

Experience of operation Blitzortung lightning detector array in Armenia

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**Thunderstorms and Elementary Particle Acceleration (TEPA-2019), October 13-17 2019,
Nor Amberd International Conference Centre of the Yerevan Physics Institute,
Byurakan, Armenia.**

Blitzortung Lightning Detection Network

- The Blitzortung lightning detector array was installed in Armenia during the TEPA-2017 conference in October 2017.
- Three stations were located at Aragats Cosmic Ray Division, Nor Amberd Research Station, Sevan Research Station and Yerevan Physics Institute.

2017-01-01 - 2017-12-31

www.lightningmaps.org

Participants

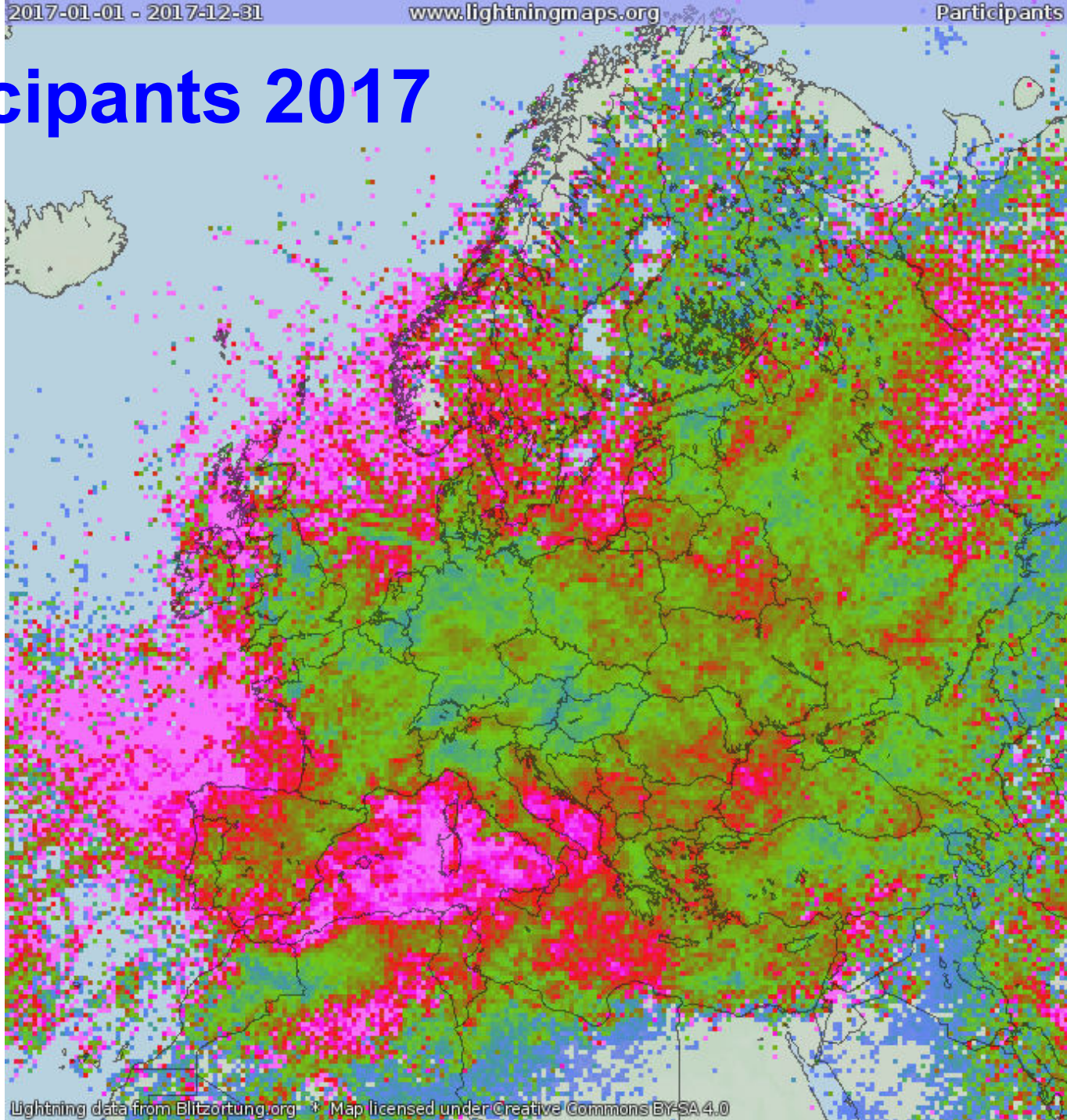
Strokes:
26923148

Maximum mean
participants
646.0

Legend
(Avg. participants per
stroke locating)



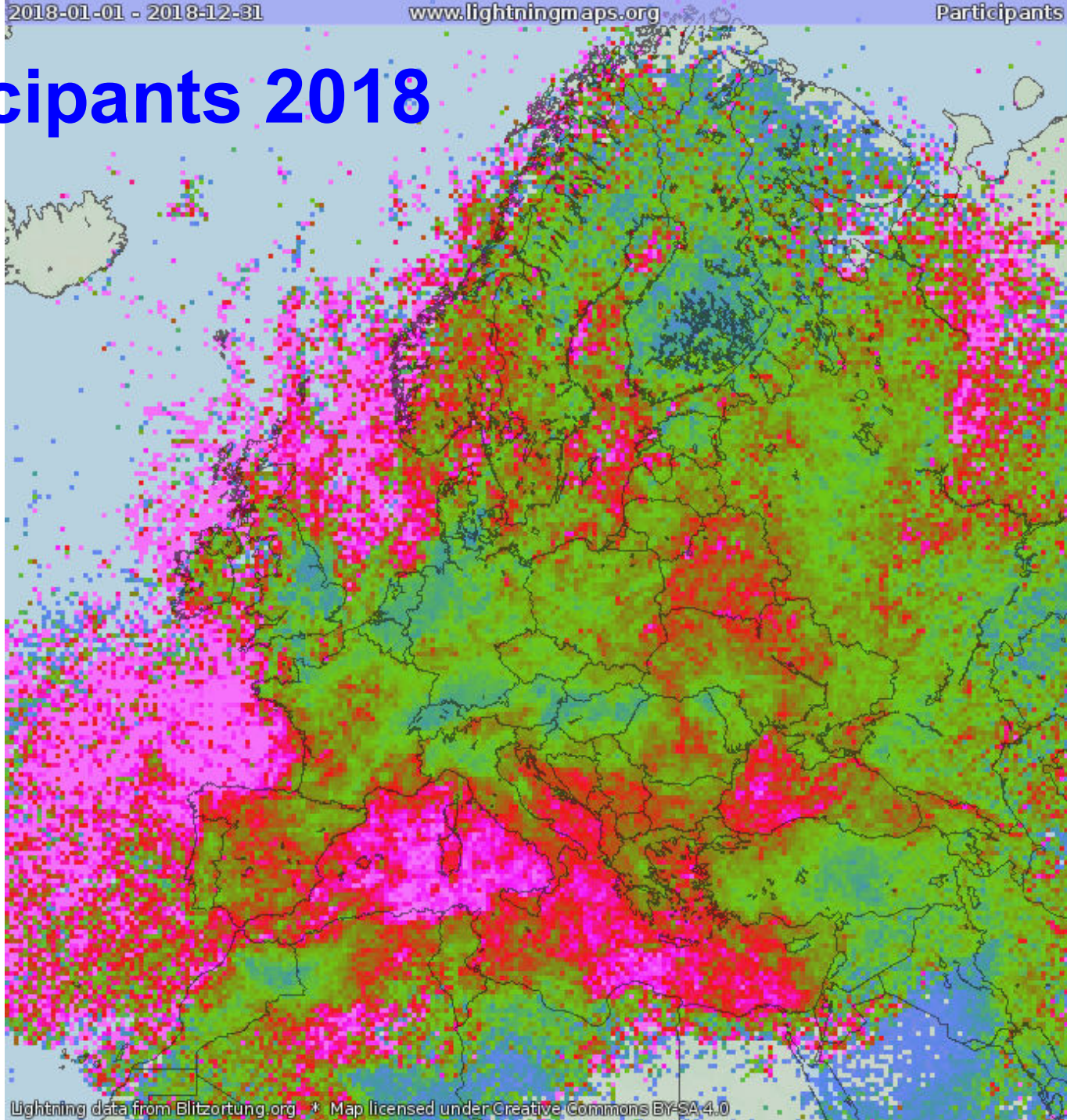
Participants 2017



Legend
(Avg. participants per stroke locating)



Participants 2018



2019-01-01 - 2019-10-13

www.lightningmaps.org

Participants

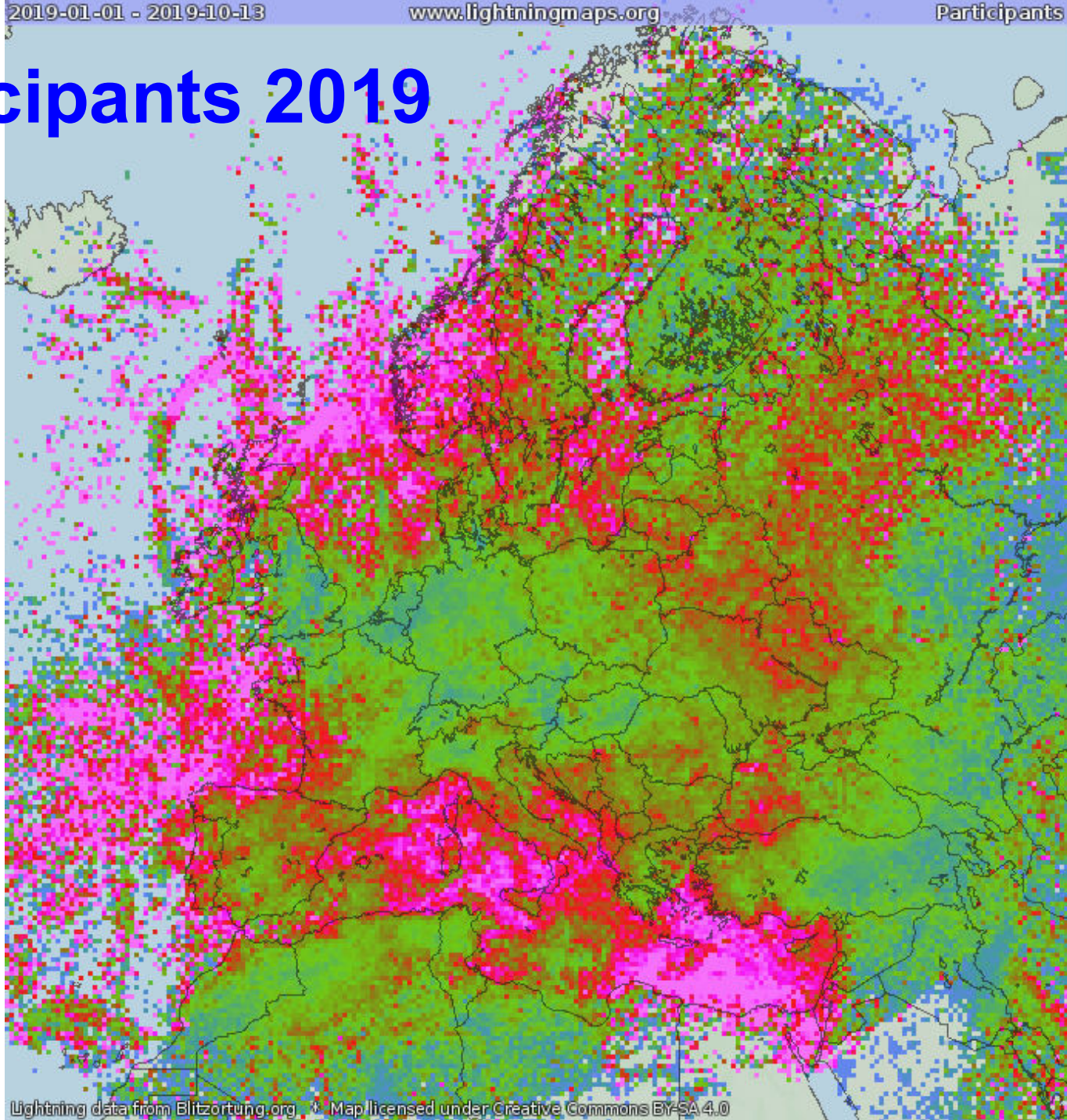
Strokes:
27087222

Maximum mean
participants:
645.0

Legend
(Avg. participants per
stroke locating)



Participants 2019



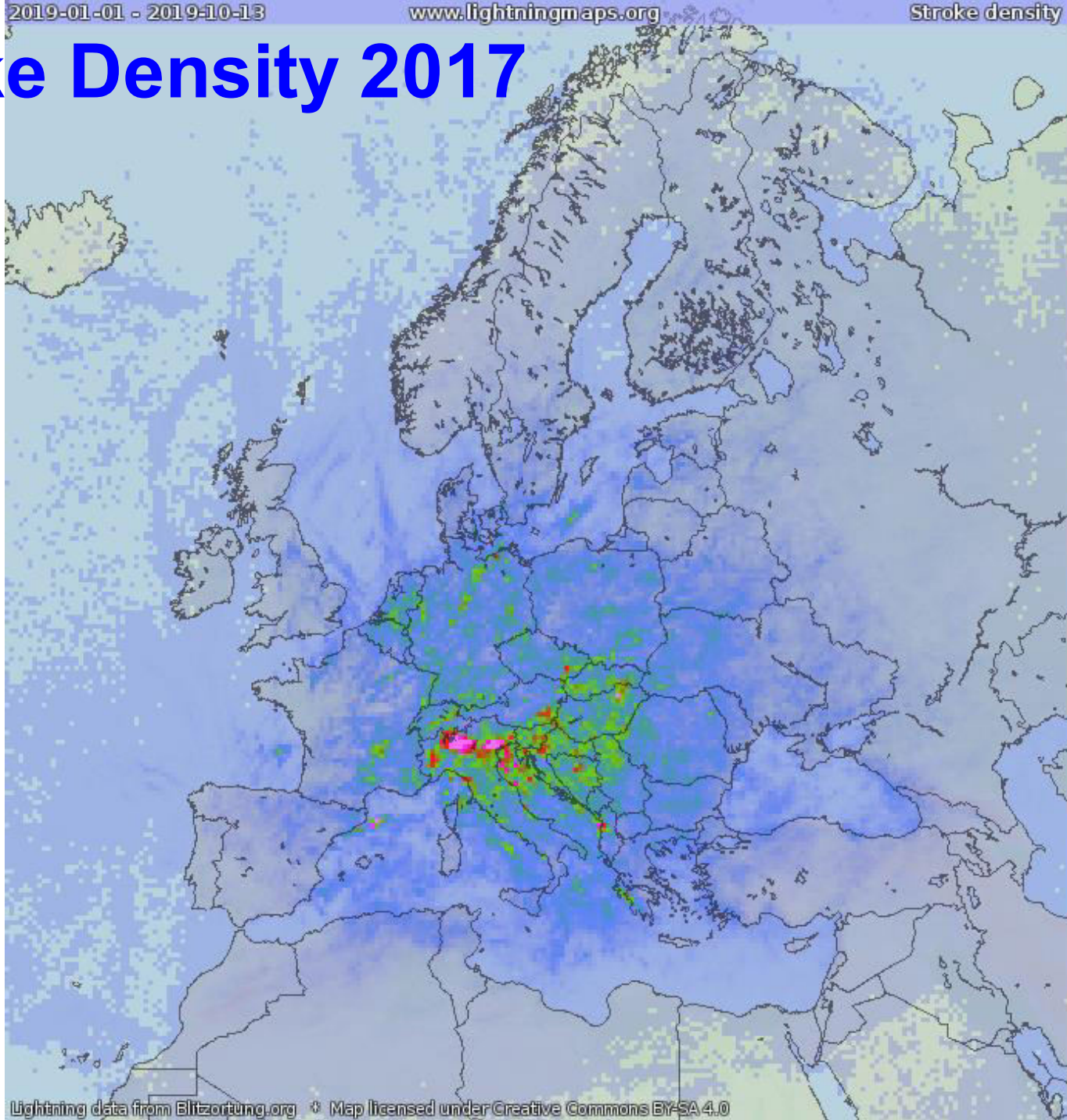
Strokes:
27087222

Maximum mean stroke
density displayed:
40.69/km²

Legend
(Strokes per km²)



