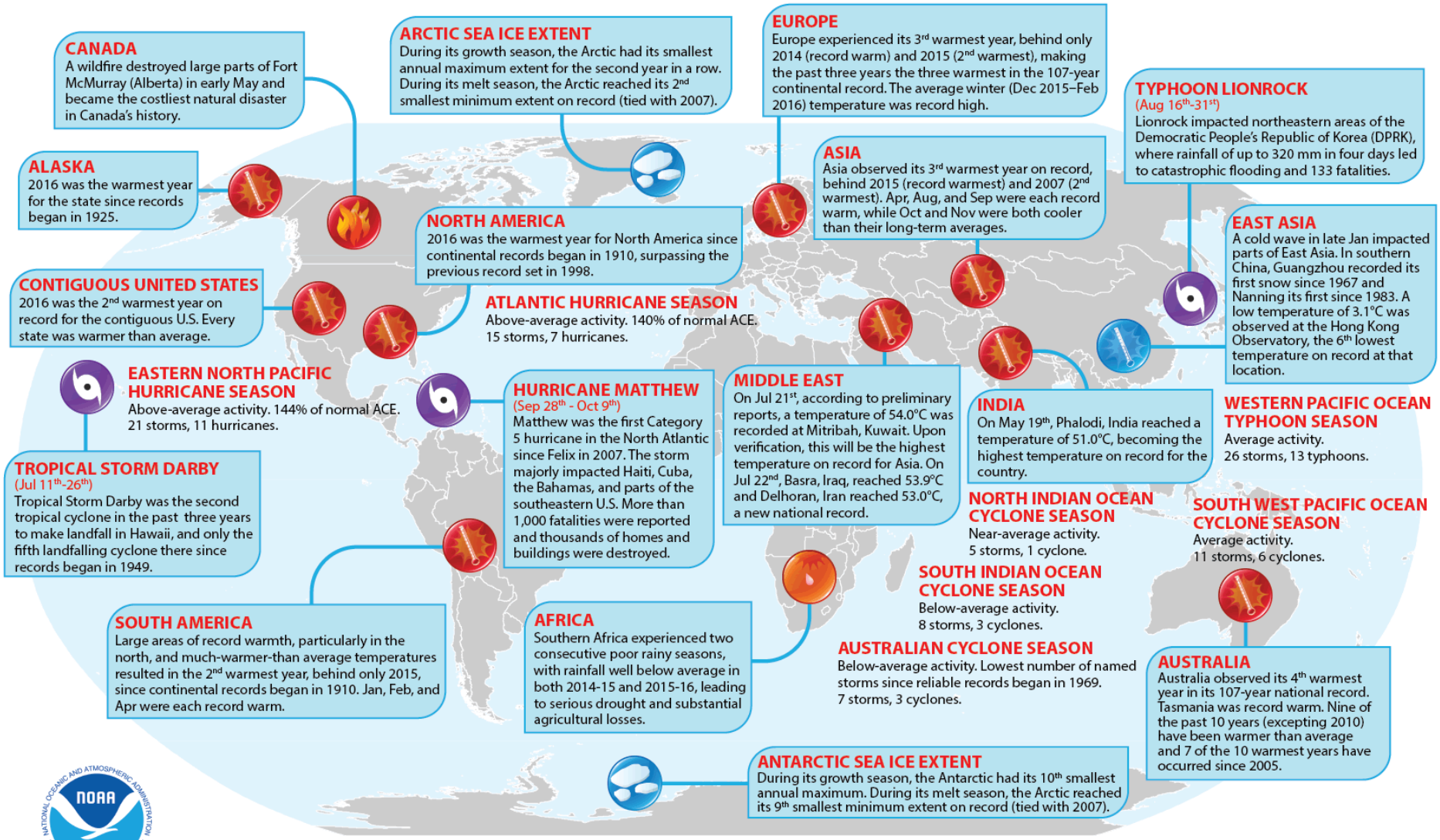
at the HNMS-WS of **Thessaloniki** (WMO-ID: 16622): **R-DEC-2016 = 0.9 mm**

historical reference

*The **R-DEC-2016 = 5.9 mm** is the **2nd in rank LOWER record** for its **DECEMBER's** precipitation height.*
(lower in rank: 0.2 mm, DEC 2015) (reference period: 1955-2016).

(R-DEC-monthly-average = 46.5 mm, reference period: 1971-2000).

Selected Significant Climate Anomalies and Events in 2016



Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports and international partners. For more information please visit: http://www.ncdc.noaa.gov/sotc