40-m Domestic Propagation at November 2022 at FT8 QSO Party in Japan

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And

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Crew of W0AIH, K1TTT, J3A, XU0AA, AH0K, JH4WBY, 8N4HQ

Social experiment FT 8 QSO party

https://hamfes.com/virtual-hamfes-2021/ft8-qso-party/

- Virtual Ham festival in Japan was hold 2022 Nov. 13 by volunteers, chaired by 7K1BIB Takahiro Yamauchi.
- FT8 QSO Party was held on same day 09:00- 24:00 JST.
  - 29 Logs were submitted.
  - 93 unique stations on the logs.
  - Contest type completion. JE6WUD got 1st prize.
  - Exchanged report Grid locator
  - Supplementary prize was sponsored by ICOM corporation.
- Analysis Part
  - All data were opened for analysis after removing critical personal information.
  - Visualization contest of propagation analysis was held.
  - Objectives is a creation for digital transformation of amateur radio. Specifically, we can enjoy a contest without transmitting.
  - It is aimed to create an innovation.
  - Judged by the volunteered Professors who are Ham. Chaired by Seiji Fukushima, JH6RTO.

We analyzed only contacts in 40m band.

Analysis Tool

- Available free or widely used.
- PYHTON Anaconda : Free
  - Pandas : Large data handling
  - maidenhead library : Grid locator analysis
- Microsoft Excel
  - Simple graph drawing
- CERN ROOT : Free, https://root.cern/
  - It is common tool on particle and nuclear experiment.
  - C++ based analysis framework.
  - Just I am using in my daily research.

Report Consideration

Friis transmission equation

$S_{ji} / N_j = P_i * A_i * I_{ij} * A_j$

Transmitted by station i, and received by station j

$S_{ji} / N_i = P_j * A_j * I_{ji} * A_i$

Transmitted by station j, and received by station i

P: transmitting power, A:anntena gain

I: propagation loss, S:recived Signal

N: Noise at receivening

Assumptions

$I_{ij} = I_{ji}$

Propagation losses are same for both direction

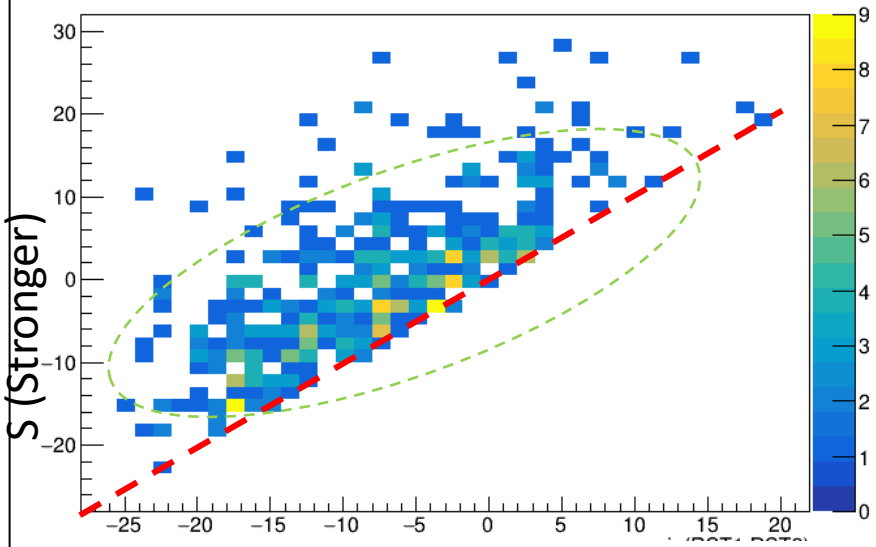
$N_j = N_i$

Receiving noises are same.

Taking log and take difference

$\mathrm{Log}(S_{ji}) - \mathrm{Log}(S_{ij}) = \mathrm{Log}(P_i) - \mathrm{Log}(P_j)$

- Report differences depends on only power.
- Not depend on the antenna and propagation conditions.



S/N(Weker)

- Most of contact done with 10 dB difference.
- Max 40 dB difference
  - Too much power?
  - Receiving noise higher?

We may analyze for noise, when not assume equal noise.

- Locations, local or global?