Stroke Density 2017



2018-01-01 - 2018-12-31

www.lightningmaps.org

Stroke density

Stroke Density 2018

Strokes:
36052933

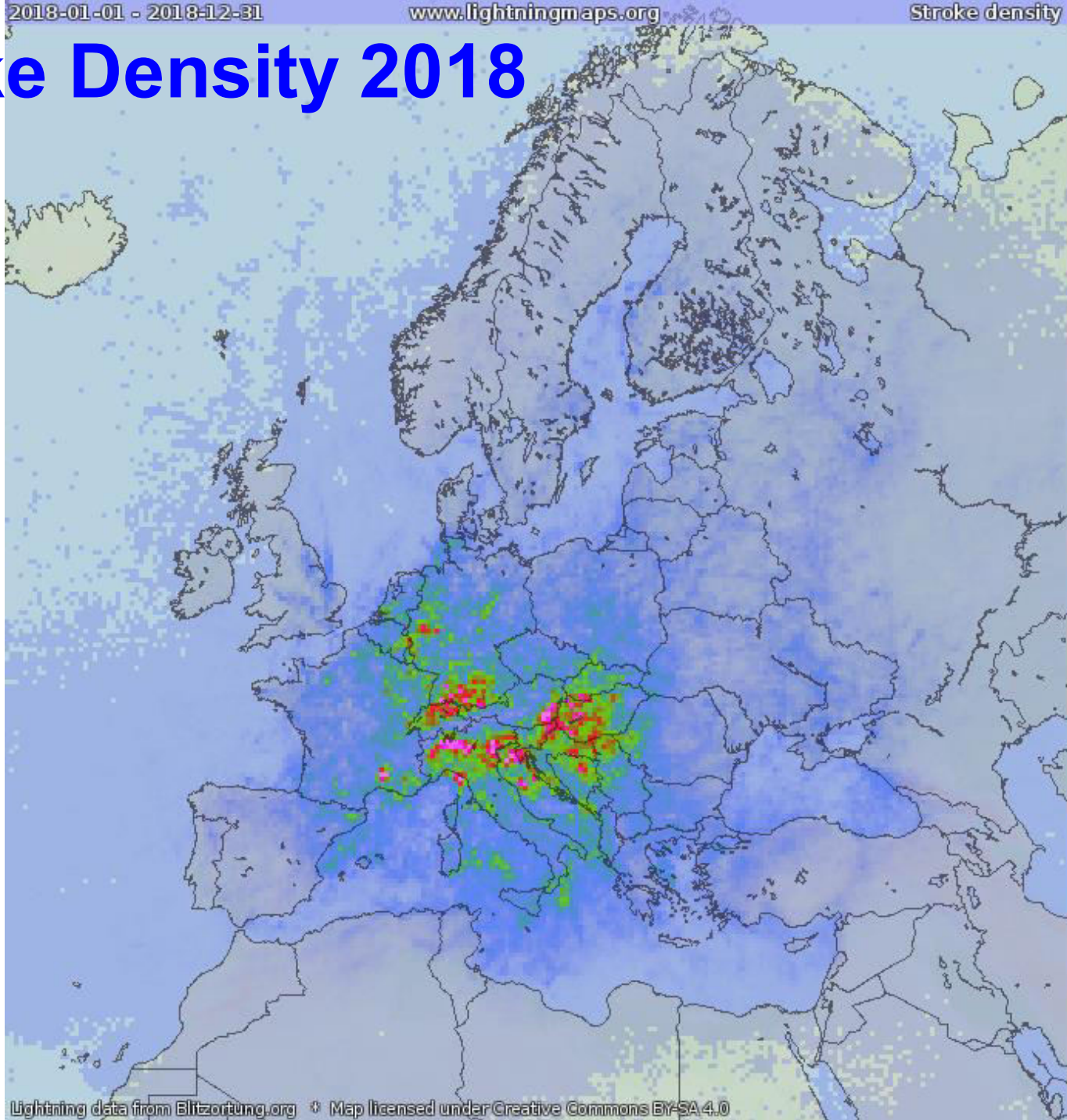
Maximum mean stroke
density displayed:
41.76/km²

Legend
(Strokes per km²)

> 35.61

17.81

0



2019-01-01 - 2019-10-13

www.lightningmaps.org

Stroke density

Stroke Density 2019

Strokes:
27087222

Maximum mean stroke
density displayed:
40.69/km²

Legend
(Strokes per km²)

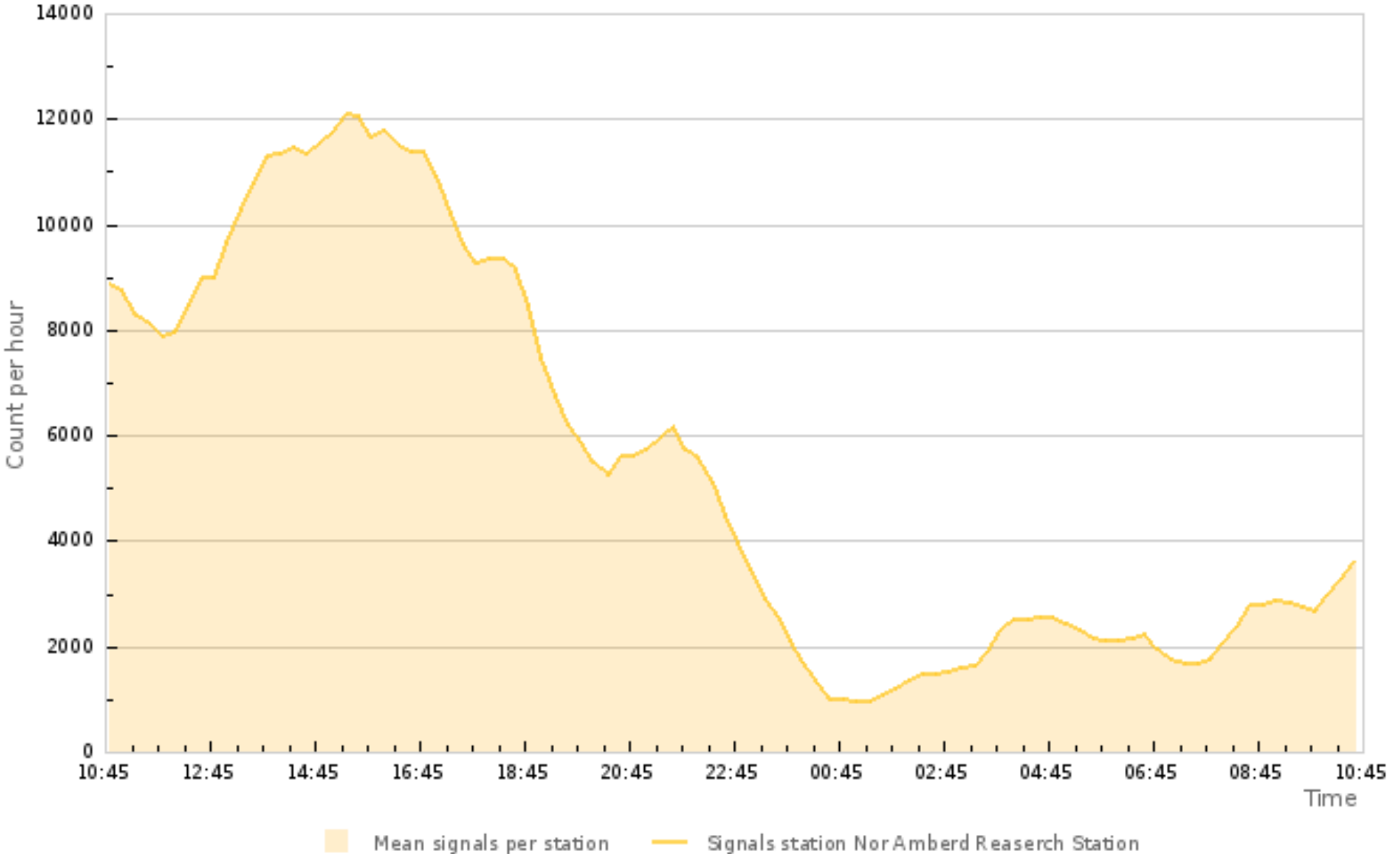


Nor Amberd Research Station

- On May 20, 2019 the Nor Amberd Research Station lightning detector was damaged and now only two stations are in operation providing data to Blitzortung.org lightning detector network.
- On the base of [Blitzortung](http://Blitzortung.org) lightning detector array data we can make an analysis of station efficiency and covered area.

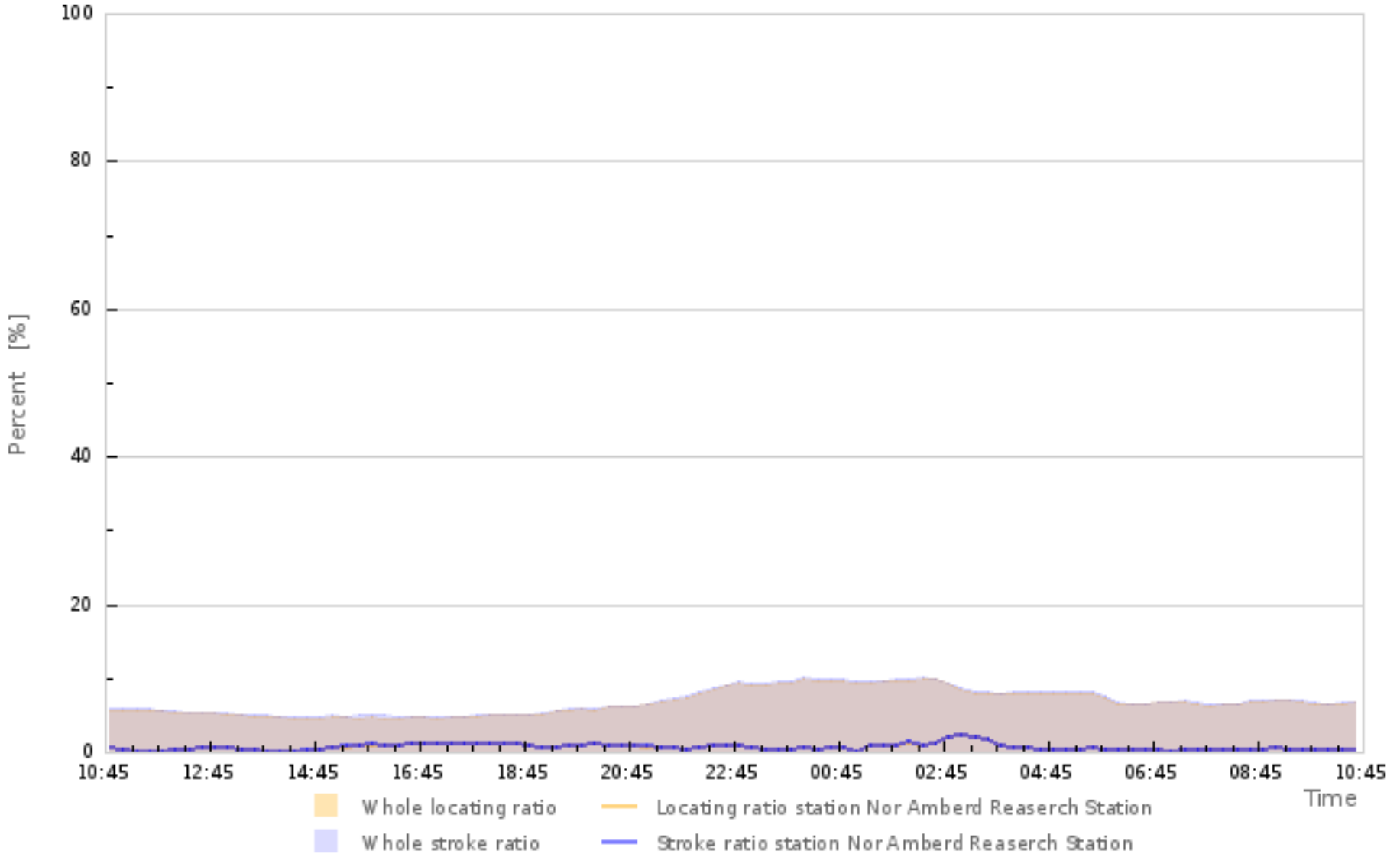
Nor Amberd Research Station (2019, 19 May)

Signal statistics of the last 24h for station: Nor Amberd Reaserch Station



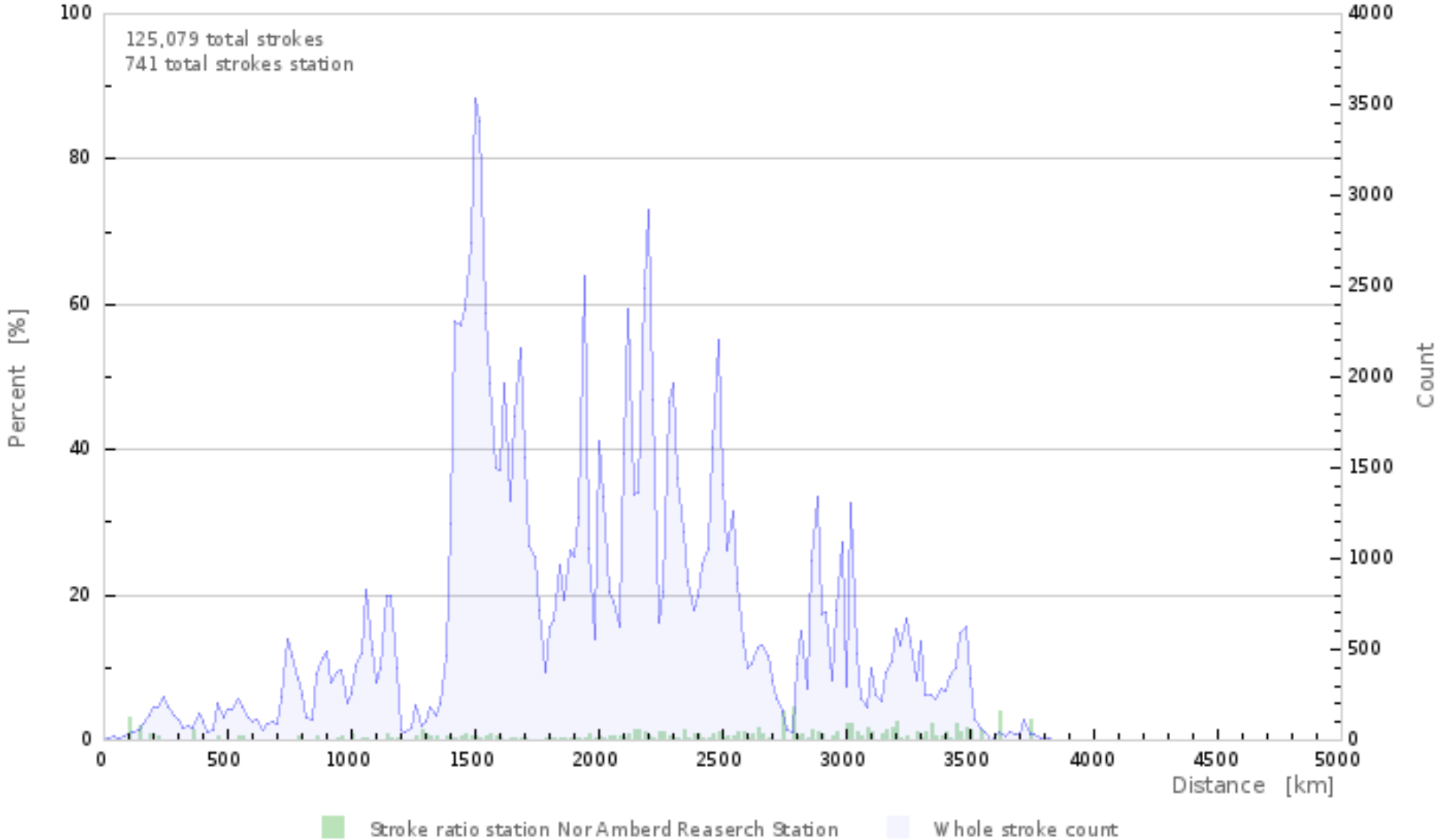
Nor Amberd Research Station (2019, 19 May)

