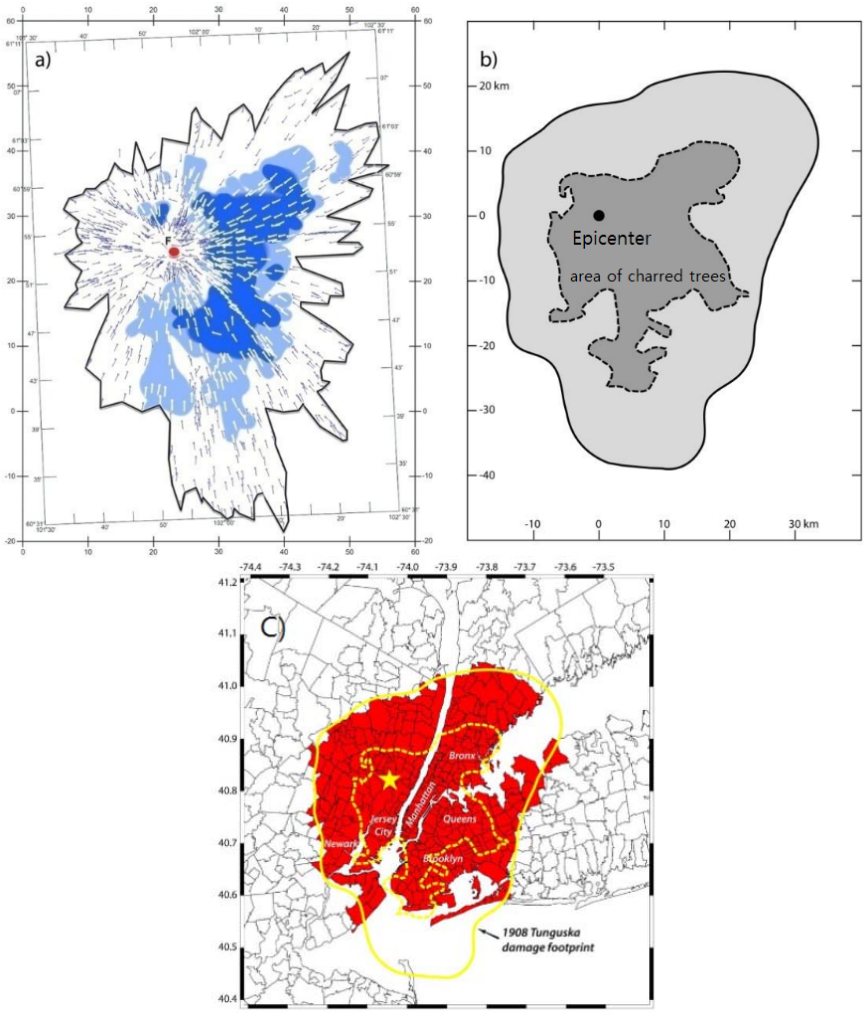
Supplementary Section S25.7

For Specialists of the Tunguska Event & Cosmic Rays

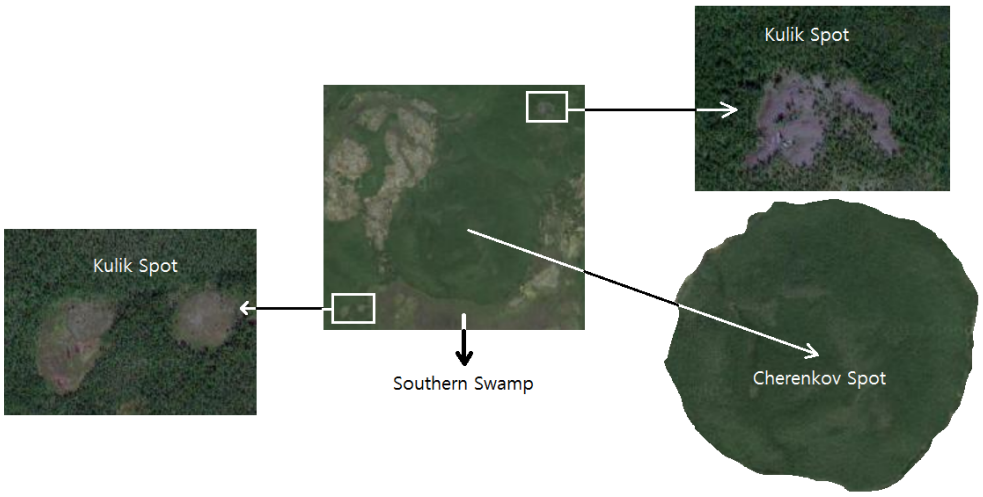
The Tunguska event was the biggest explosion in human history (Figure 25-7-S-1-C) that is classified as an impact event, even though no impact crater has been found.



