

Leonids 2001

by Radio Meteor Observation all over the world

(Leonids 2001 project by Radio Meteor Observation)

Hiroshi Ogawa (University of Tsukuba)

Shinji Toyomasu (Misato Observatory), Kouji Ohnishi (Nagano NCT)
Takashi Asahina (Hiroshima University), Kimio Maegawa (Fukui NCT)
Shinobu Amikura (University of Tsukuba),
Kayo Miyao (Asahigaoka High School)

- Purposes -

1. Monitor Leonids activity at all time

When does Leonids activity start ? When did it finish ?

--- It is possible to observe at all time

even if it is bad weather or daytime.

--- By unifying worldwide data,

it becomes possible to observe without radiant problem.

2. Get Leonids detail information

- active structure, characters, dust tube and trail information, etc.

3. Research the distribution of meteoroids

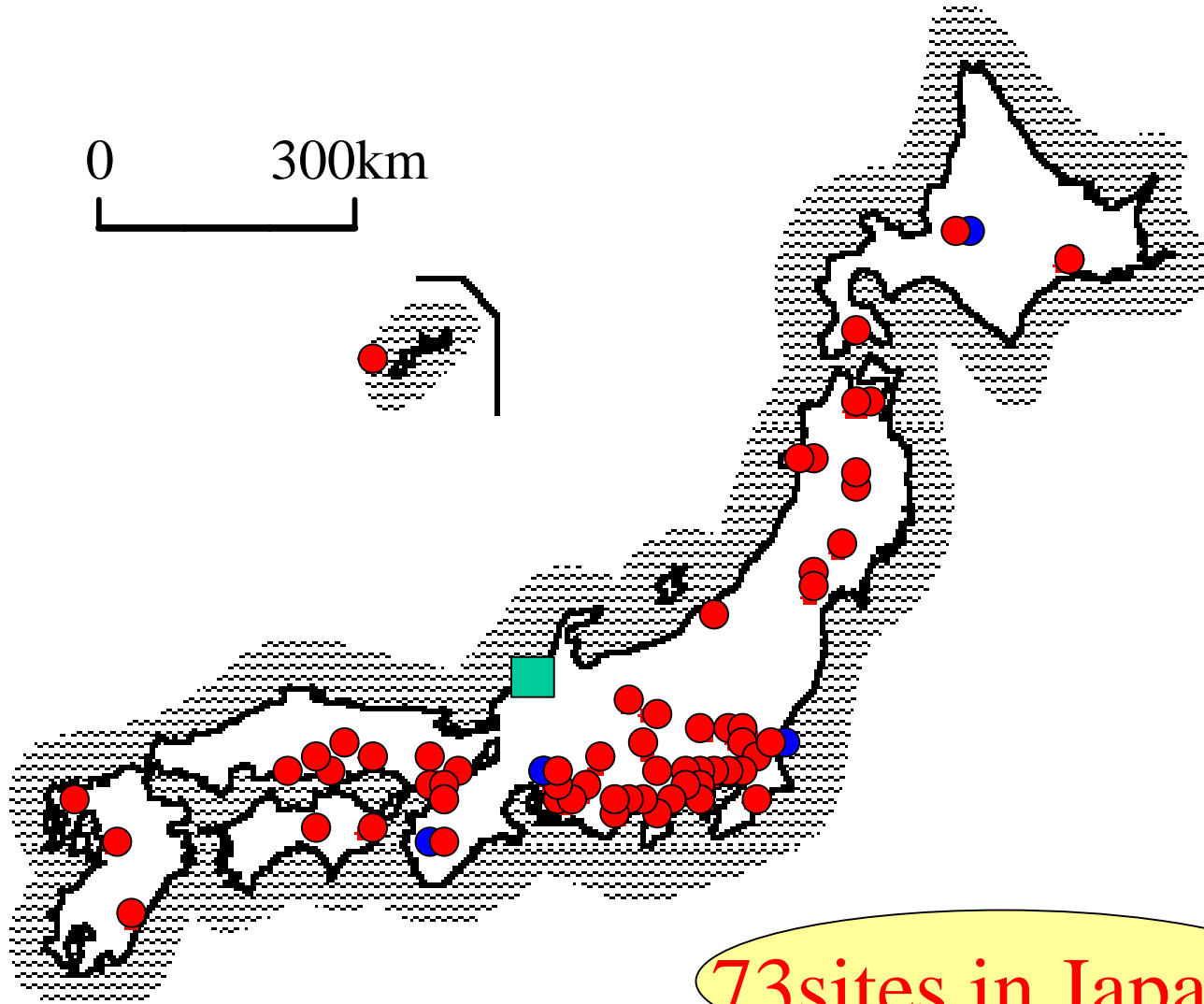
on the earth orbit