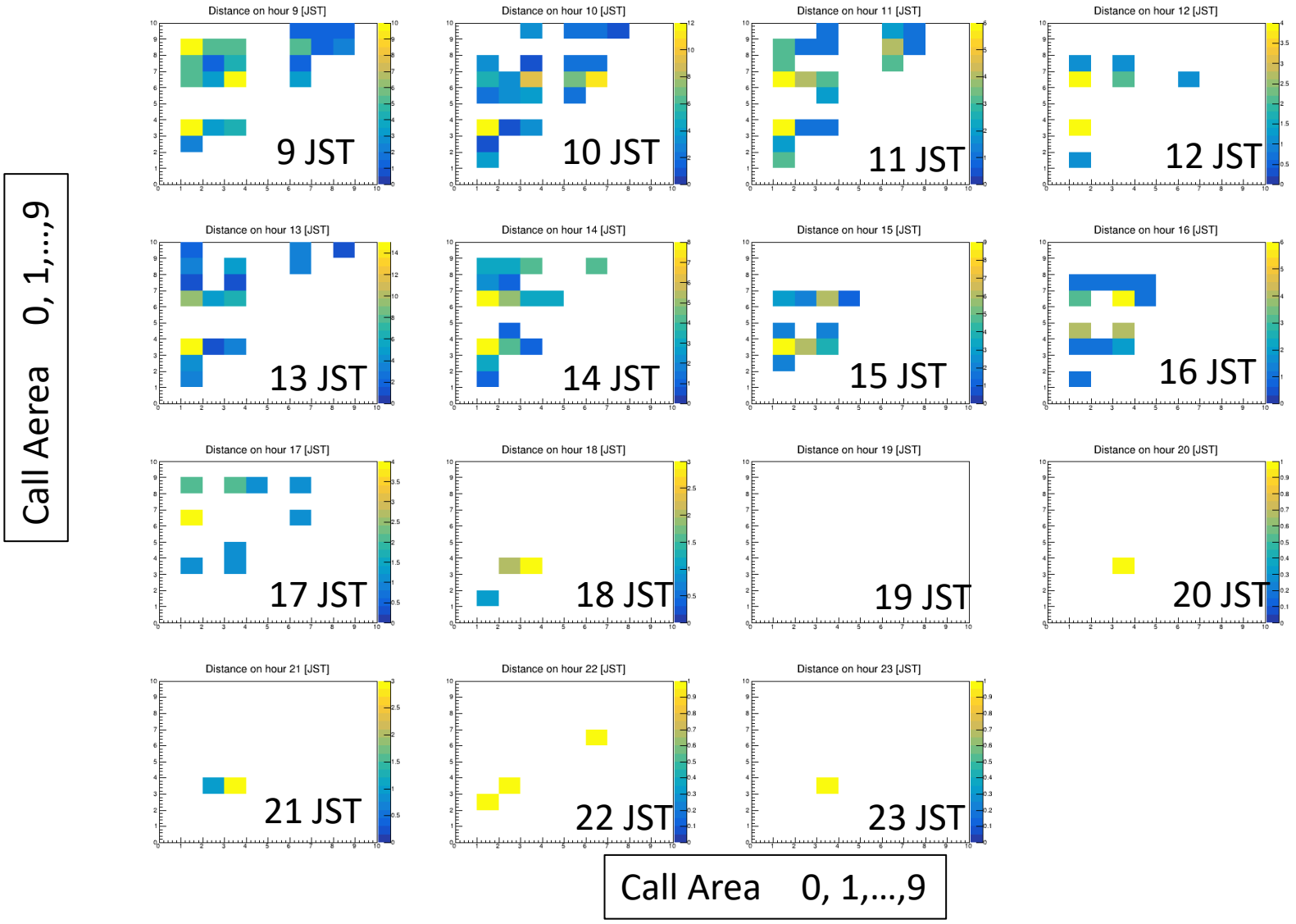
Hourly contact

Number of logged contact in each hour

Hour[JST]

It is 90 QSO just after started.
However, many people may take lunch. In addition to lunch, some may prepare lunch?
After 15:00, propagation to change

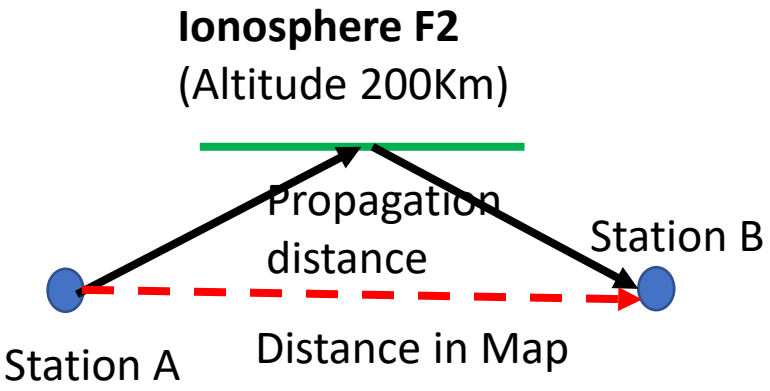
Contacts among Call area(JA0- JA9)