(A) Total damage area, (B) area of charred trees, (C) overlaid over Manhattan

Figure 25-7-S-1

However, according to CFLE theory there are Cherenkov-Kulik spot (cf. §25.7) by cosmic ray air shower as Figure25-7-S-2.



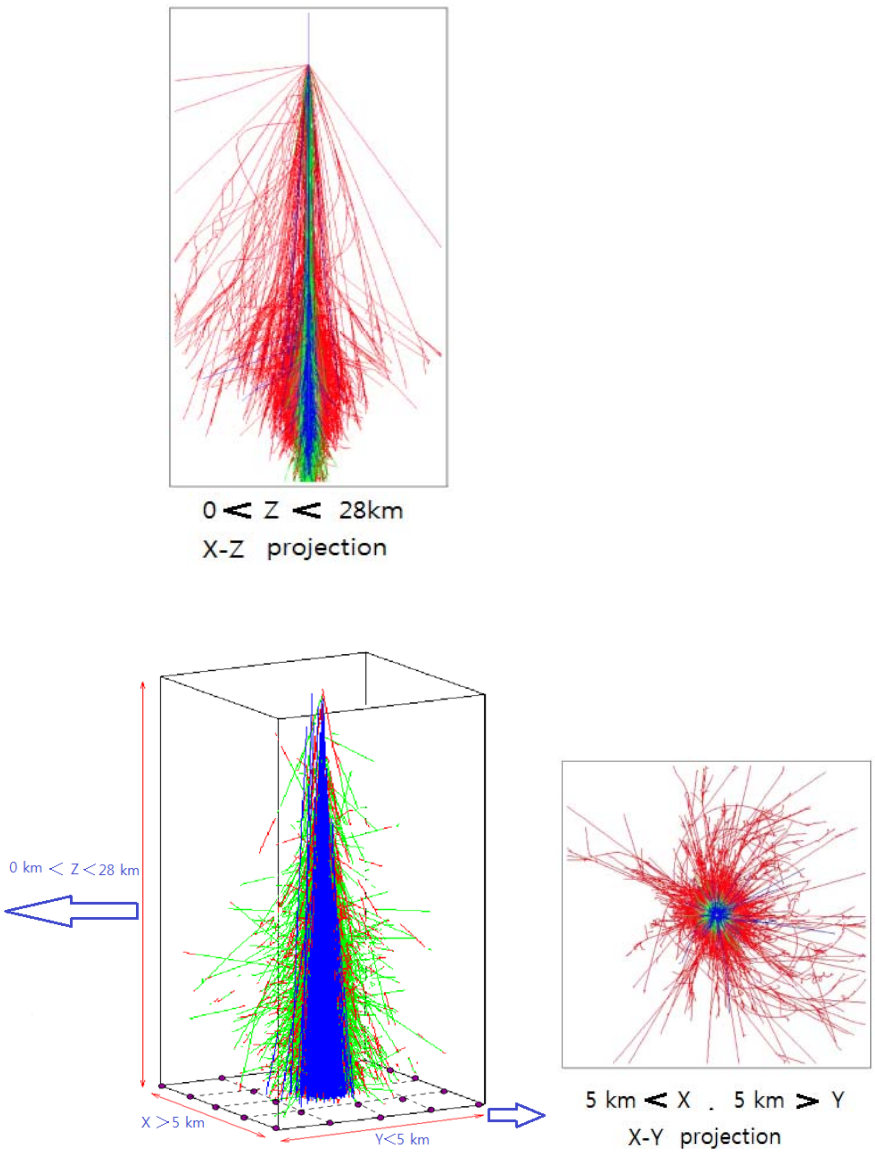
Cherenkov-Kulik spot of Tunguska explosion site