Leonids 2001 project by Radio Meteor Observation all over the world

- Participants -

0 300km

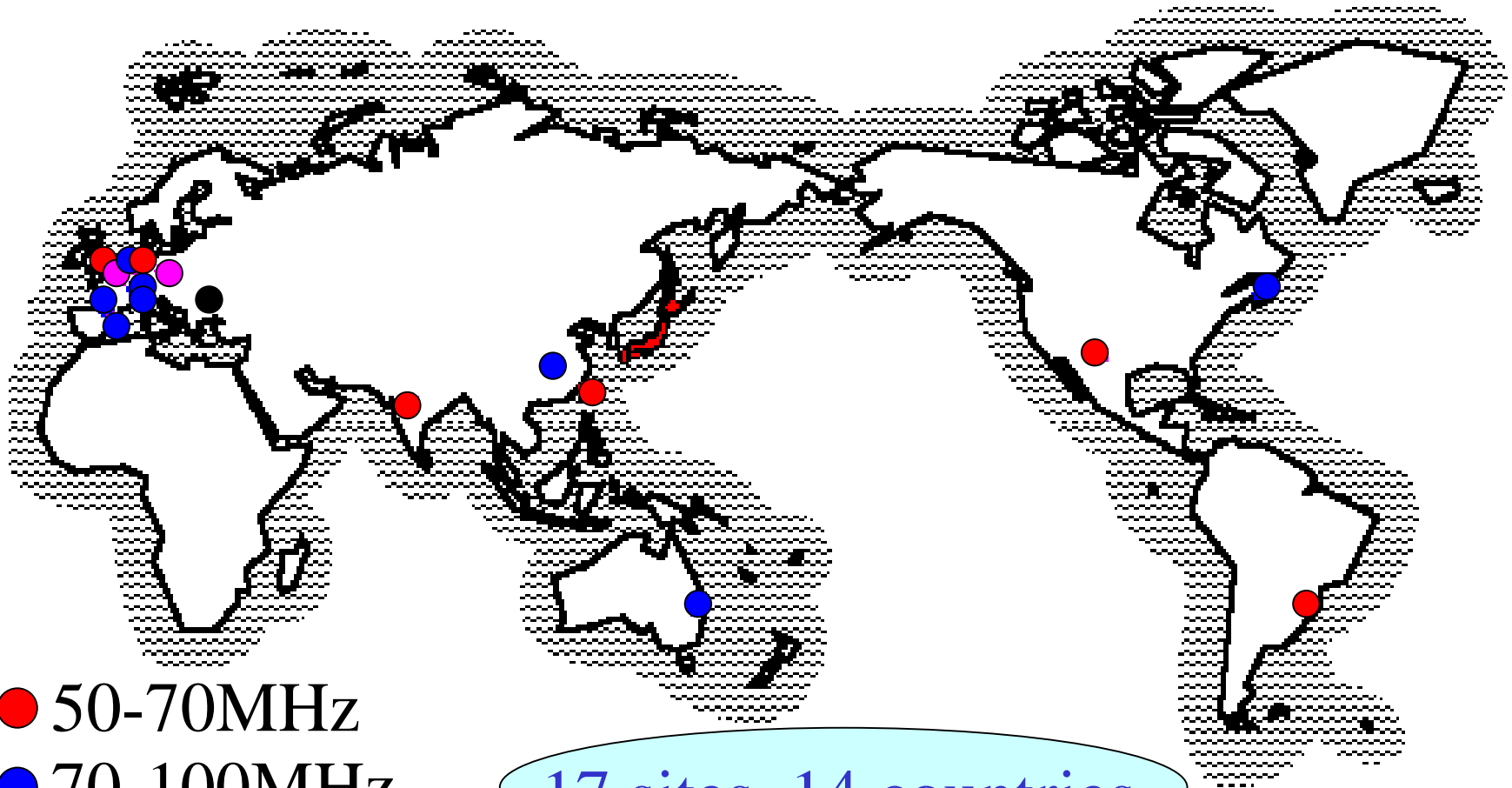


● FRO
76-90MHz

● HRO
53.750MHz

■ : TX
(Fukui-NCT)

73sites in Japan



- 50-70MHz
- 70-100MHz
- >100MHz
- unknown

17 sites 14 countries

Total : 90sites 15countries

- Analyzing methods -

1. How many times are echoes observed compared to background echo rate?

Activity Level : AL(H)

$\frac{H - H_0}{H_0}$ H : the number of echoes for a certain 1 hour "H"
Ho : background echoes during 2 weeks

→ $\left[\text{AL(H)}_{\text{total}} = \frac{\text{AL(H)}_i}{N} \right.$ AL(H)_i : the value of AL(H) at site " i "
Site : S₁, S₂, ..., S_i, ..., S_N

“AL(H)_{total}” is averaged all data.

Japan is divided 5 area because of many sites.

2. The factor of radiant elevation (h)

20deg < h < 80deg data is only used.