Locating and stroke ratios of the last 24h for station: Nor Amberd Reaserch Station



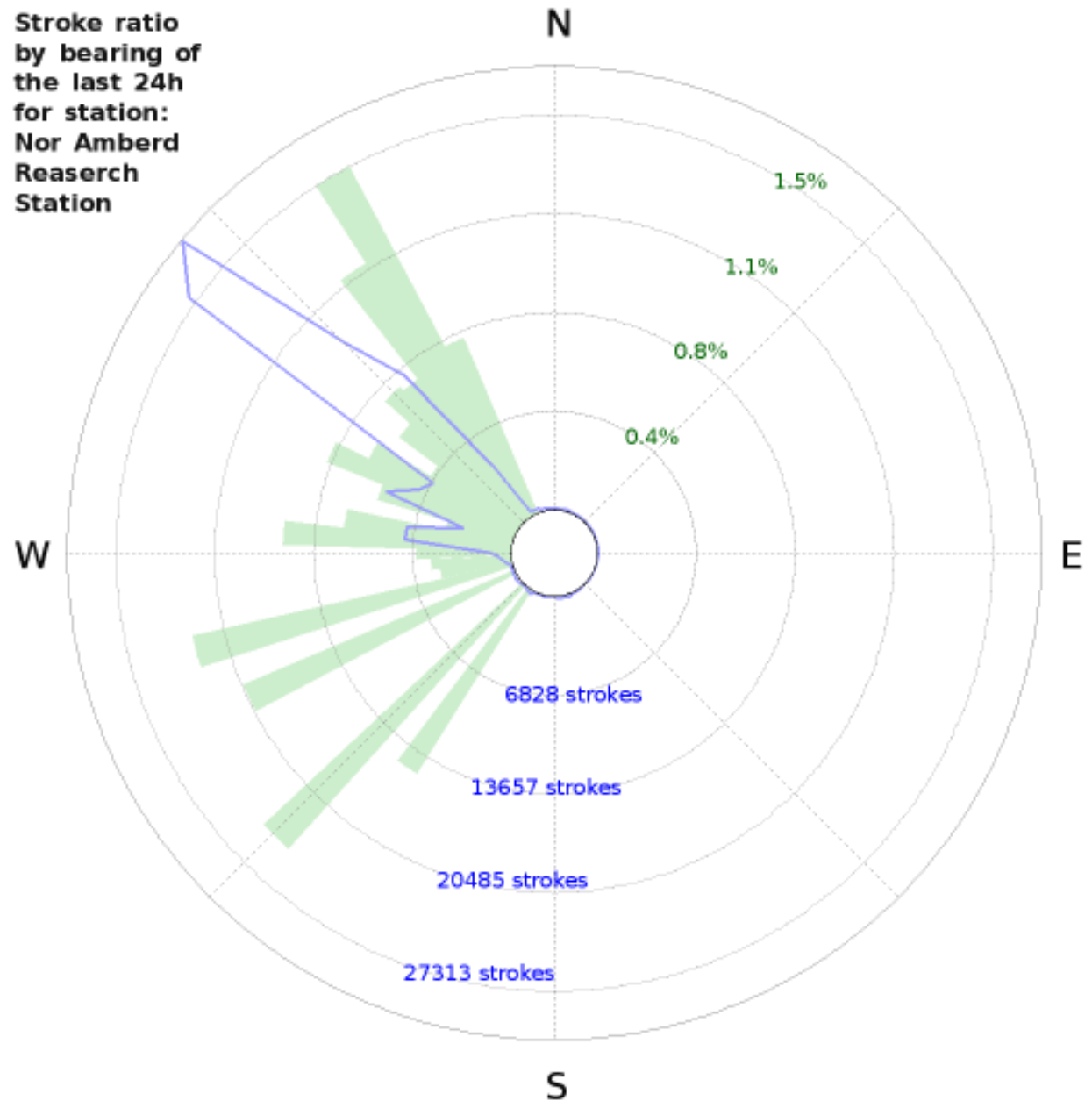
Nor Amberd Research Station (2019, 19 May)

Stroke ratio by distance of the last 24h for station: Nor Amberd Research Station

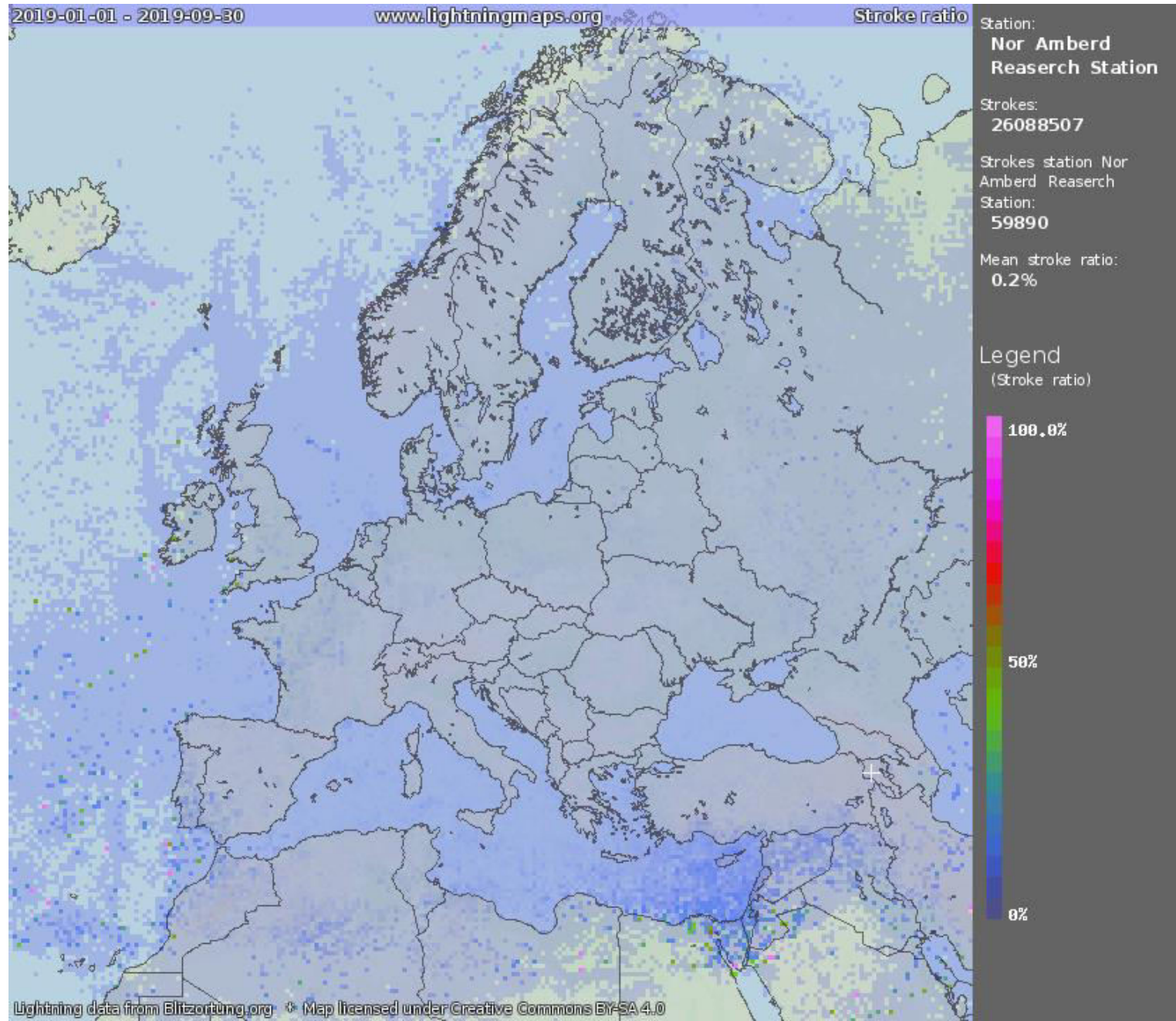


Nor Amberd Research Station (2019, 19 May)

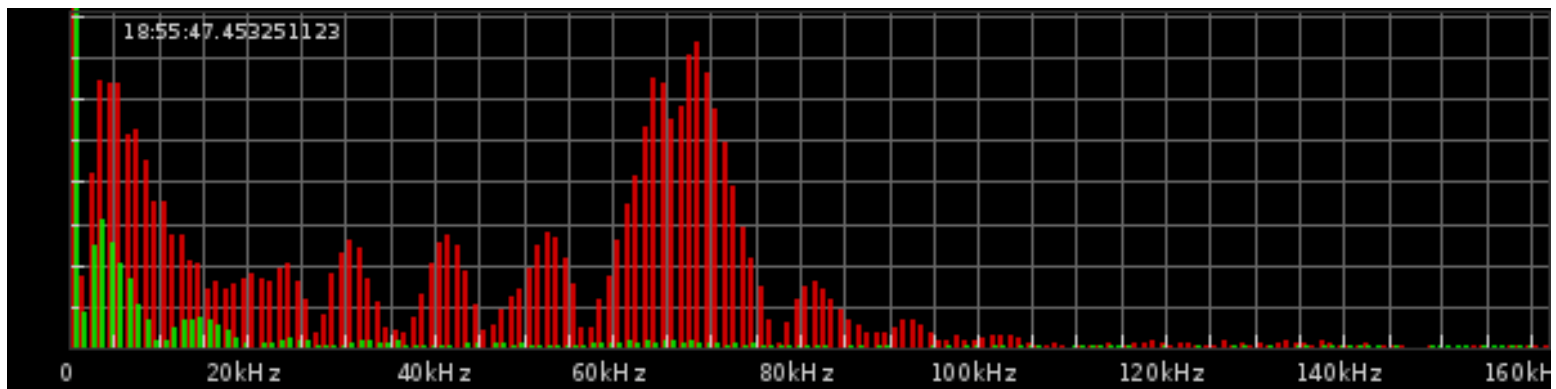
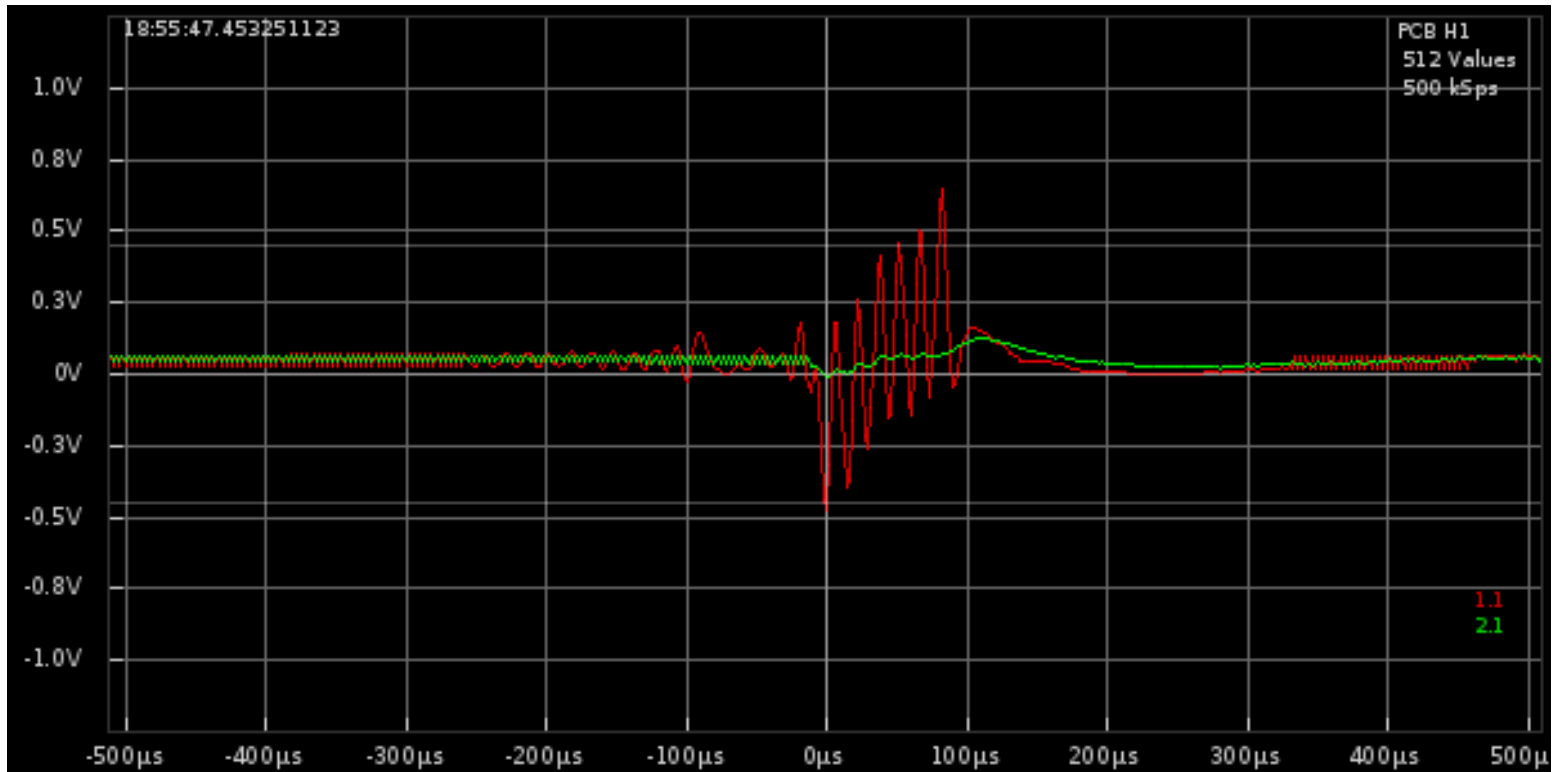
Stroke ratio
by bearing of
the last 24h
for station:
Nor Amberd
Research
Station



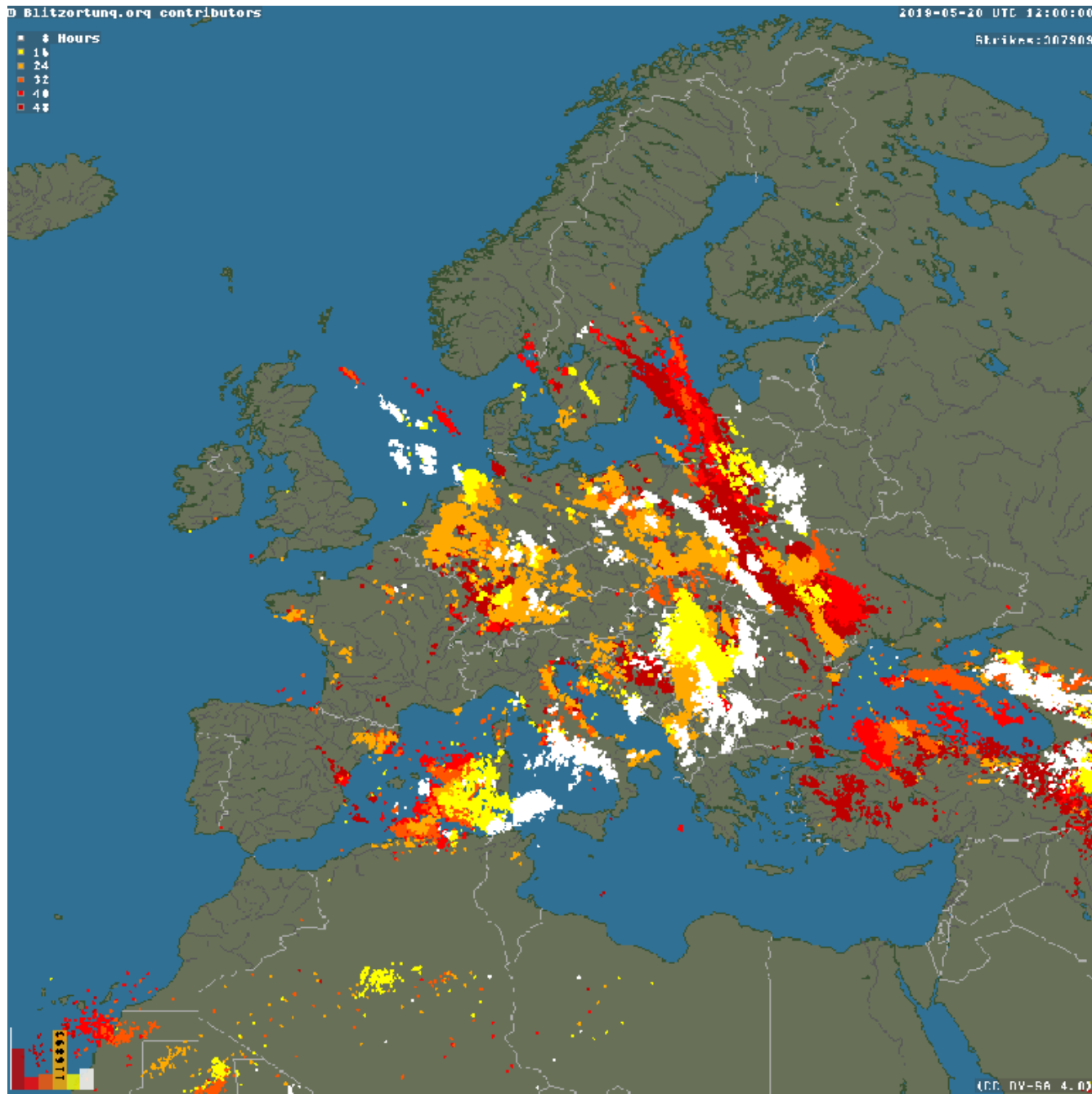
Station ratio Nor Amberd Research Station (2019)