Figure 25-7-S-2

Figure 25-7-S-3 show clearly that Cherenkov spot come into being by strong Cherenkov photon as unthinkable large laser beam weapon.

Main Cherenkov spot of Tunguska explosion site by Cherenkov radiation

Figure 25-7-S-3

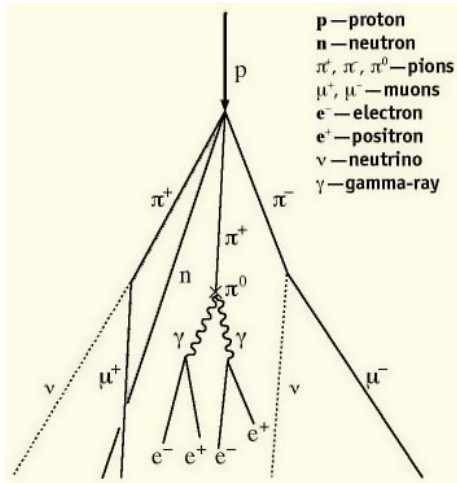


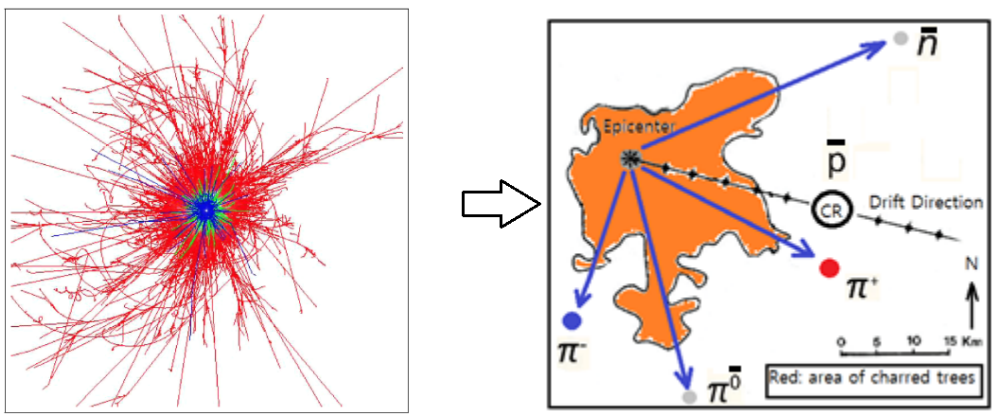
The CORSIKA air shower simulation

Figure 25-7-S-4

Figure 25-7-6-5 clearly show similarity between air shower simulation and Area of charred trees of Tunguska Event. Expected air shower reaction by anti-proton of cosmic ray of Tunguska event with air (cf.§25.6,25.7) is

$$\bar{P} \rightarrow \pi^{+} + \pi^{-} + \bar{n} + \pi^{\bar{o}} \qquad 25\text{-}7\text{-}S\text{-}1$$