1/sin (h) is corrected

3. Elimination of observational error data

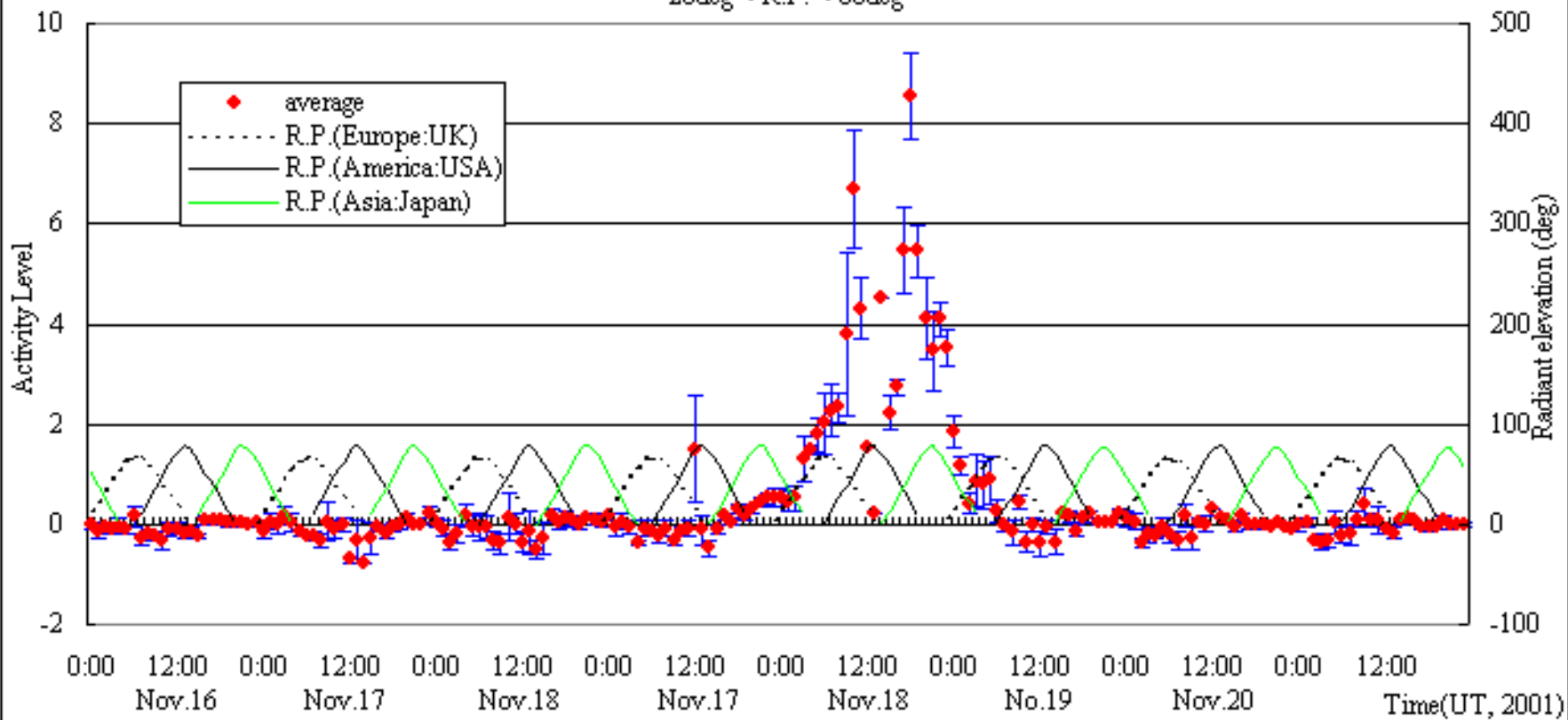
- 1.5 (H) < results < +1.5 (H) is only used (91% of total).

- Results -

Leonids 2001 by Radio Meteor Observation

Leonids 2001 project all over the world

20deg < R.P. < 80deg



- Around Leonids maximum -

Radio Results

Visual Results (IMO)