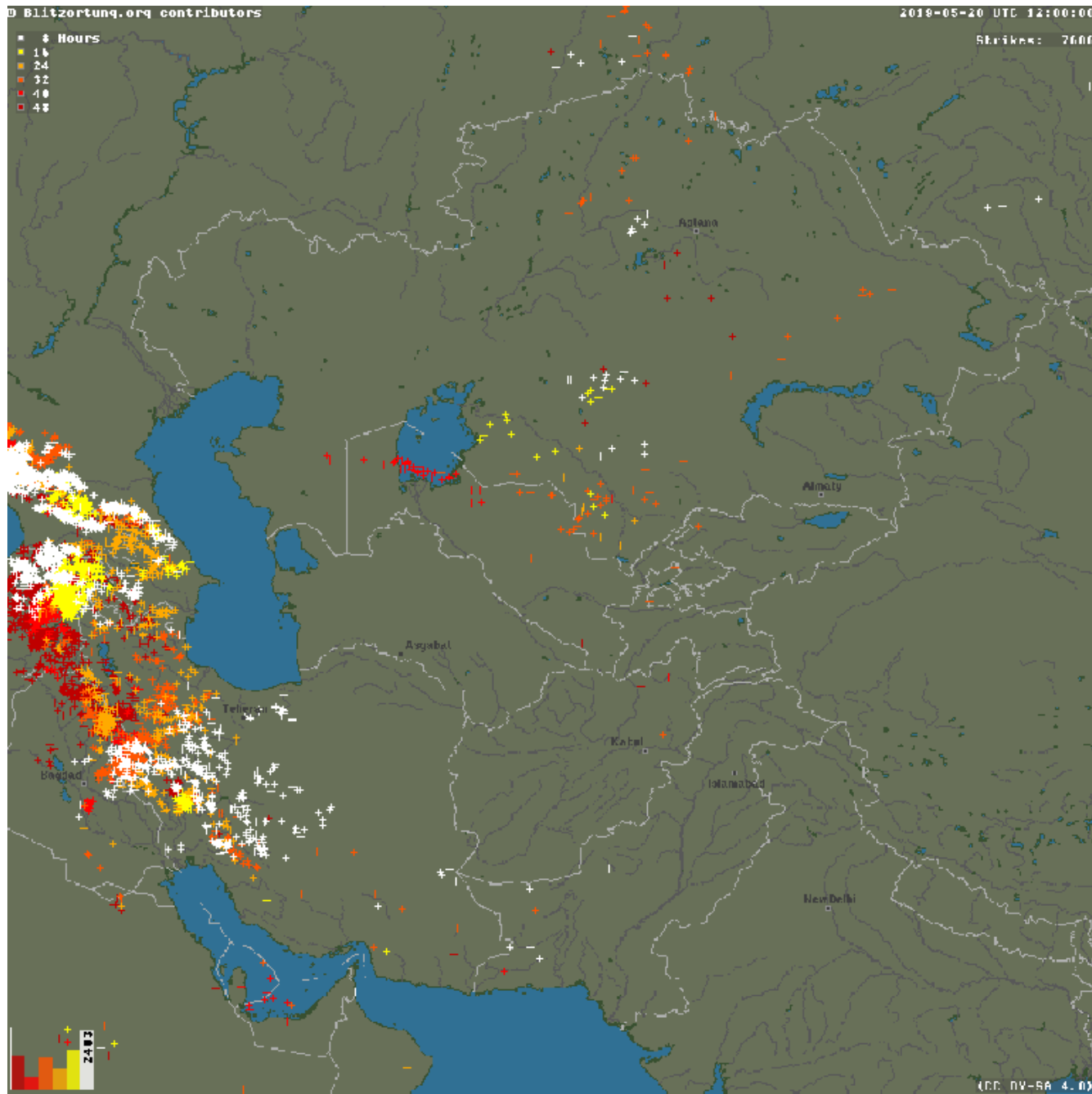
Interference Nor Amberd Research Station (2019, 14 October)



Lightning Detection over Europe 2019, 18-20 May

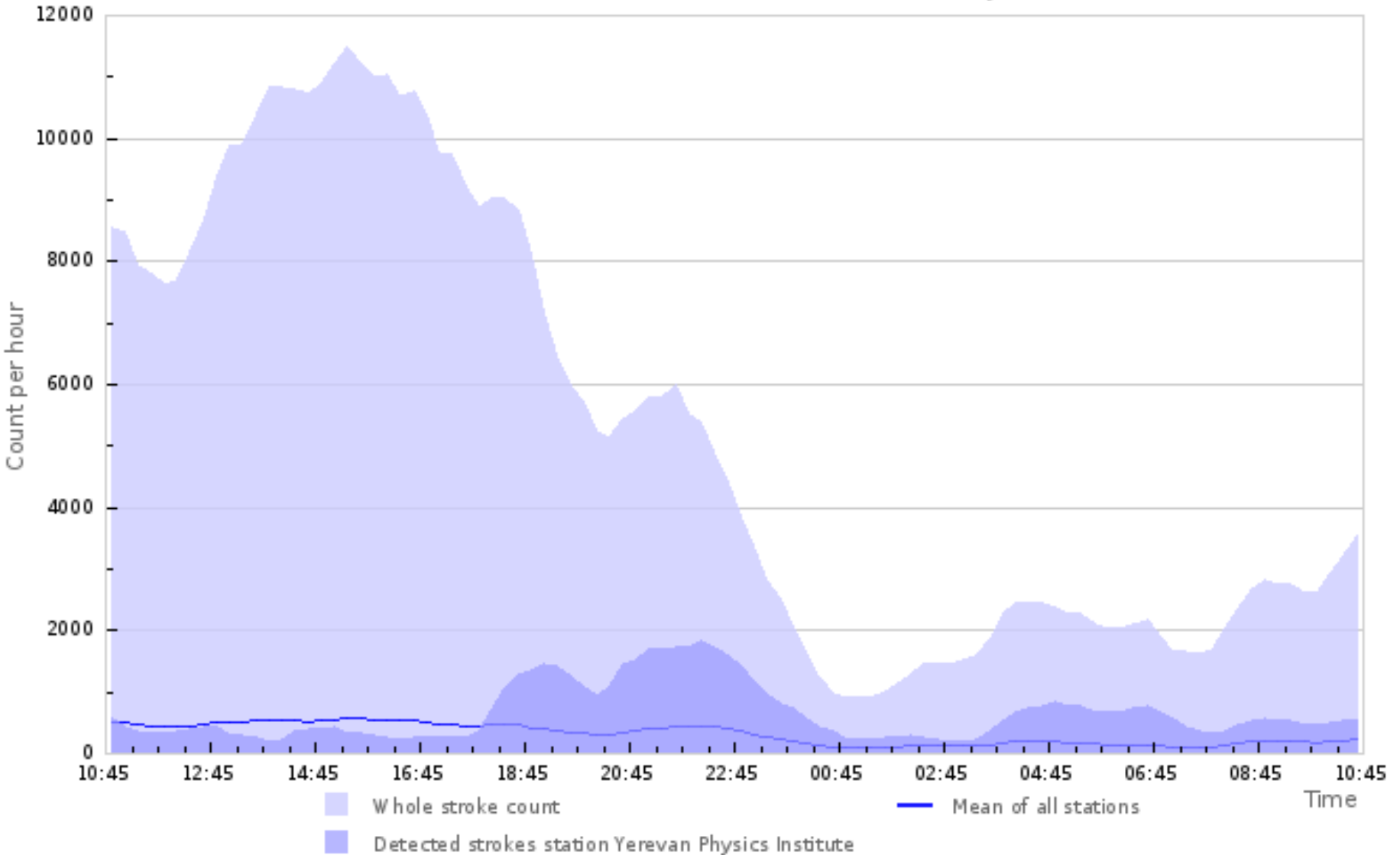


Lightning Detection over Armenia 2019, 18-20 May



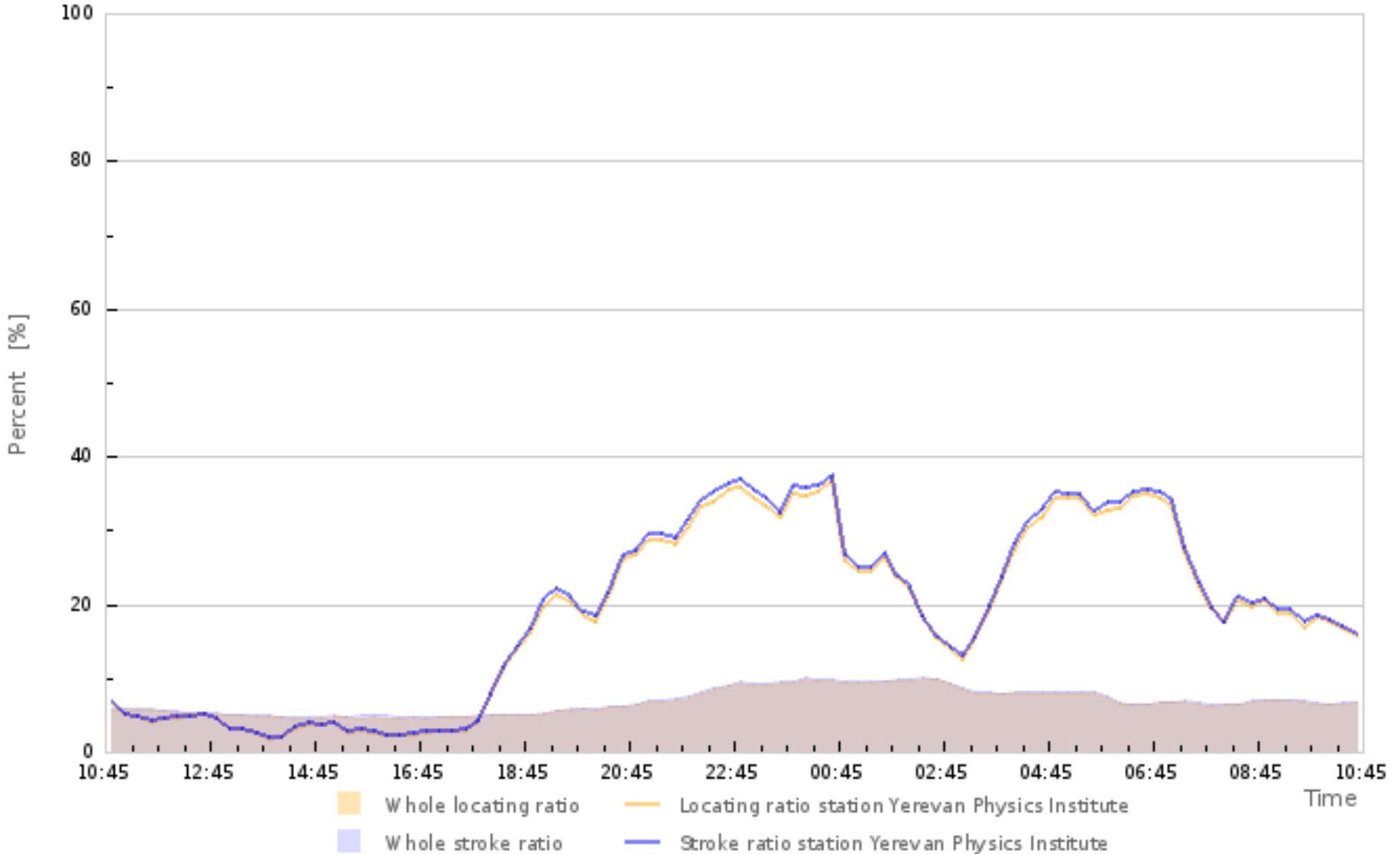
Yerevan Physics Institute (2019, 19 May)

Stroke statistics of the last 24h for station: Yerevan Physics Institute



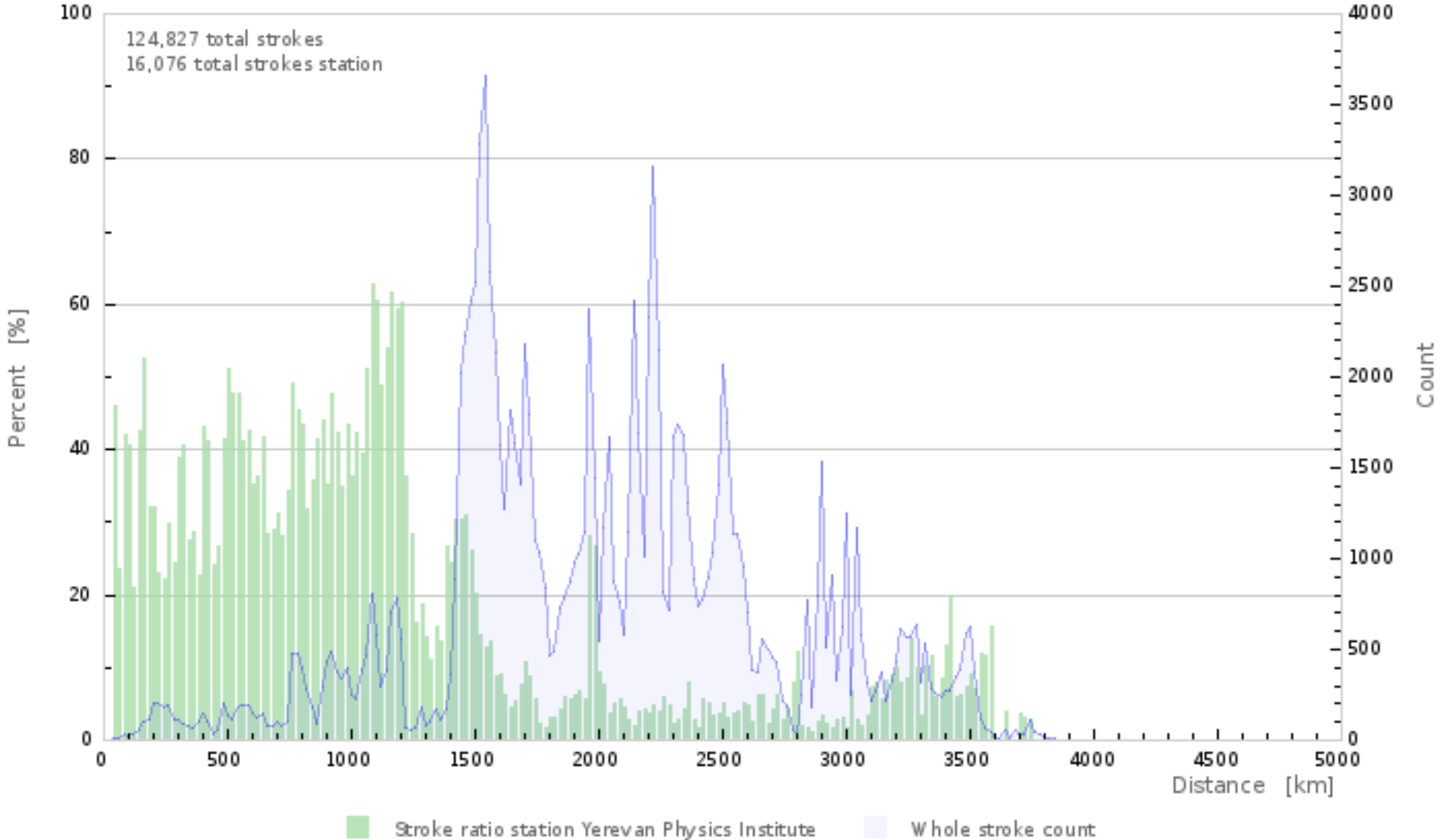
Yerevan Physics Institute (2019, 19 May)