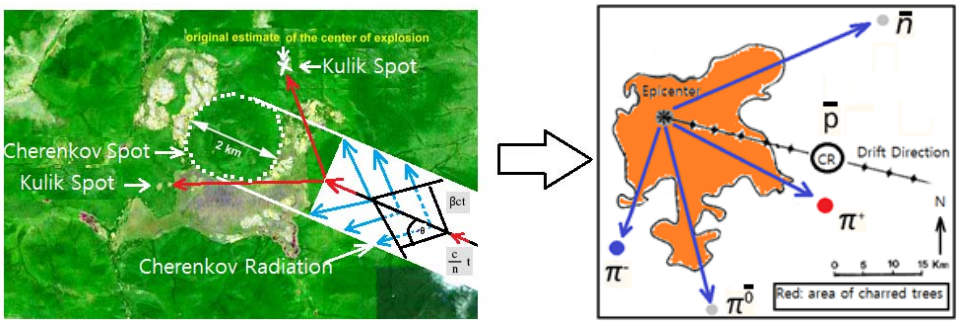




CORSIKA Simulation and Area of charred trees of Tunguska Event

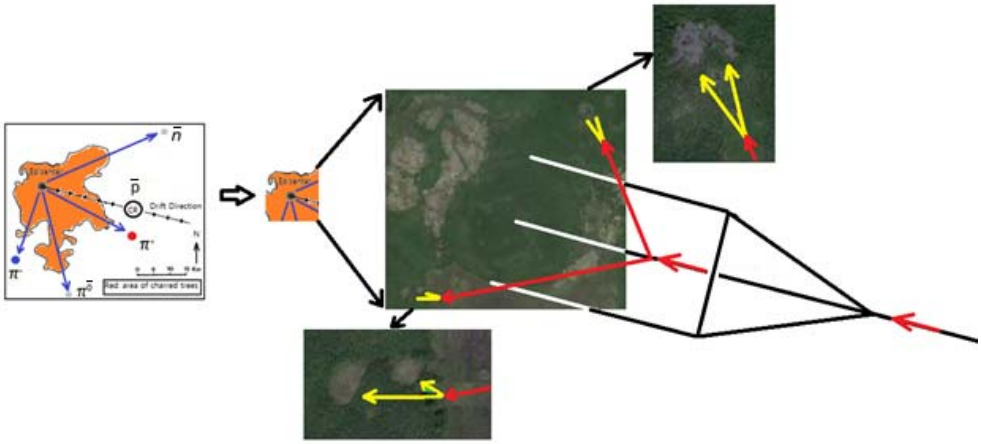
Figure 25-7-S-5

Figure 25-7-S-6, 25-7-S-7 show how area of charred trees of Tunguska Event took shape by reaction of cosmic ray air shower and related Cherenkov radiation.



Cherenkov radiation of Epicenter and Area of charred trees of Tunguska Event

Figure 25-7-S-6

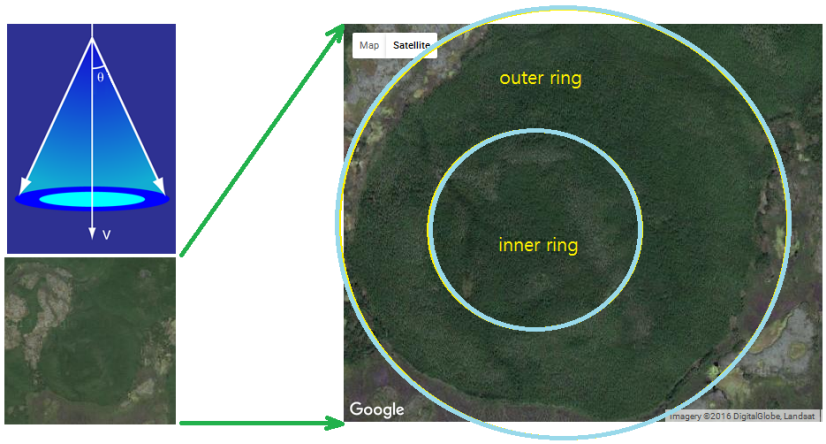


Area of charred trees of Tunguska Event, Cherenkov radiation for Cherenkov spot and Pair creation for flat Kulik spot by Cosmic ray air shower

Figure 25-7-S-7

Figure 25-7-S-8 show clearly how such structure of primary Cherenkov spot take shape by Cherenkov photon from air shower of cosmic ray. Because Cherenkov photon of inner ring is arrived earlier than photon of outer ring, reaction time of photon of inner ring is longer than outer ring.