10h UT 18th

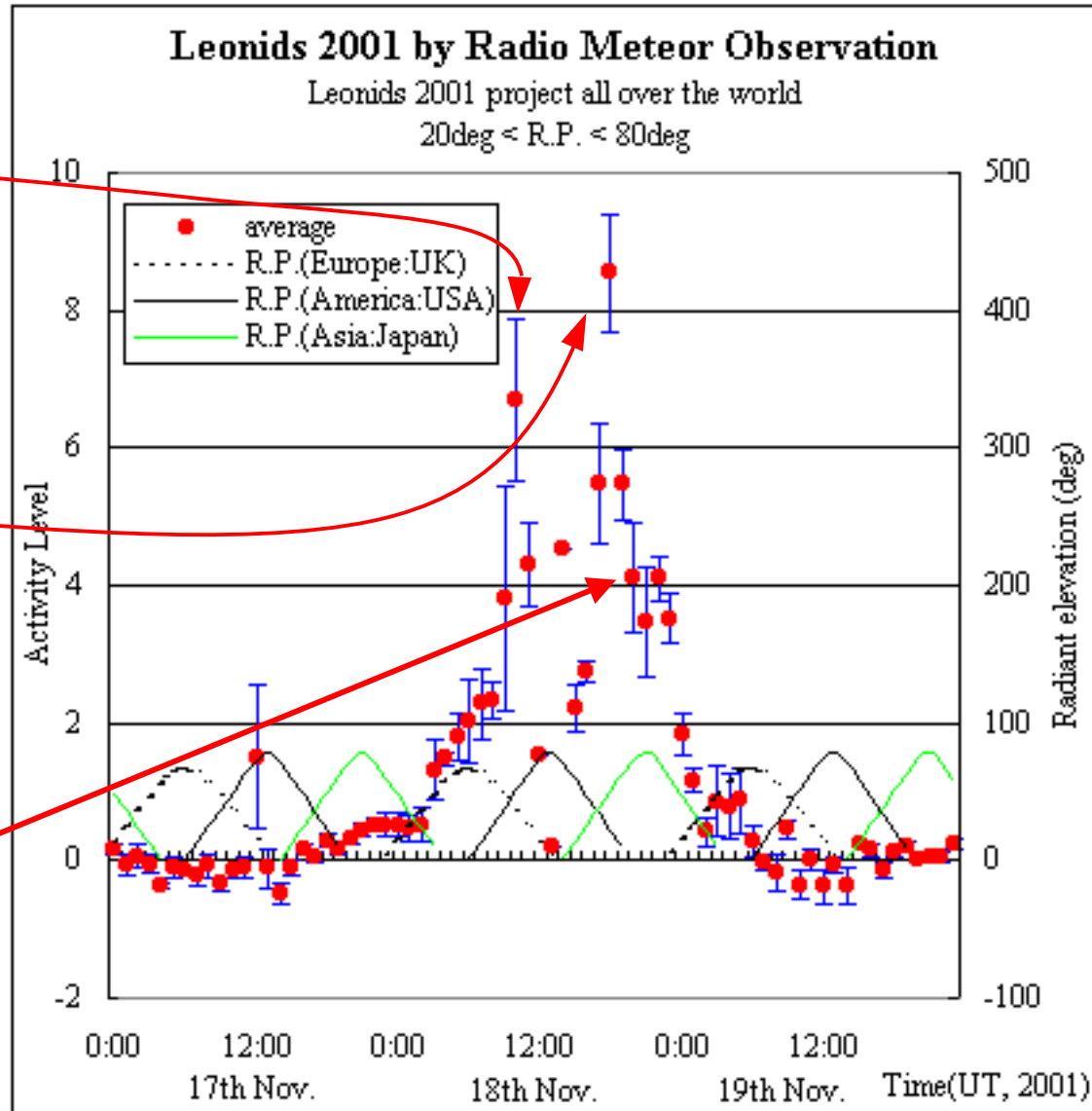
10:39UT ZHR 1620
(America) 7rev. trail

18h UT 18th

18:16UT ZHR3430
(Asian and Australia)
4, 9 rev. trail

22h UT 18th

19:04UT ZHR 1840
(Asia) Old trail ??

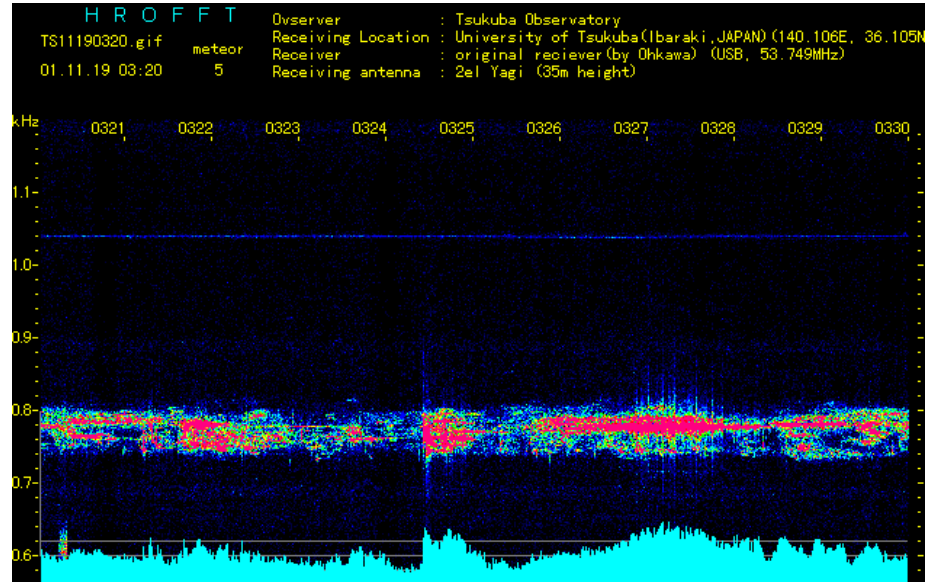


- The analysis of Japanese data -

In Japan, it became impossible to count the number of echo.



other analyzing method



*The activity level was estimated from
“reflection time” of echo*

reflection time (sec.) of echo more than 10dB, 20dB, 30dB and 40dB

The confirmation of this method

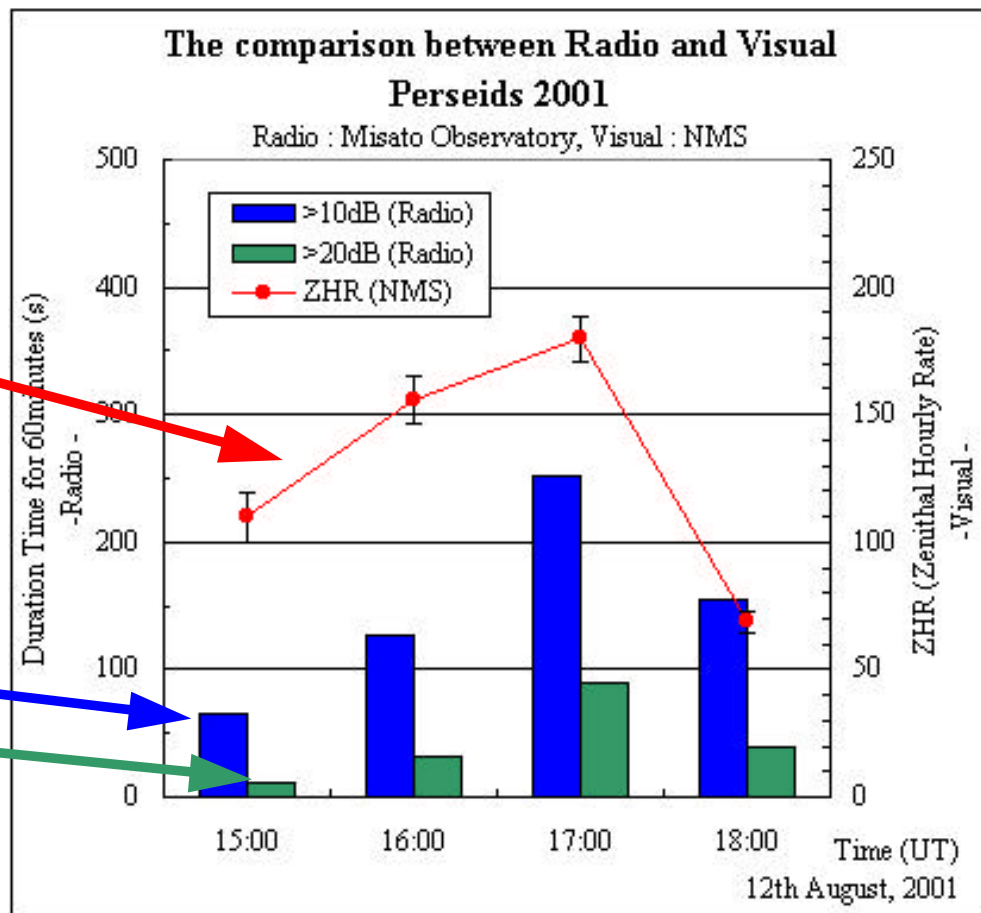
Perseids 2001

Visual results (ZHR)
(The Nippon Meteor Society)

reflection time (sec.)