Locating and stroke ratios of the last 24h for station: Yerevan Physics Institute



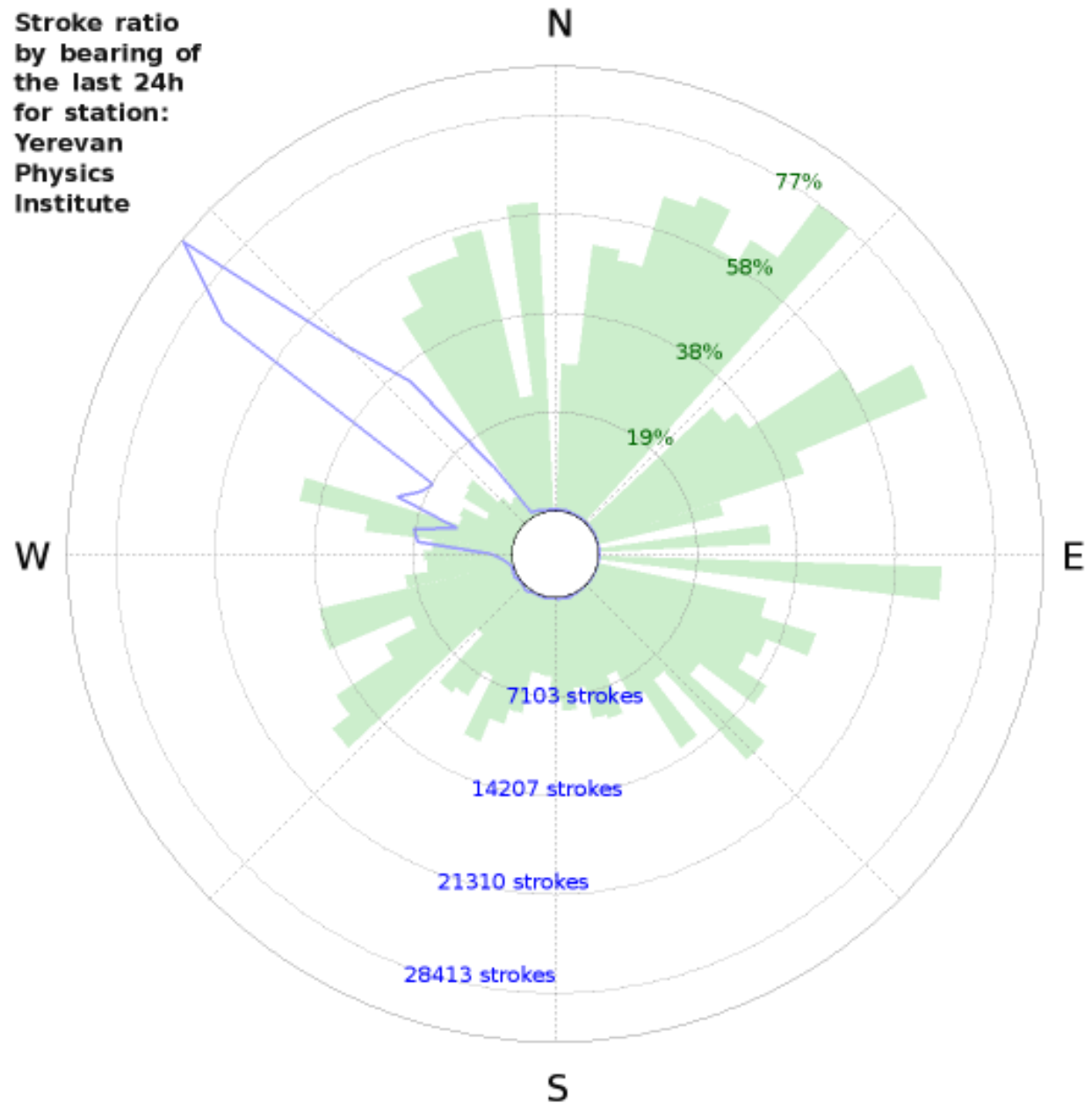
Yerevan Physics Institute (2019, 19 May)

Stroke ratio by distance of the last 24h for station: Yerevan Physics Institute



Yerevan Physics Institute (2019, 19 May)

Stroke ratio
by bearing of
the last 24h
for station:
Yerevan
Physics
Institute



2019-01-01 - 2019-09-30

www.lightningmaps.org

Stroke ratio

Station ratio Yerevan Physics Institute (2019)

Station:
Yerevan Physics
Institute

Strokes:
26088507

Strokes station Yerevan
Physics Institute:
1815169

Mean stroke ratio:
7.0%

Legend
(Stroke ratio)

100.0%

50%

0%

2019-01-01 - 2019-09-30

www.lightningmaps.org

Stroke density

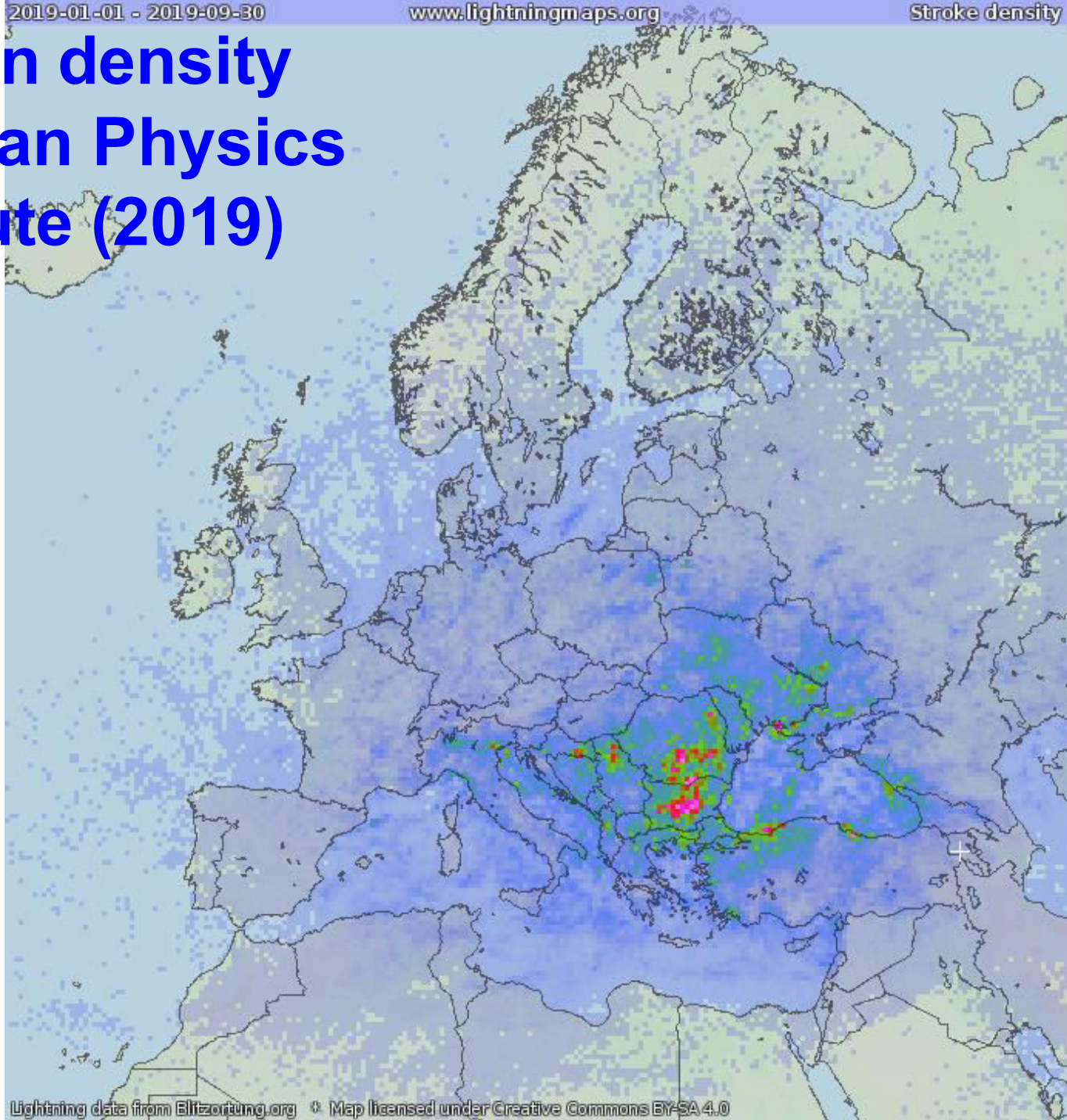
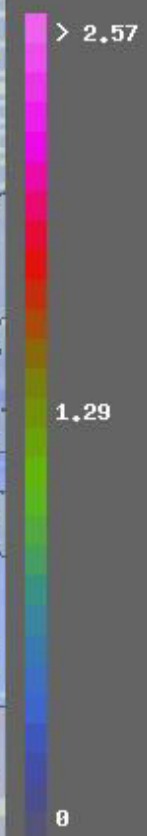
Station density Yerevan Physics Institute (2019)

Station:
Yerevan Physics
Institute

Strokes:
1815169

Maximum mean stroke
density displayed:
3.54/km²

Legend
(Strokes per km²)

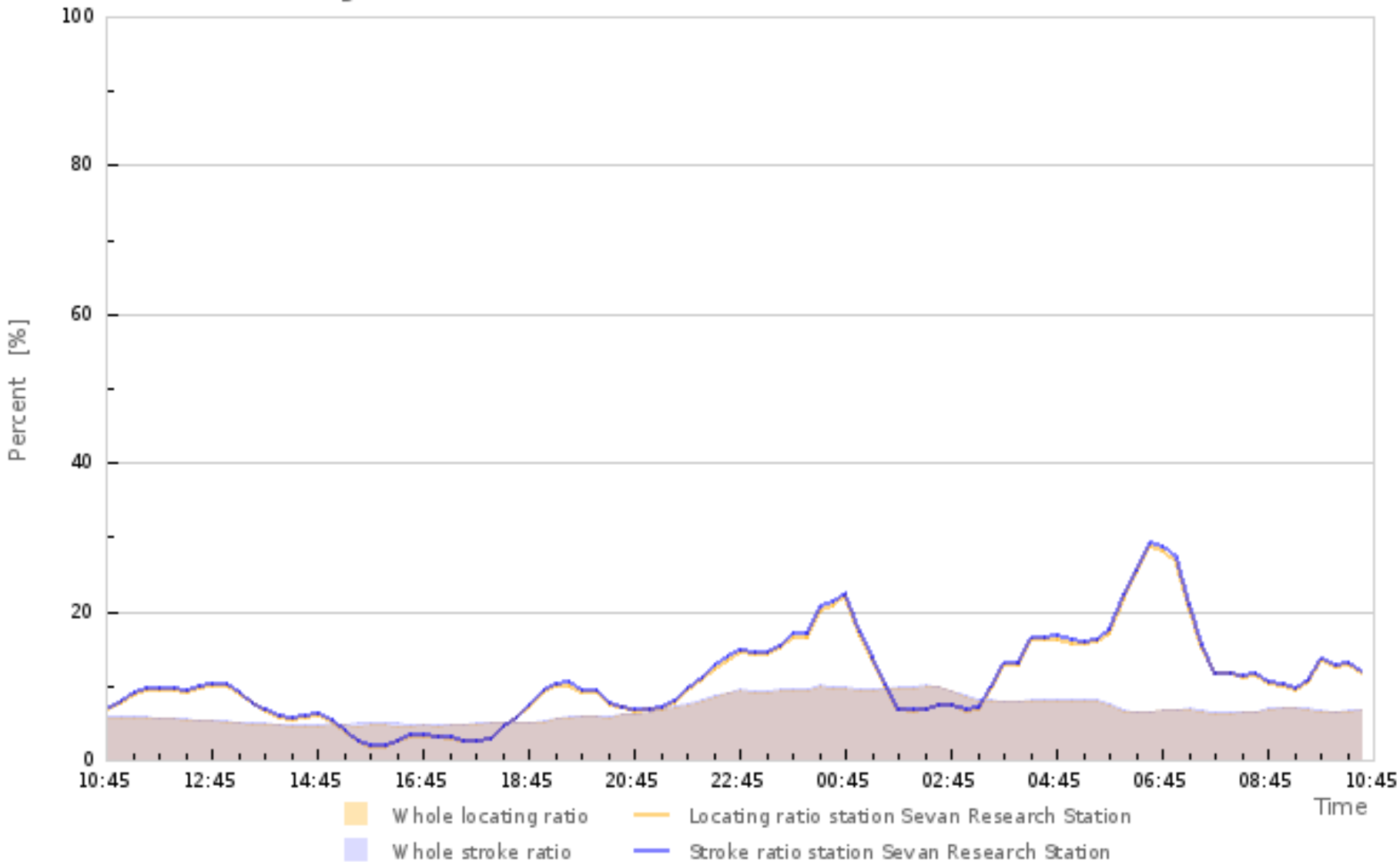


Radio Interference

- Due to the high level of electromagnetic interference the operational efficiency of the station in Aragats Cosmic Ray division was very low.
- This station was moved to the destination of Sevan Research Station.
- Luckily the electromagnetic environment near Sevan is one of the best.

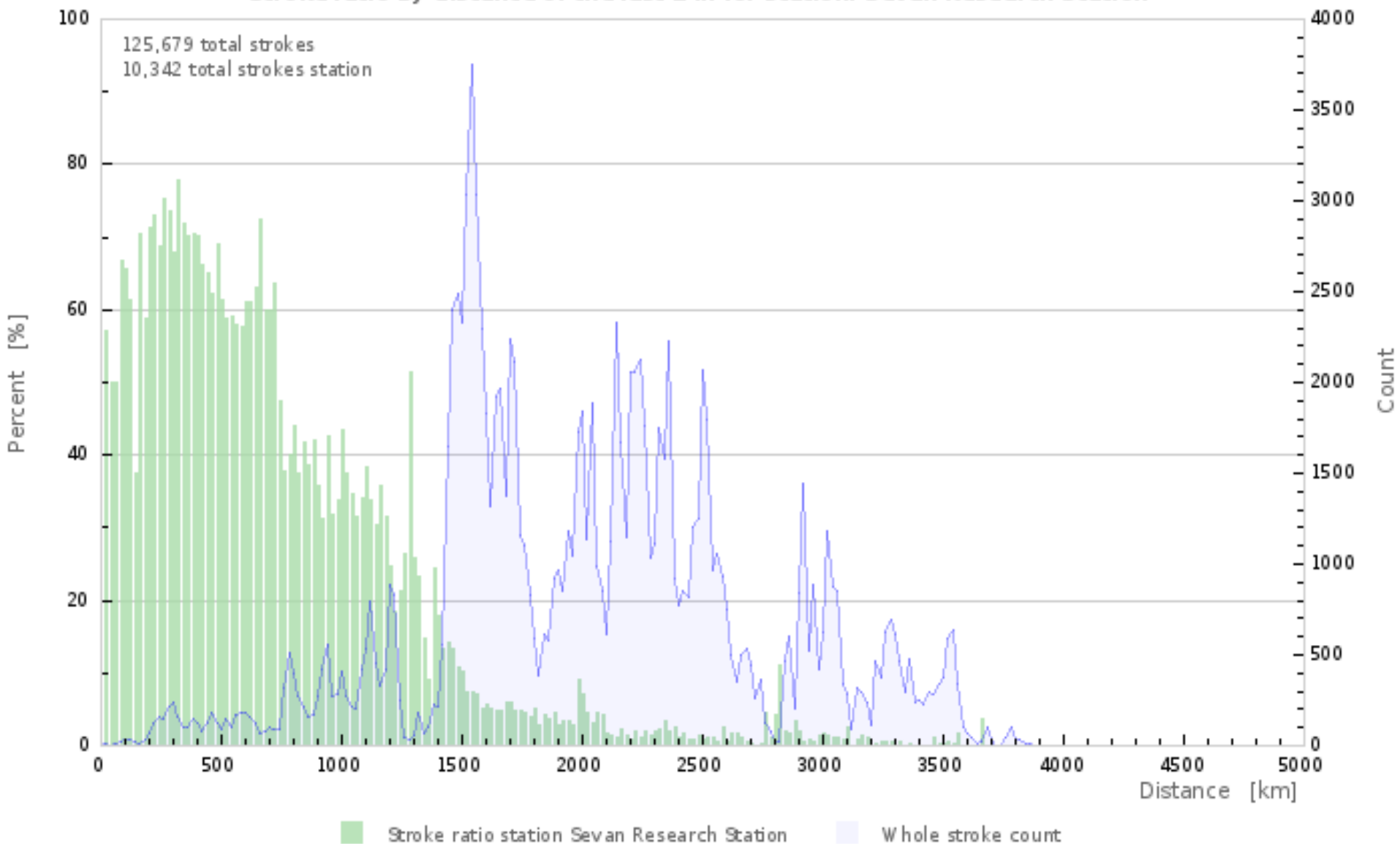
Sevan Research Station (2019, 19 May)