Therefore area of inner ring take shape deeper than outer ring as Figure 25-7-S-8.

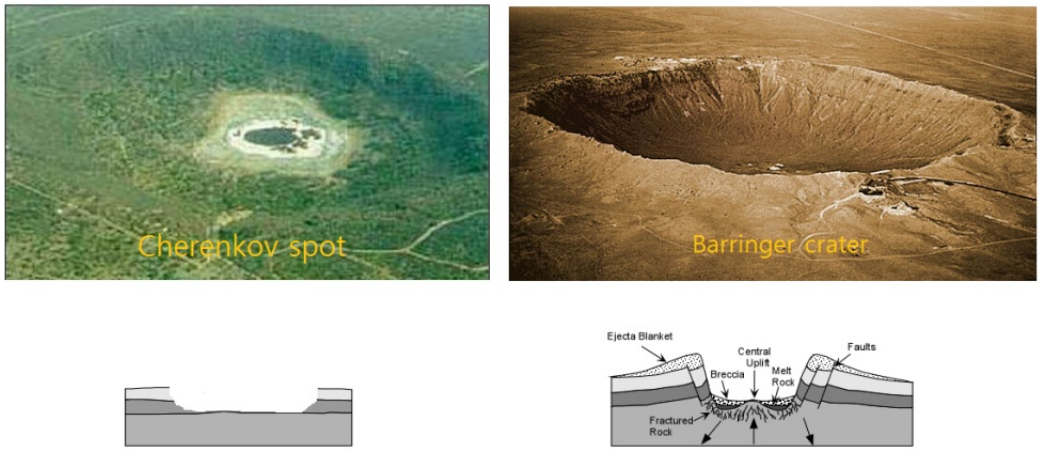


Structure of primary Cherenkov spot by Cherenkov radiation

Figure 25-7-S-8

Figure 25-7-S-9 show clearly Structure difference between Cherenkov spot and Meteor crater.

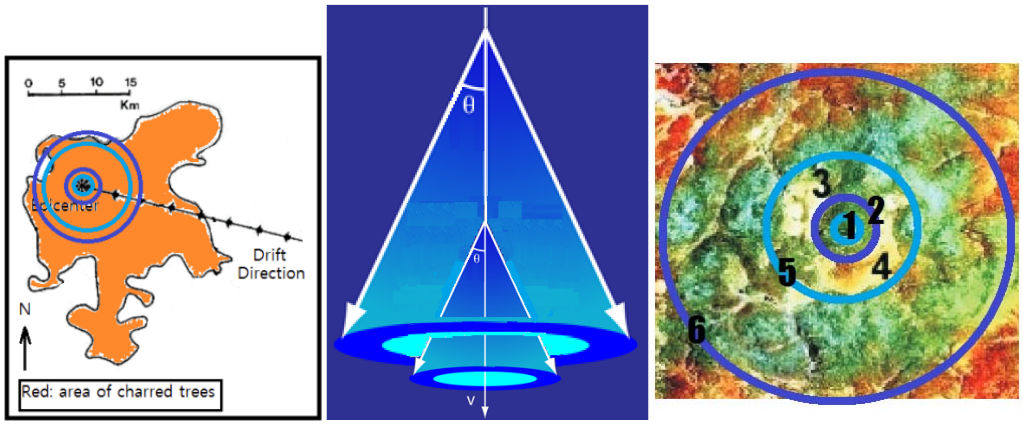
Because Cherenkov spot of Tunguska explosion doesn't have typical Ejecta blanket of meteor crater, scientists concluded that there are not impact crater despite the explosion over the sparsely populated eastern Siberian taiga flattened 2,150 km^2 (80 million trees) and charred by bolide according to eyewitness.