more than 10dB

more than 20dB



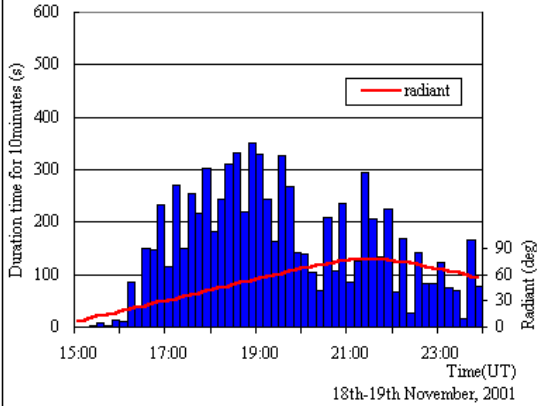
This method is effective on estimating meteor activity !

- Reflection time more than 20 and 30dB -

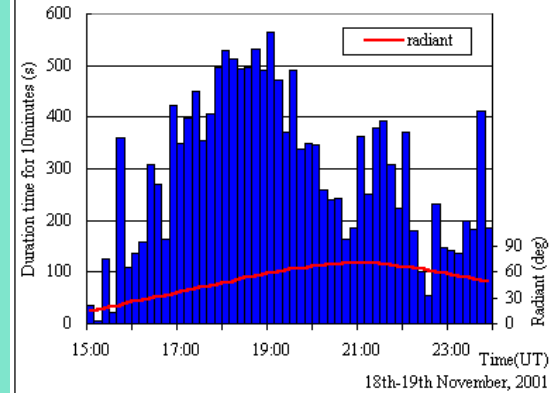
Leonids 2001

Reflection time for 10min.
more than 20dB

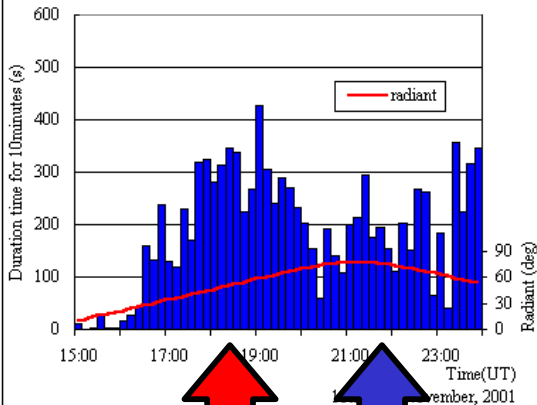
Leonids 2001 - Echo Duration Time (>20dB) -
RX: Tokushima, Japan (Awa High School)



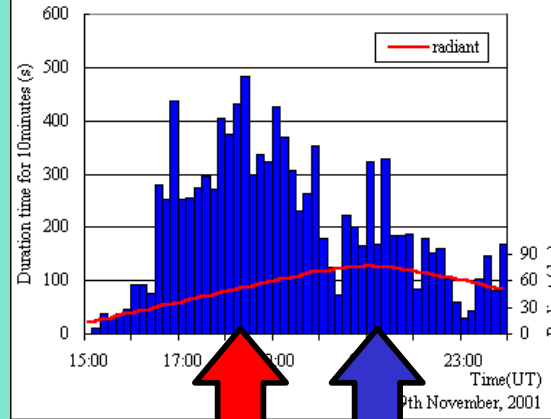
Leonids 2001 - Echo Duration Time (>20dB) -
RX: Hakodate, Hokkaido, Japan (Iai girl High School)



Leonids 2001 - Echo Duration Time (>20dB) -
RX: Kasugai, Aichi, Japan (Takashi Asahina)



Leonids 2001 - Echo Duration Time (>20dB) -
RX: Tsukuba, Ibaraki, Japan (University of Tsukuba)

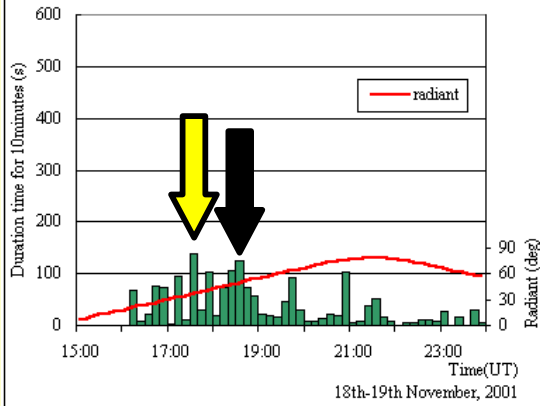


Many sites observed same trend !!