Locating and stroke ratios of the last 24h for station: Sevan Research Station



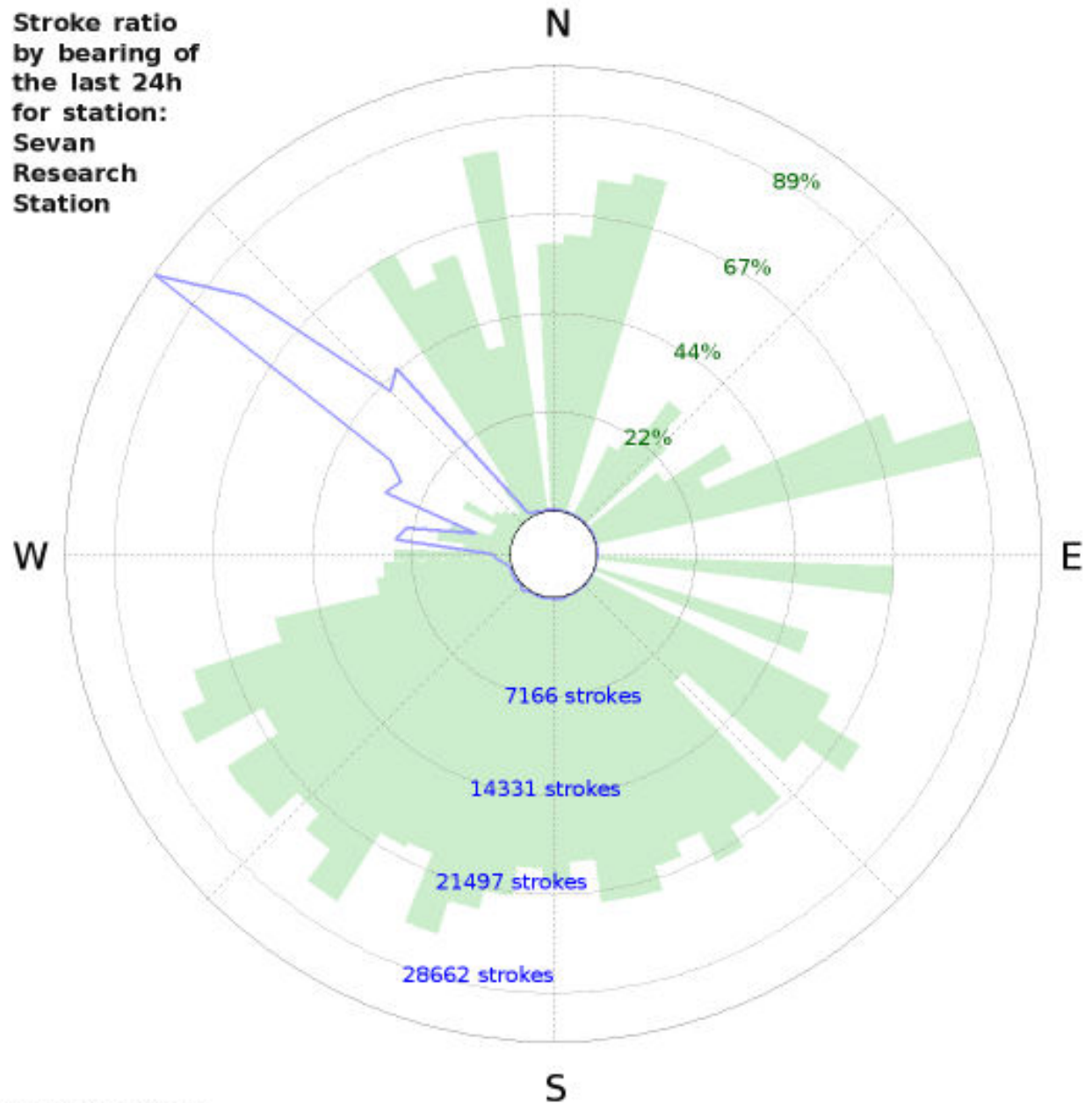
Sevan Research Station (2019, 19 May)

Stroke ratio by distance of the last 24h for station: Sevan Research Station

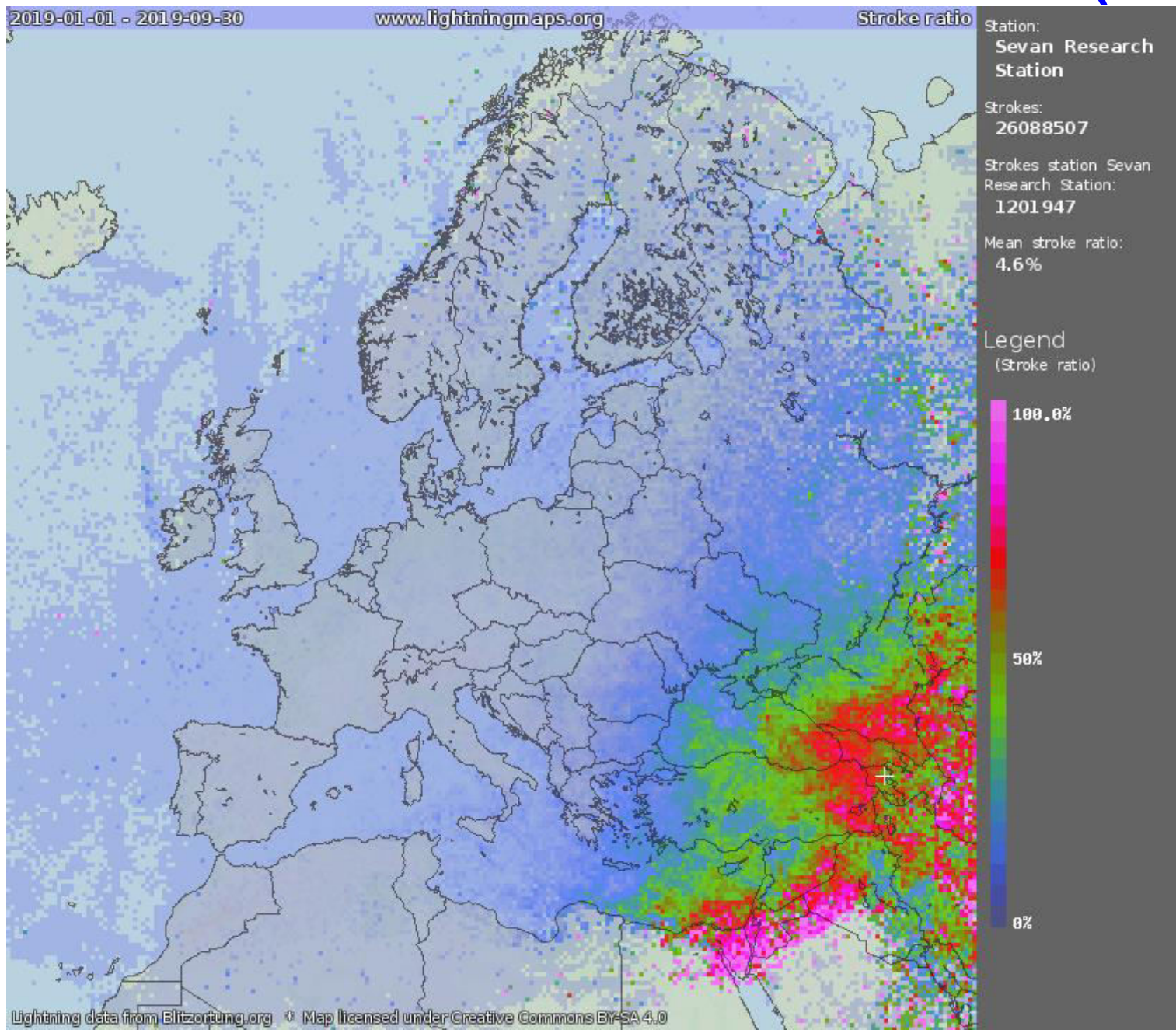


Sevan Research Station (2019, 19 May)

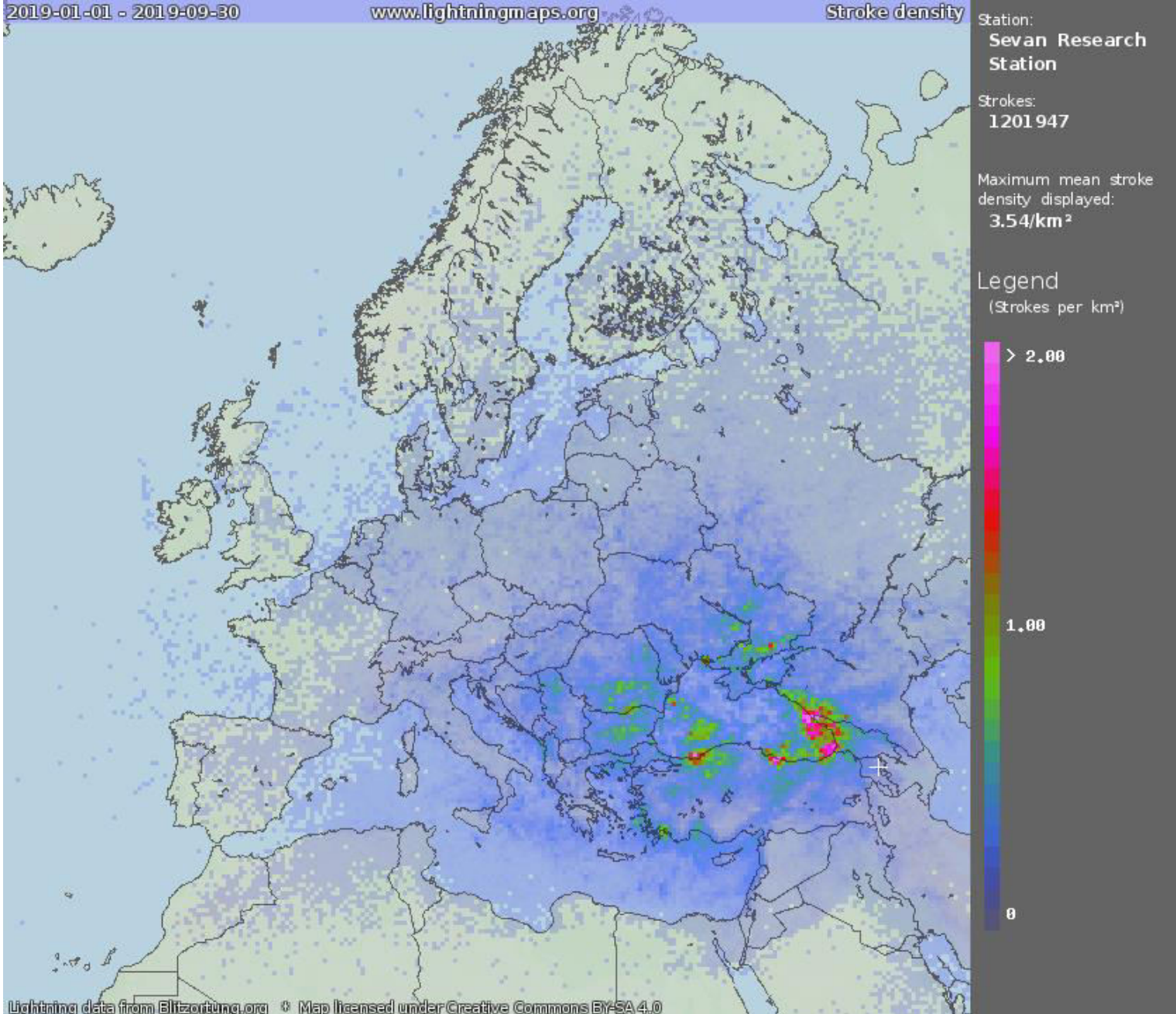
Stroke ratio
by bearing of
the last 24h
for station:
Sevan
Research
Station



Station ratio Sevan Research Station (2019)

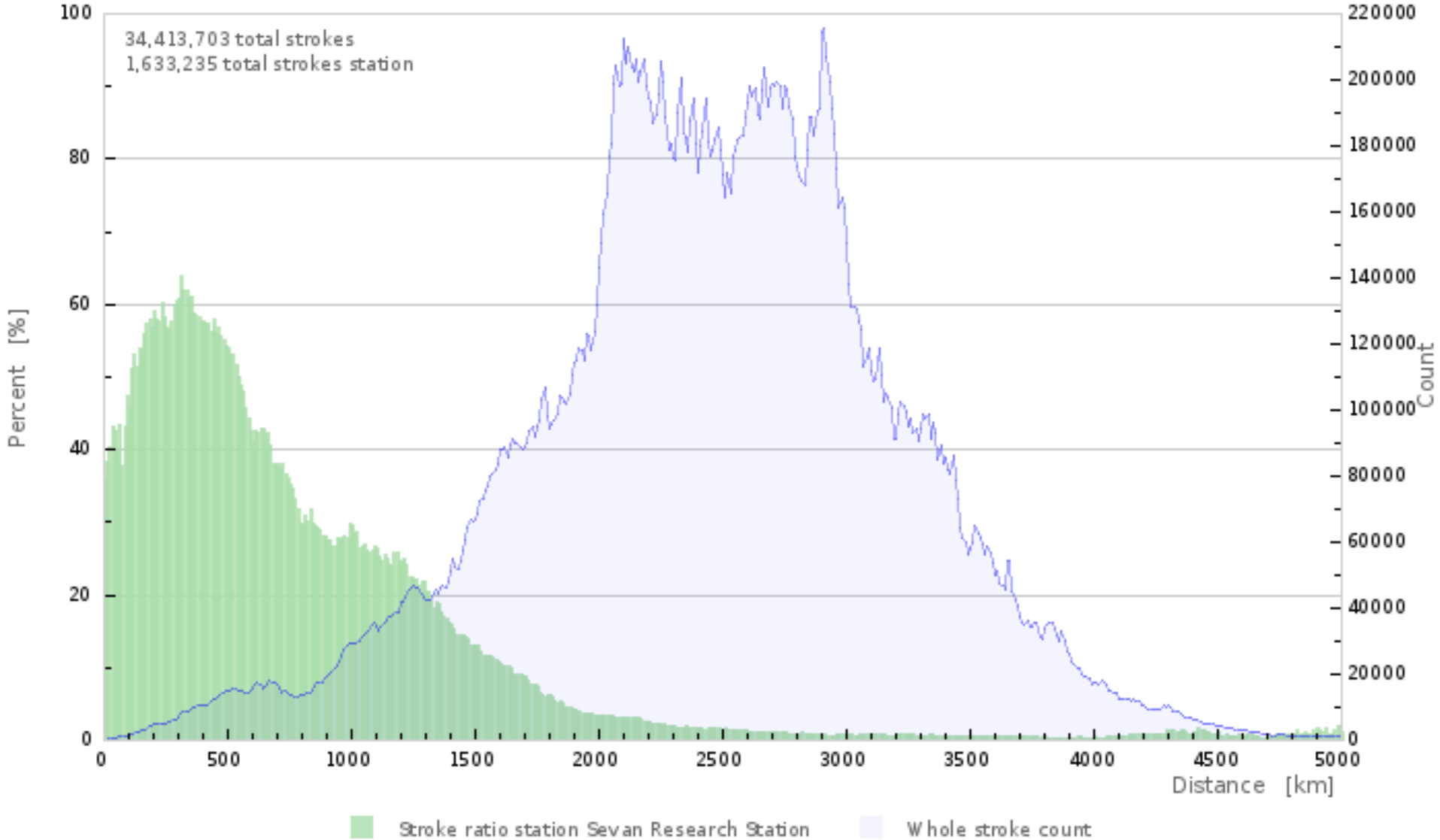


Station density Sevan Research Station (2019)