Structure difference between Cherenkov spot and Meteor crater

Figure 25-7-S-9

However, Figure 25-7-S-10 show that there are another Cherenkov spot by extra Cherenkov radiation by lots of accessory charged cascade particles from air shower.



A B C

Secondary Cherenkov spot by secondary radiation of dispersion and lots of cascade particles

Figure 25-7-S-10

Figure 25-7-S-10-C is satellite view of secondary Cherenkov spot around primary Cherenkov spot. C-1 is inner ring of primary Cherenkov spot. C-2 is outer ring of primary Cherenkov spot.C-3 is northern swamp. C-4 is southern swamp. C-5 is inner ring of secondary Cherenkov spot. C-6 is outer ring of secondary Cherenkov spot by lots of accessory cascade particles from air shower.

In Figure 25-7-S-11 we can find similar structure of two Cherenkov spot.

A is Secondary Cherenkov spot (Satellite View). C is Primary Cherenkov spot (Google Map)

A **B** **C**

1: inner ring of primary Cherenkov spot 2: outer ring of primary Cherenkov spot 3: northern swamp 4: southern swamp

Comparison between secondary Cherenkov of A spot and primary Cherenkov spot of C

Figure 25-7-S-11

Figure 25-7-S-12 show two flat Kulik spot.

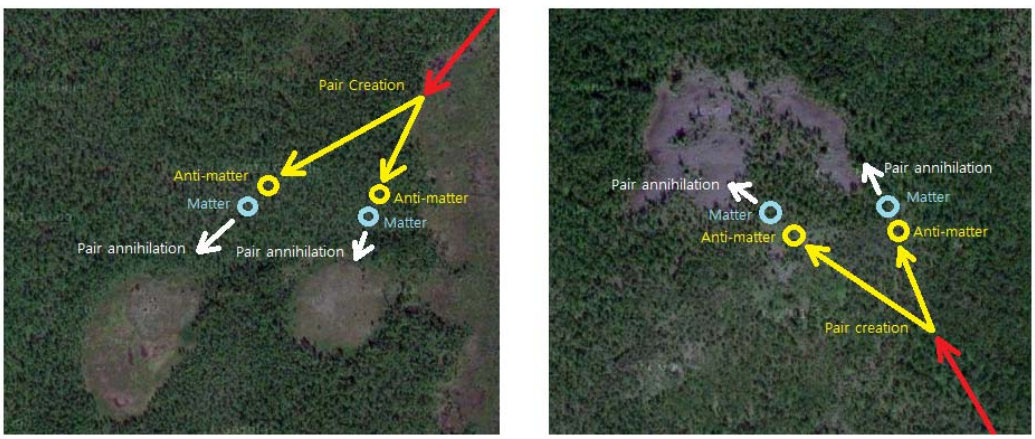
However, here, important point is why Kulik spot is flat and small despite 80 million trees was flattened.

That is "Kulik spot is created by pair annihilations between Earth' ordinary matter and anti-matter from cosmic ray of anti-proton." π_{CR}^{-} of cosmic ray is coupled with π_{Earth}^{+} of Earth' proton, π_{CR}^{+} of cosmic

ray is coupled with π_{CR}^{+} of Earth's neutron,$\overline{n_{CR}}$ of cosmic ray is coupled with n_{Earth}, $\pi_{CR}^{\overline{0}}$ is coupled with π_{Earth}^{0} of proton and neutron. Therefore pair of (π_{CR}^{-}, π_{Earth}^{+}),

(π_{CR}^{+}, π_{CR}^{+}),($\overline{n_{CR}}$, n_{Earth}), ($\pi_{CR}^{\overline{0}}$, π_{Earth}^{0}) are pair annihilated and related huge energy is released before collide with Earth's surface. That is none other than flat Kulik spot as 25-7-S-12.