Reflection time for 10min. more than 30dB

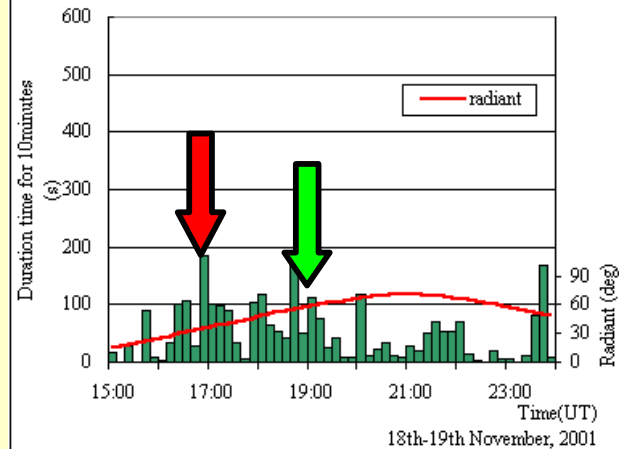
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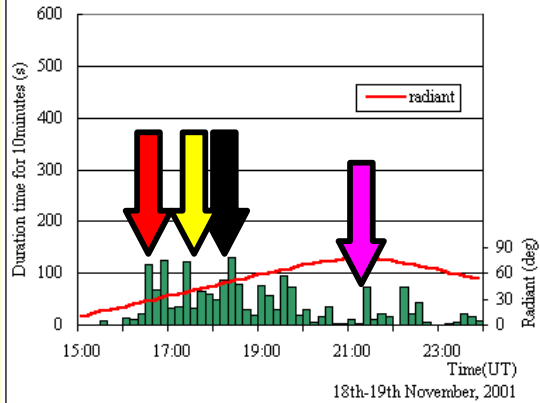
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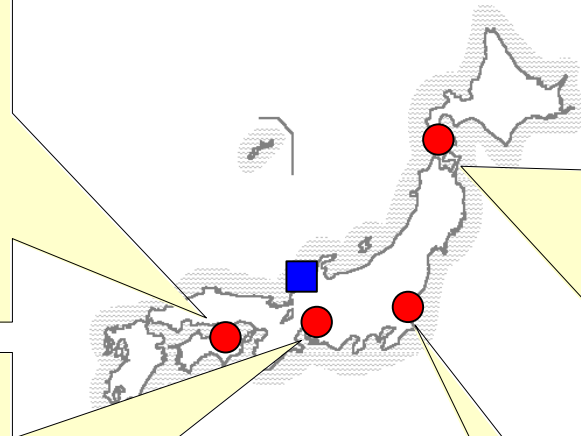
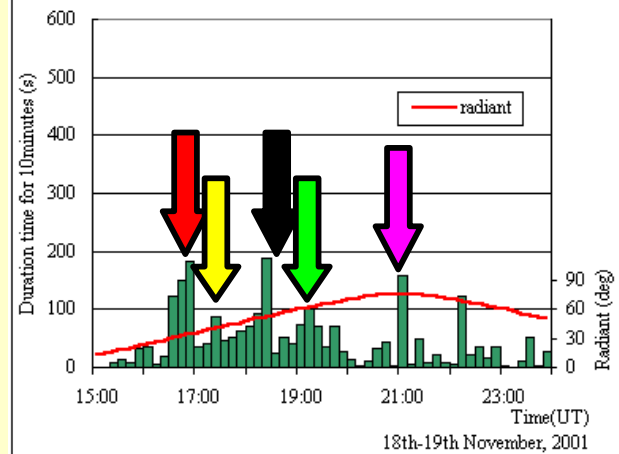
Leonids 2001 - Echo Duration Time (>30dB) -

RX: Kasugai, Aichi, Japan (Takashi Asahina)



Leonids 2001 - Echo Duration Time (>30dB) -

RX: Tsukuba, Ibaraki, Japan (University of Tsukuba)



- Conclusions -

All Leonids activity

- The maximum time was 10h UT and 18h UT 18th.
- High activity (AL(H) >2) kept about 10hours from 6:00UT 18th.
- The half-width time each maximum :
American peak : 3hours, Asian peak : 6hours

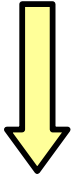
Around main peak activity ...

- In Japan, since long echoes increased, it became impossible to count.
- About the peak of reflection time of more than 30dB echo
at many observational sites ,
at the same time (around 16:50, 17:20, 18:20, 19:10, 19:40, 21:00UT)
- A change of reflection time of more than 30dB echo has no clear peak

- Discussions -

1. The half width is about 1.9×10^5 km !!

The high density width of meteoroids was 1.9×10^5 km on the dust trail



Duration time was 6 hours

In the case of American peak, the half width is about 9.4×10^4 km

In 1999, the half width is about 3.1×10^4 km

Dust trail was wide

ex. Esko Lyytinen, et al $\dots 6.0 \times 10^4$ km (about 115 minutes)