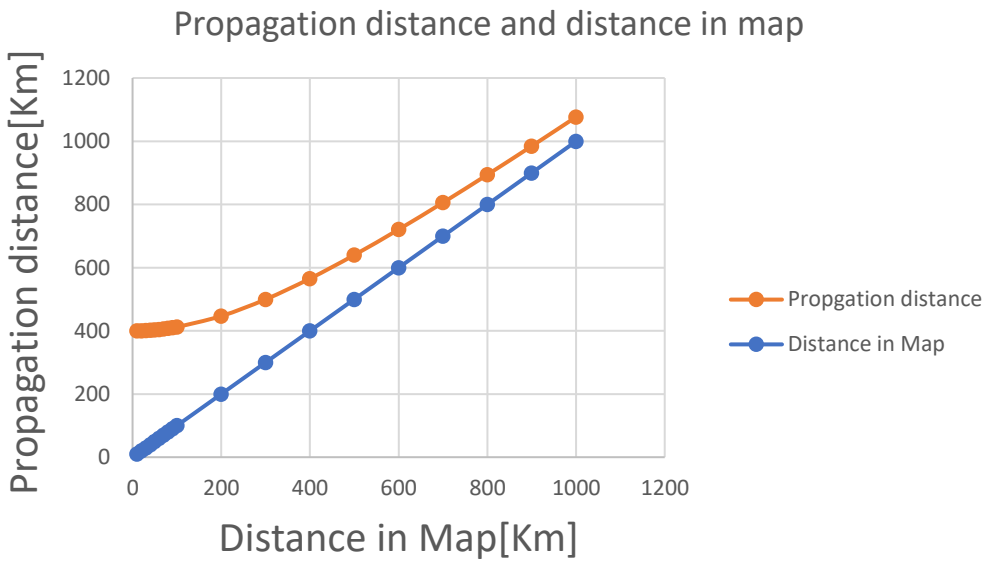


- Until early afternoon, all area are opened.
- After 16, only same area or long distant contact.

Propagation distance

Distance in map obtained from Grid locator.





Loss is 1/distace^2

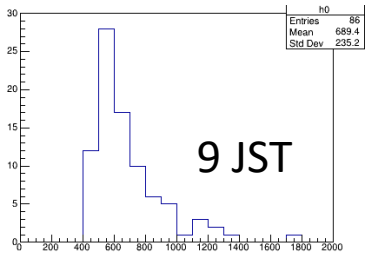
Shor distance contact affected by altitude of ionosphere.

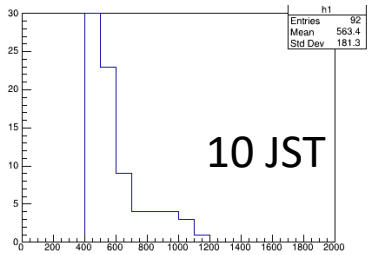
Long distance may be affected by distance in map.

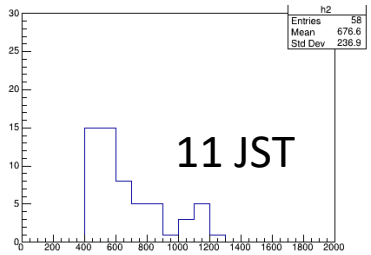
Upto 200 Km of distance in map propagation distance are almost same length.

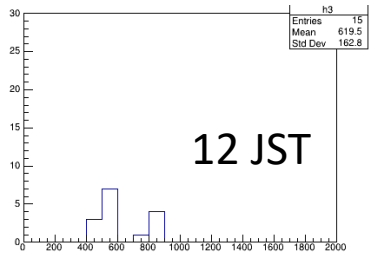
Use Propagation distance.