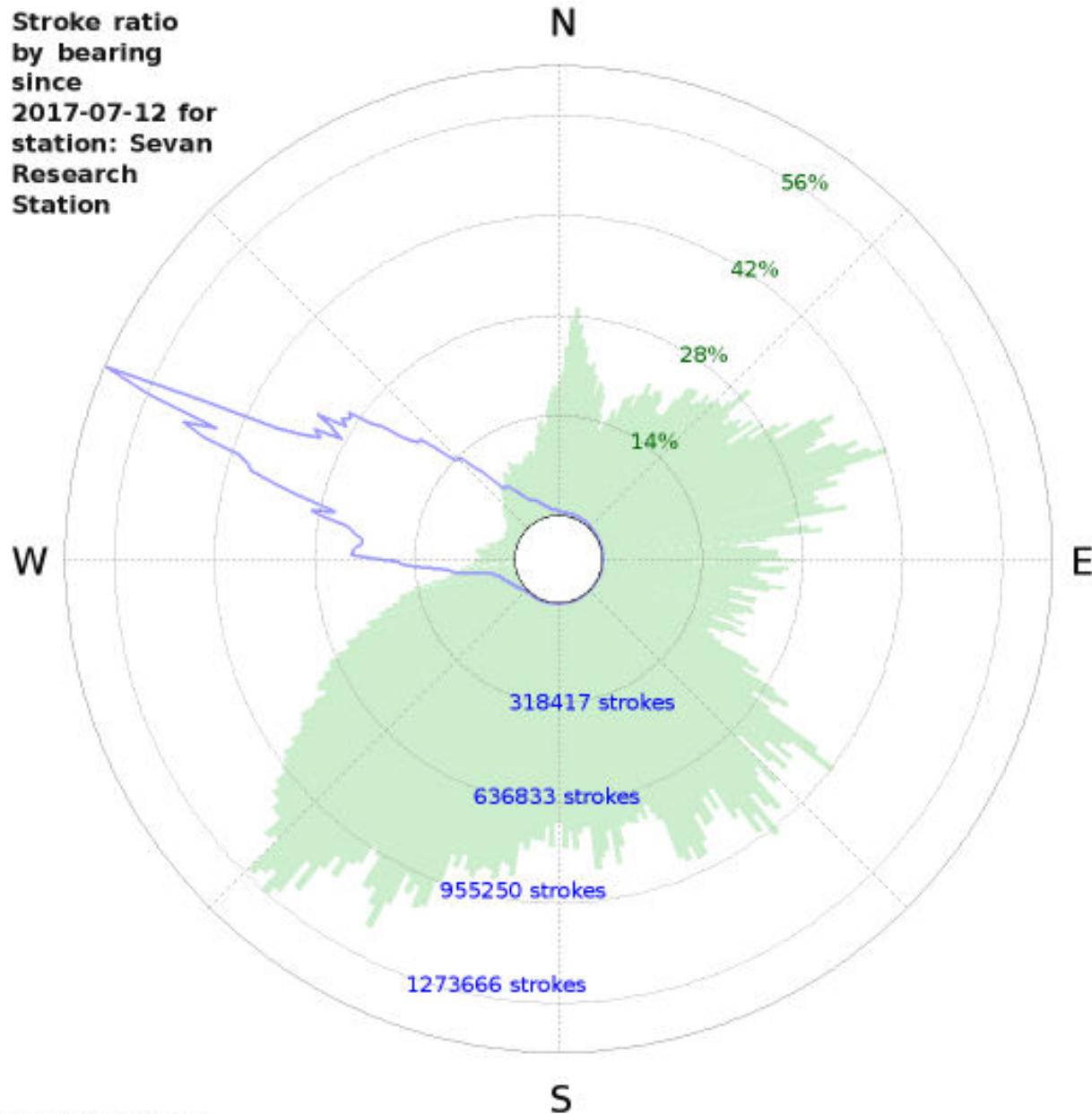
Sevan Research Station (Total)

Stroke ratio by distance since 2017-07-12 for station: Sevan Research Station

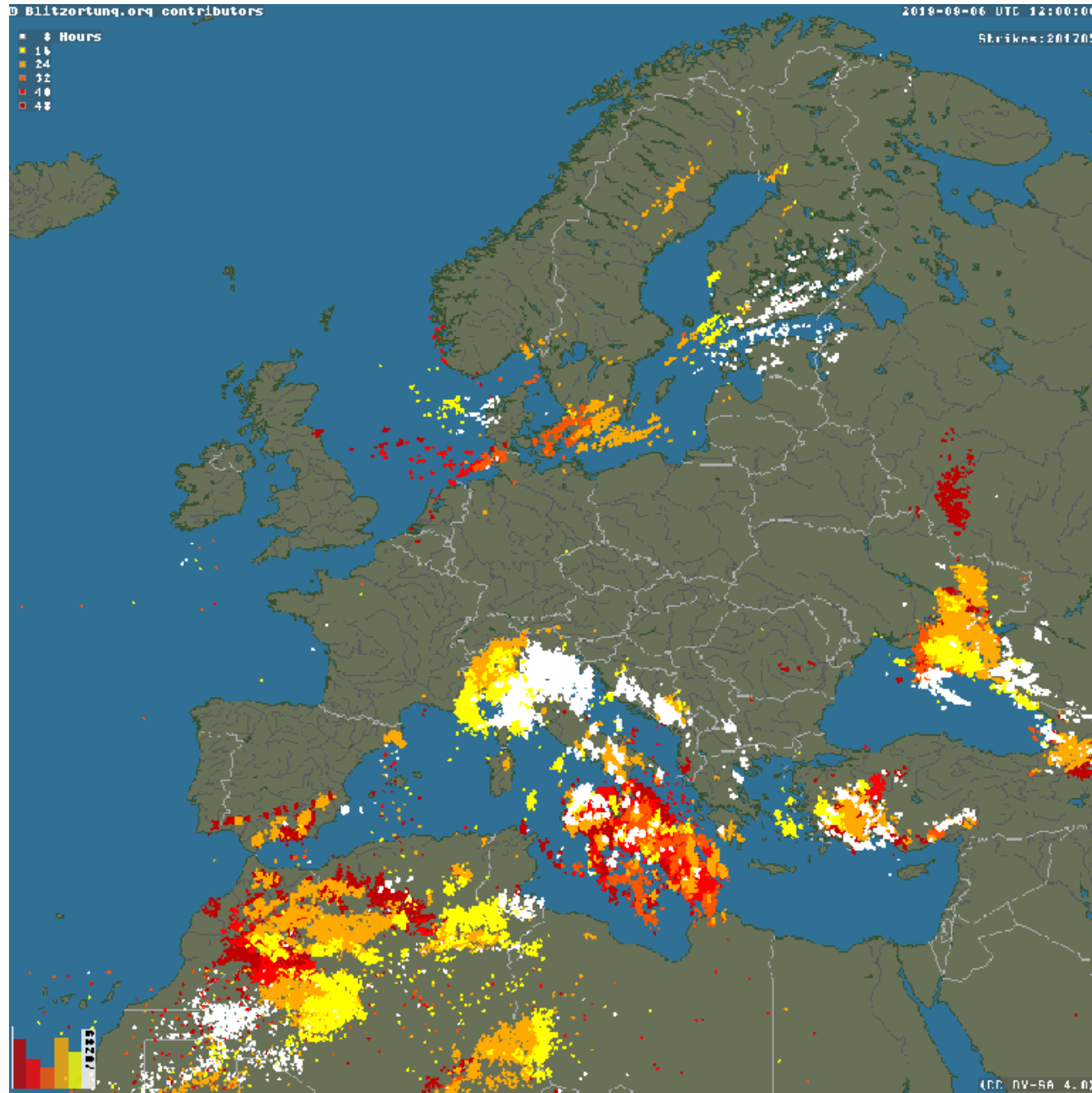


Sevan Research Station (Total)

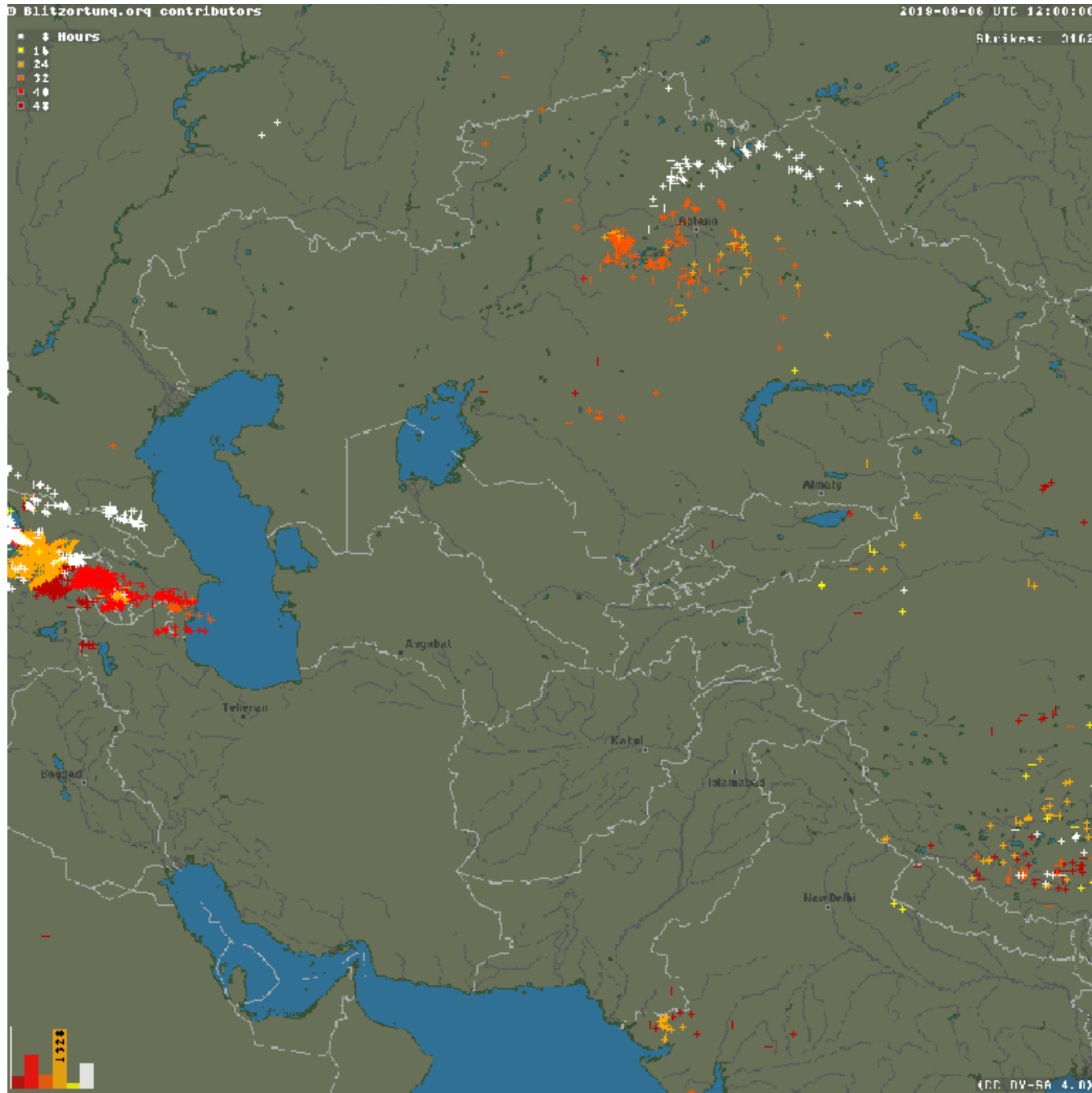
Stroke ratio
by bearing
since
2017-07-12 for
station: Sevan
Research
Station