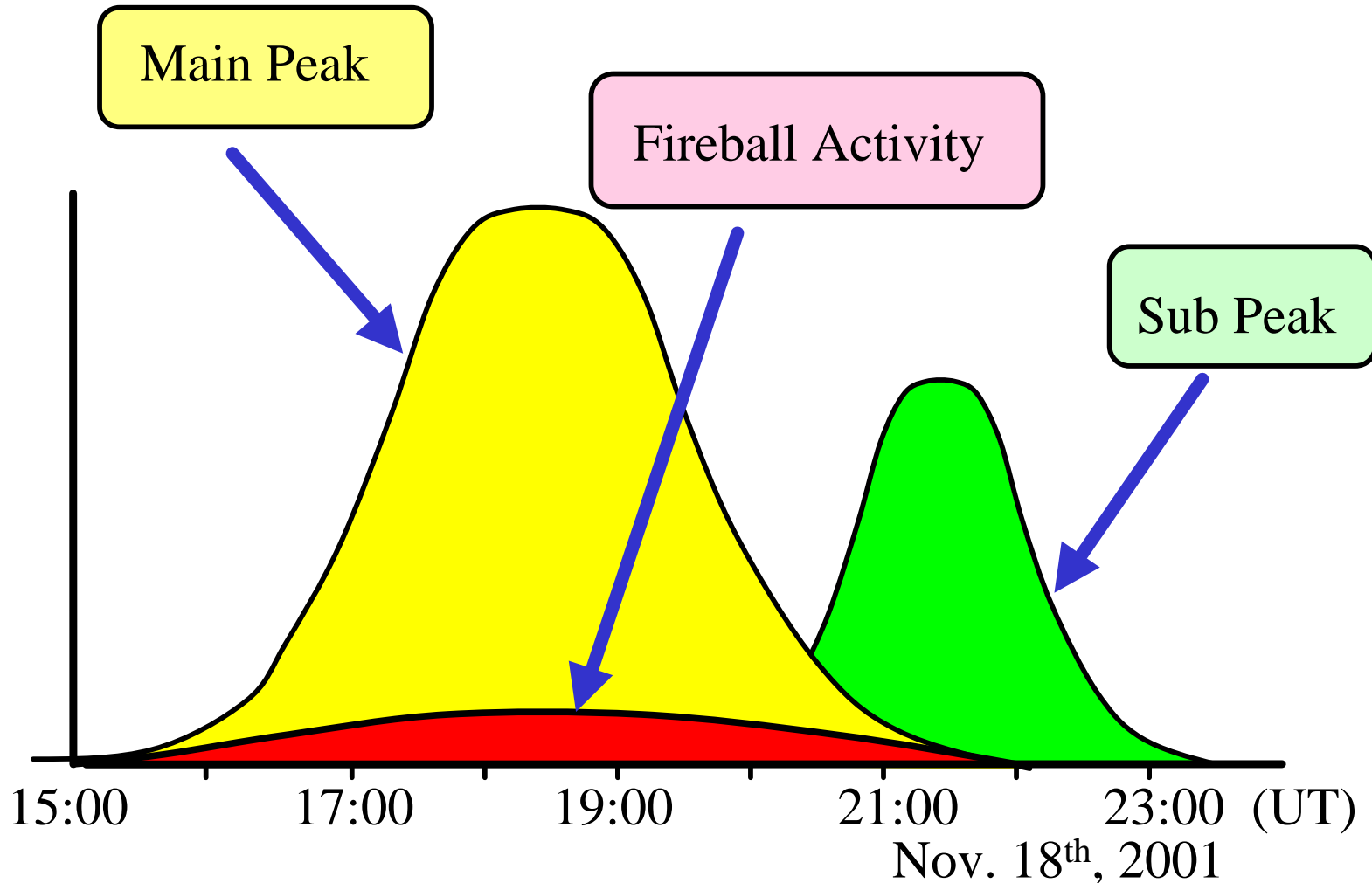
2. The distribution like fireball was broad

A change of meteoroids like fireball has no clear peak.

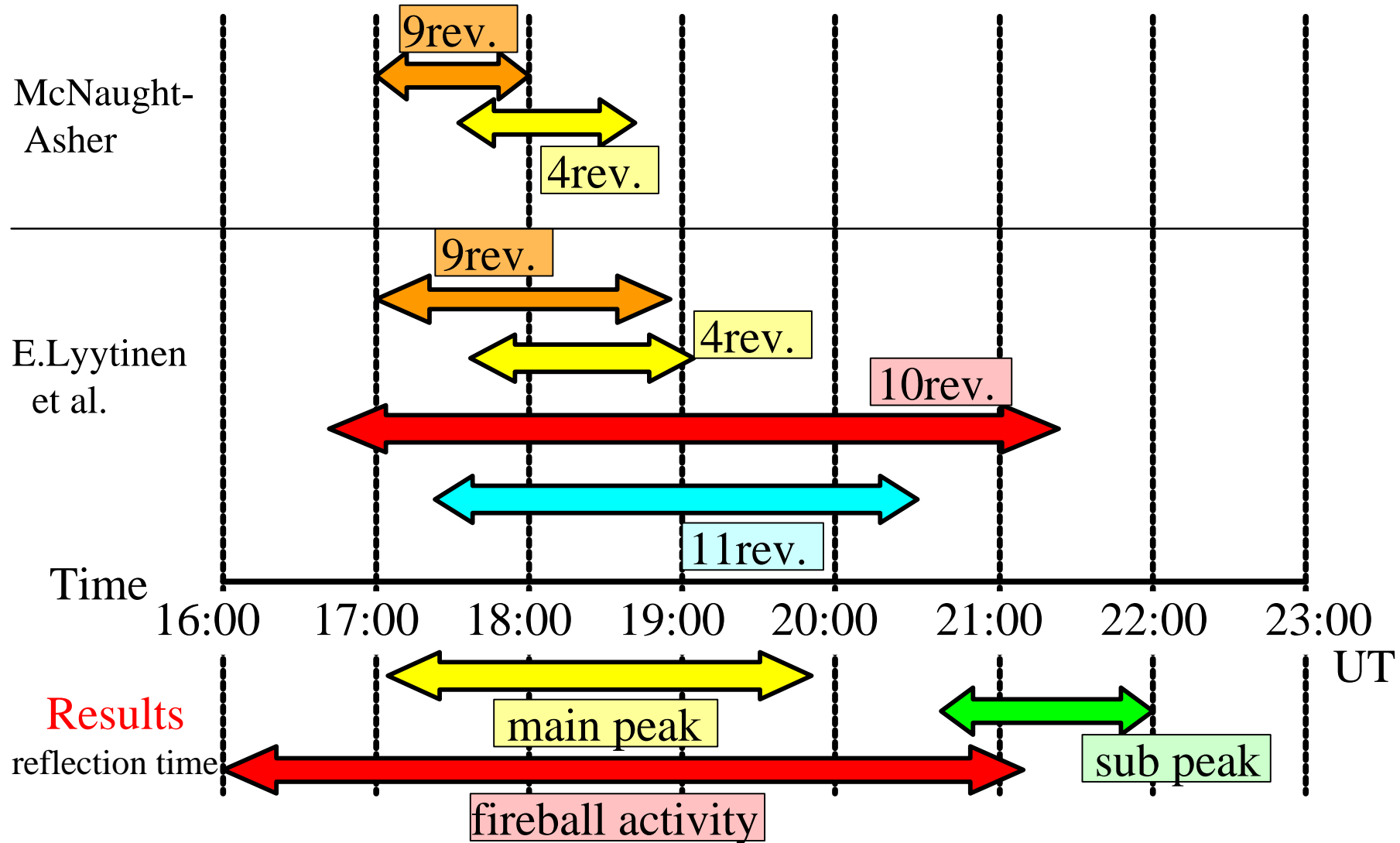
On the other hand, normal meteoroids has clear peak