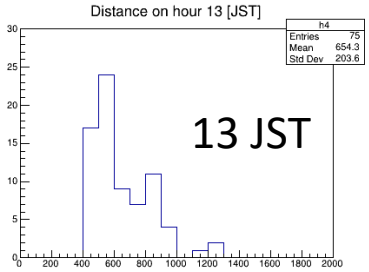
Time dependent of Propagation distance

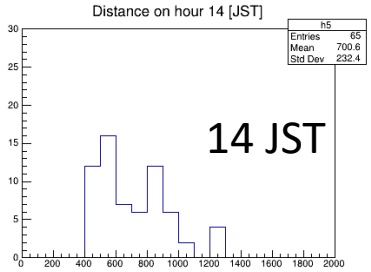


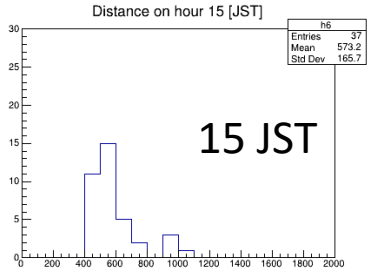


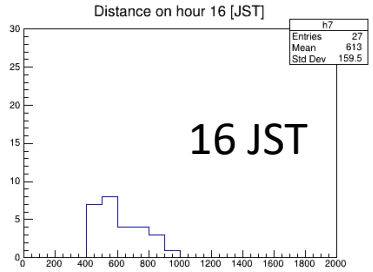


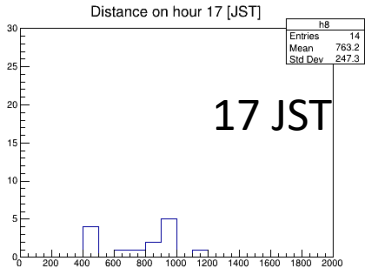


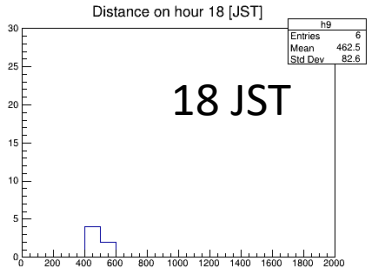


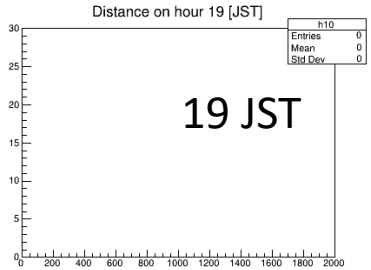


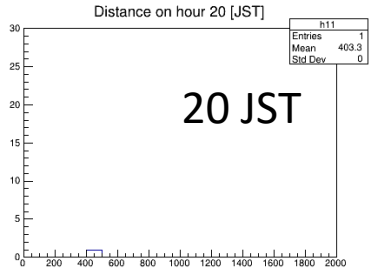


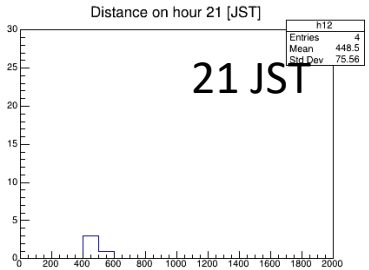


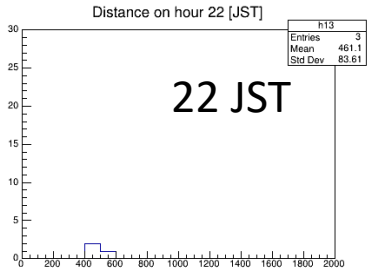


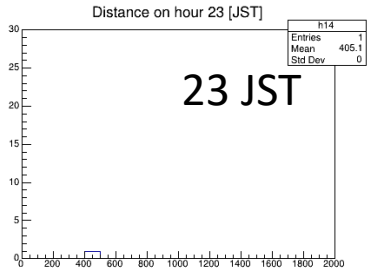












Contact
(Same Vertical scale)

Propagation Distance[Km] 0Km -2000Km

Summary

- Advice of transmitting power level ―＞with in 10dB.
  - If you have more than 10dB, too much power or, poor noise environment.
- Hourly contact number.
- Changes of propagation conditions is visualized.

My dreams

- If we have more data, it could visualize daily seasonal change.
- If we know the transmitting power, we can analyze propagation and noise conditions from Friis equations.

$$\mathrm{Log}(S_{ji}) - \mathrm{Log}(S_{ij}) - \mathrm{Log}(N_i) + \mathrm{Log}(N_j) = \mathrm{Log}(P_i) - \mathrm{Log}(P_j)$$

$$S_{ji} / N_j = P_i * A_i * I_{ij} * A_j$$