Lightning Detection over Europe 2019, 4-6 September

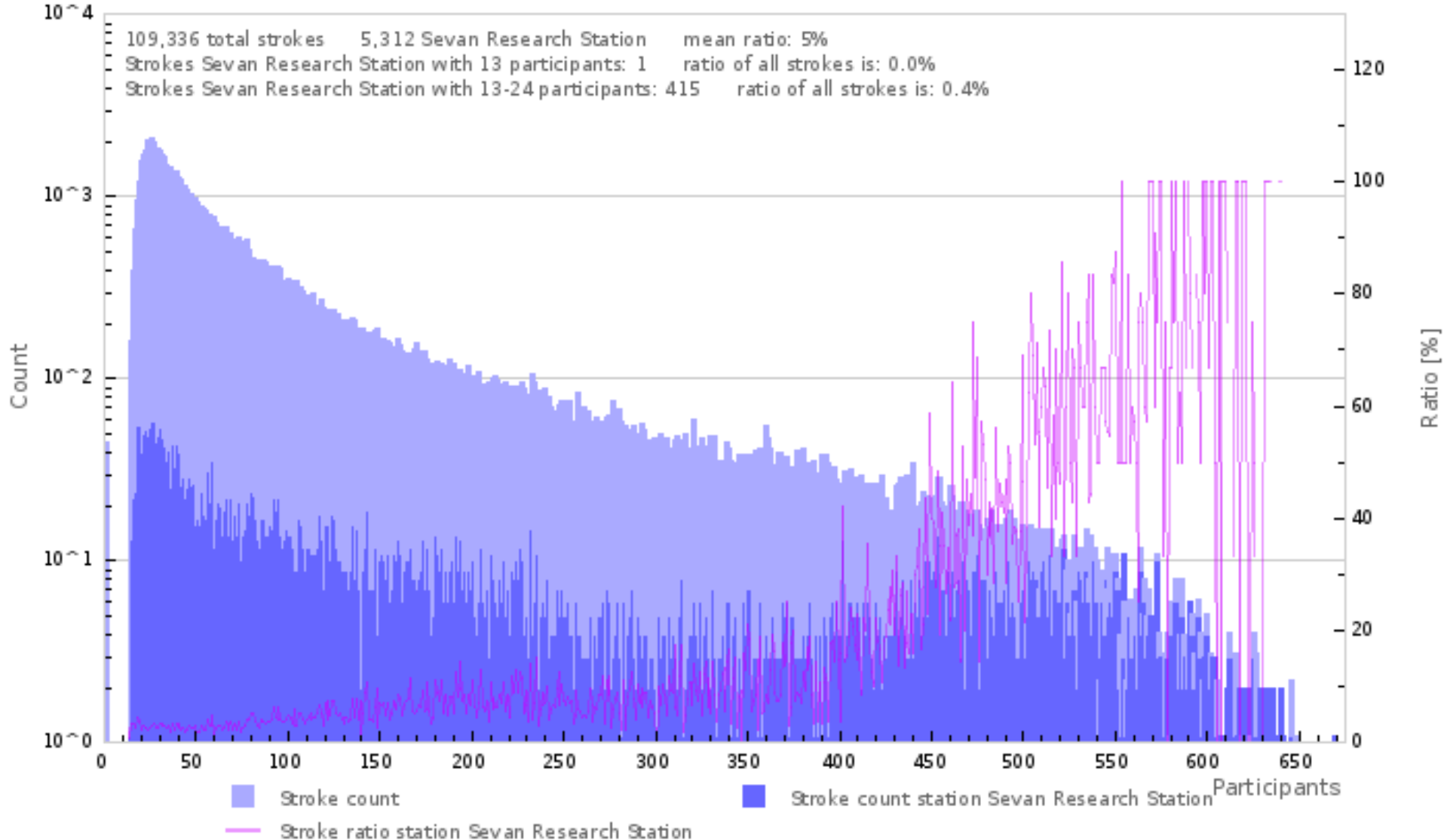


Lightning Detection over Armenia 2019, 4-6 September

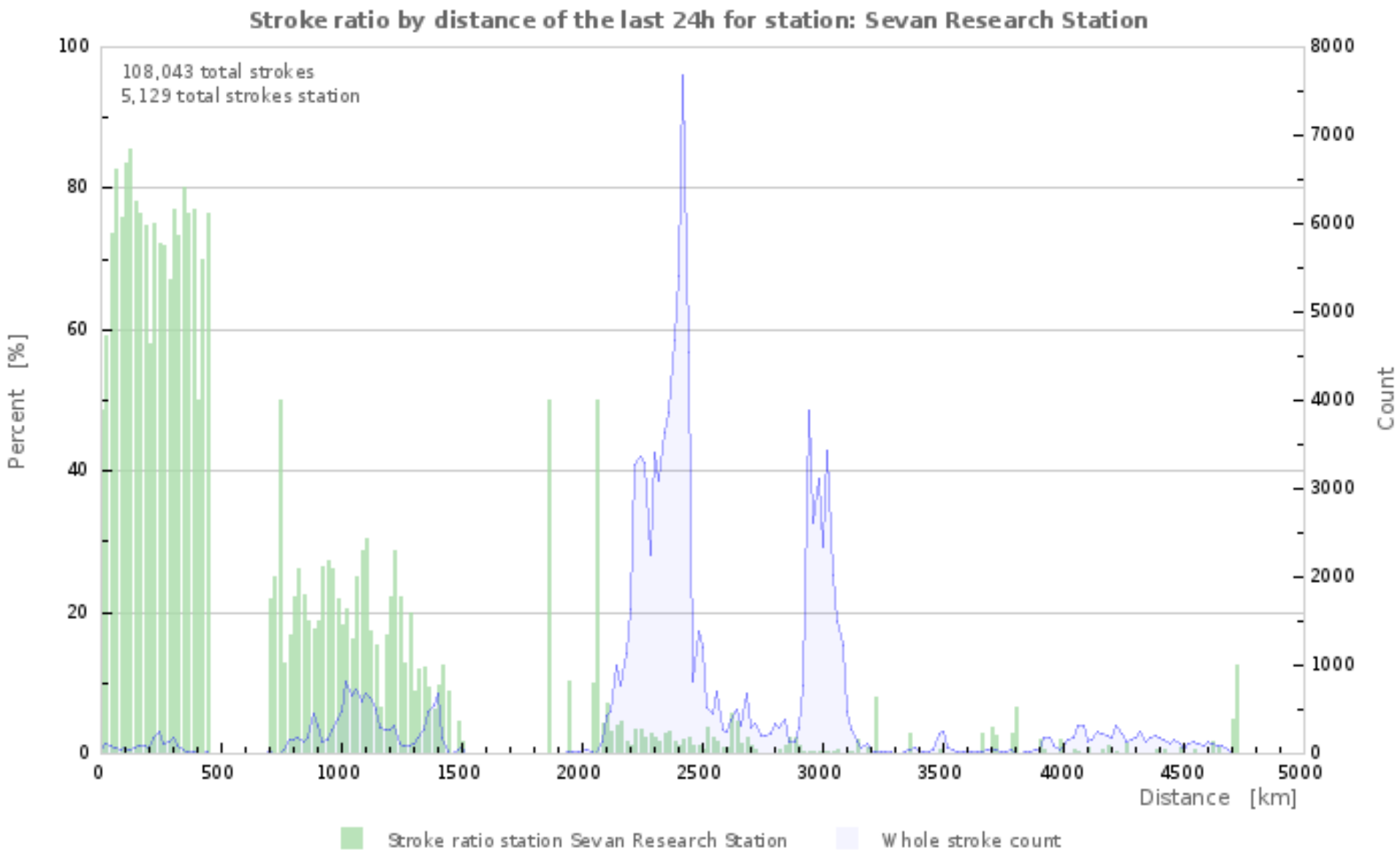


Sevan Research Station (2019, 5 September)

Detections per participation count of the last 24h for station: Sevan Research Station

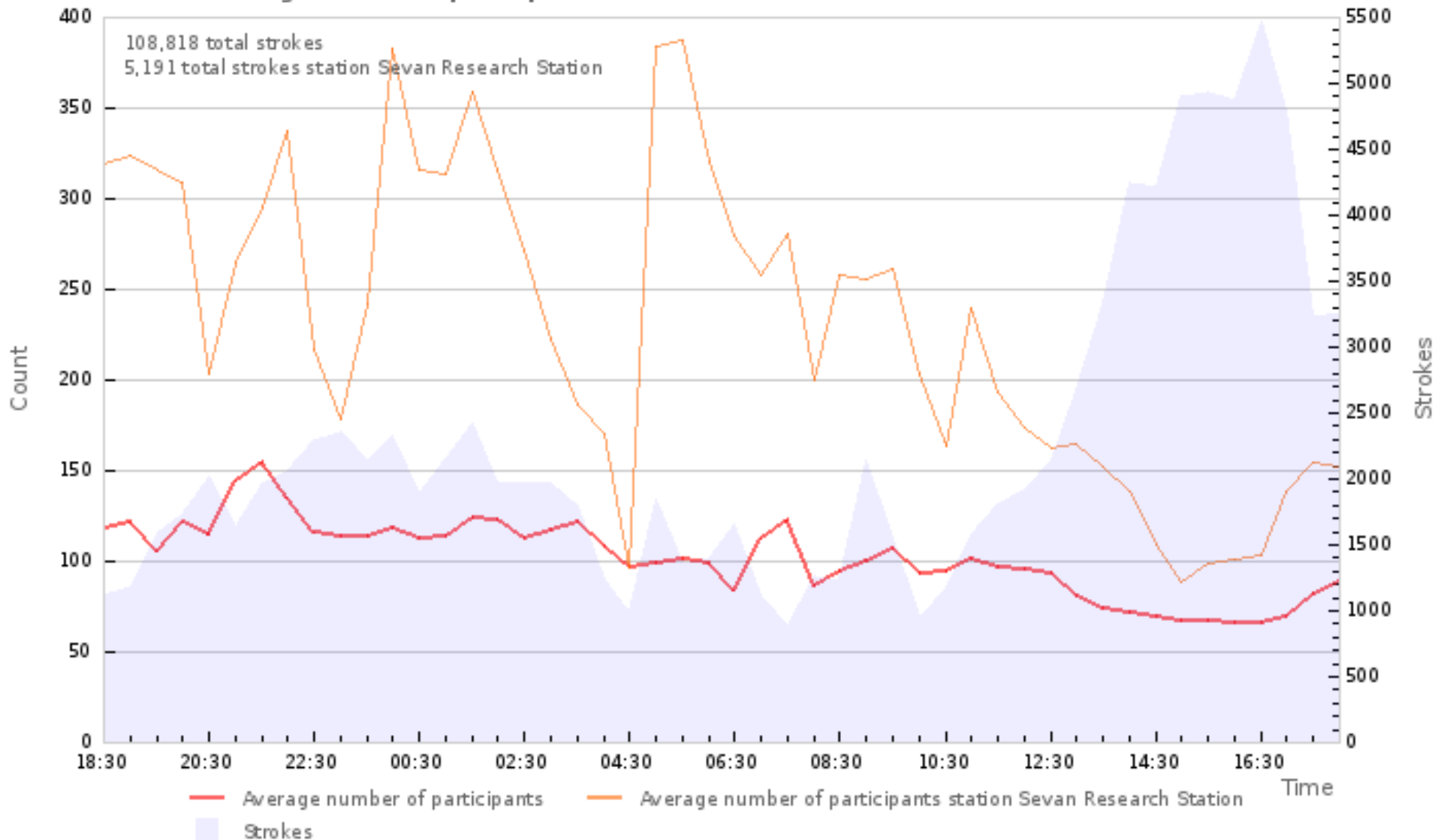


Sevan Research Station (2019, 5 September)



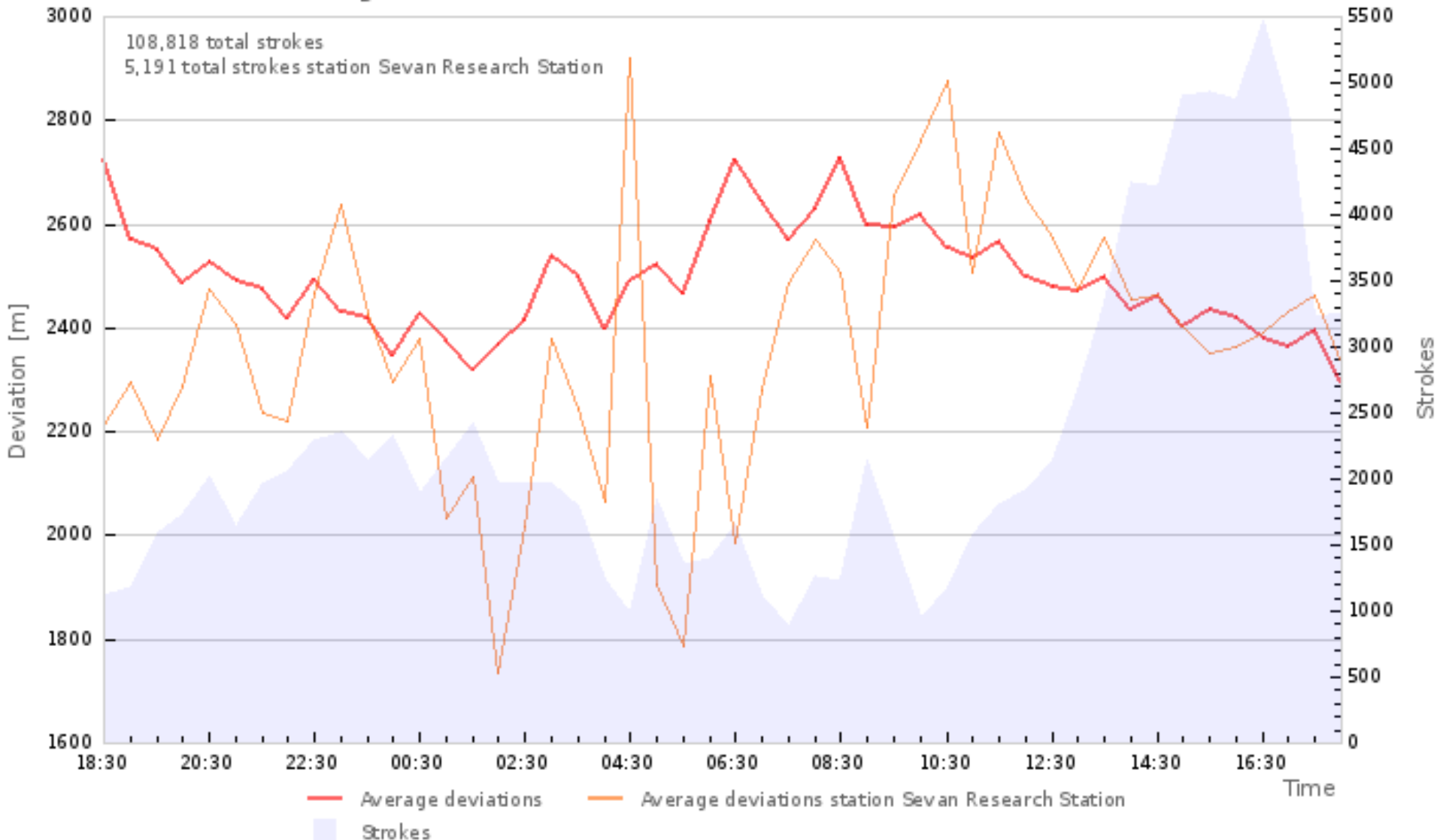
Sevan Research Station (2019, 5 September)

Average number of participants of the last 24h for station: Sevan Research Station



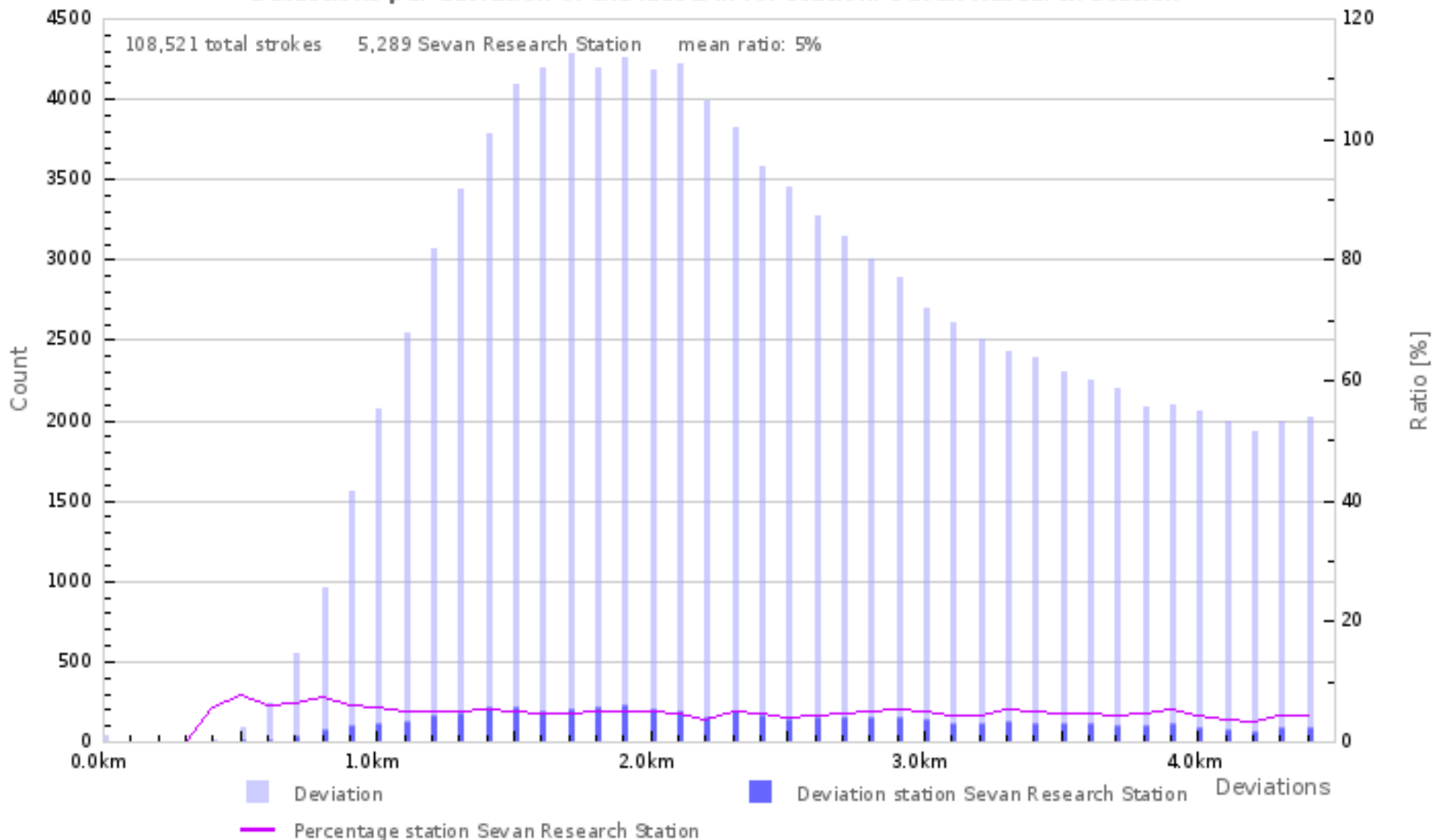
Sevan Research Station (2019, 5 September)

Average deviations of the last 24h for station: Sevan Research Station



Sevan Research Station (2019, 5 September)

Detections per deviation of the last 24h for station: Sevan Research Station



Conclusion

- Average Number of Participants of Blitzortung lightning detector array for Armenia are from 100 to 390.
- Accuracy of Lightning detection for Armenia is in the range from 1800 m to 2900 m.
- The probability of Lightning detection for Sevan station is about 0.8 in the range of 500 km.
- The probability of Lightning detection for Yerevan Physics Institute station is about 0.4 in the range of 1000 km.
- The probability of Lightning detection for stations located at Aragats Cosmic Ray Division and Nor Amberd Research Station is less than 0.01 due to interference.
- This instrument can be used for obtaining time and spatial information on the Lightning Discharges together with particle detectors and facilities of A. Alikhanyan National Lab (Yerevan Physics Institute).

Acknowledgments

- A worldwide, real time, community collaborative lightning location network.
- 2003-2019 Blitzortung.org Contributors

Thank you for your attention!
Спасибо за Внимание!