3.complicated peak structure

From reflection time more than 20dB echo, clear two peaks were seen.
From reflection time more than 30dB echo, flat trend was seen.

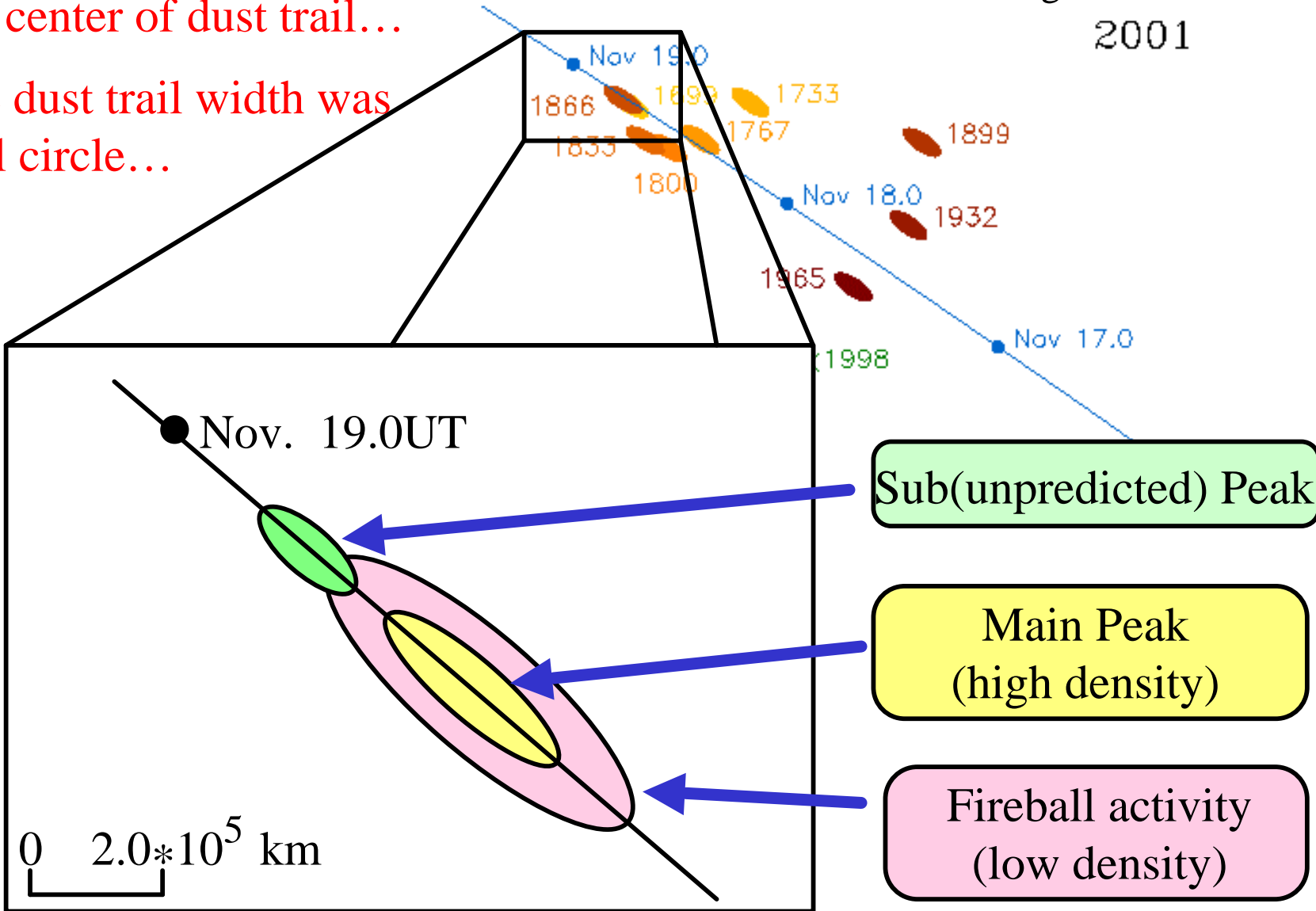


The comparison between predictions and results



If the earth went through
the center of dust trail...

If the dust trail width was
real circle...



The dust trail structure around peak was very complicated.

- Future work -

- Leonids research

more research about maximum structure and character

--- dust trail research

--- sub peak (unpredicted peak), fireball activity and main peak

- Radio Meteor Observational Network

more results and information

Especially, America, West-Asia and East-Europe

continuation of the Network made by Leonids 2001 project

As the meteor activity monitor at all time