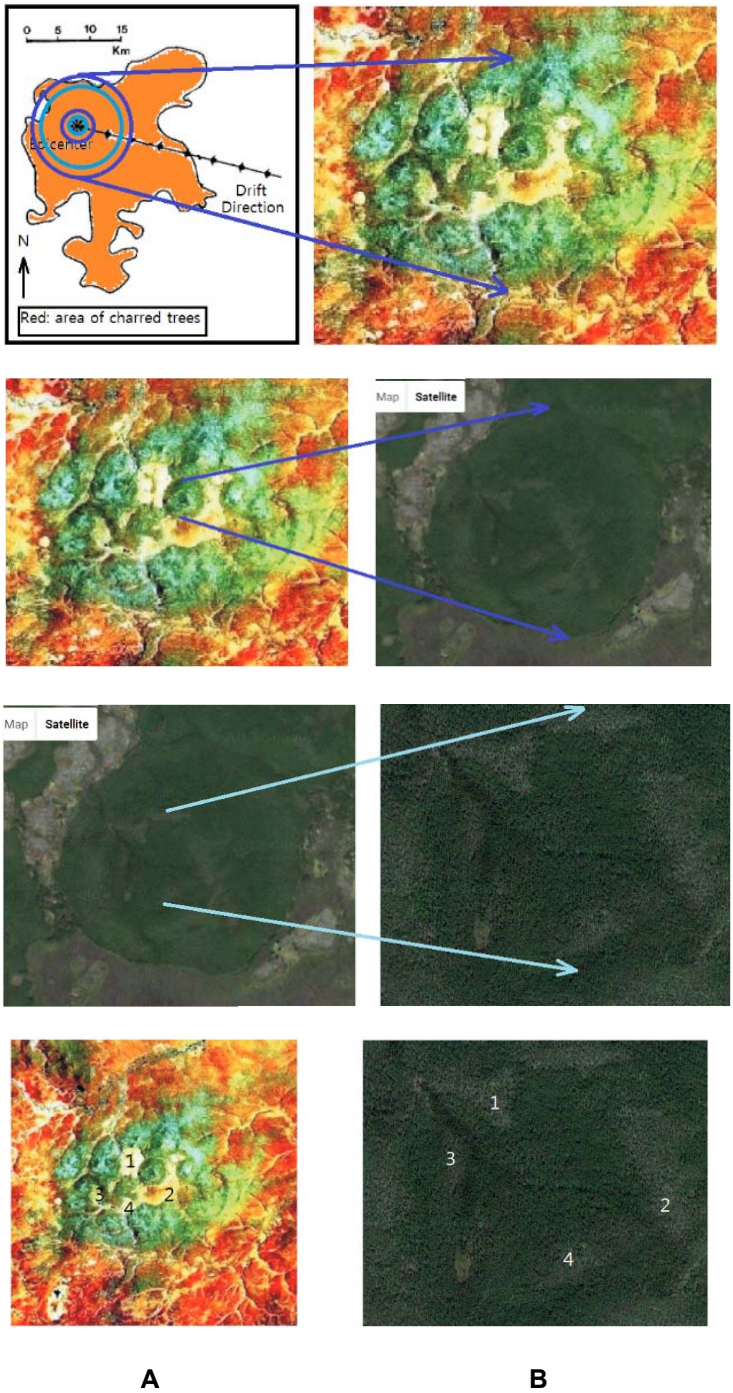
According to Heisenberg uncertainty principle $\Delta x \Delta mv \geq \hbar$, small size means high energy and strong momentum. Therefore, we can conclude that between small area of Kulik spot, area of charred trees and large area of total damage there are close relation with uncertainty principle.



Flat Epicenters are took shape by pair annihilation.

Figure 25-7-S-12

Figure 25-7-S-13 show similarity between primary Cherenkov spot by primary cascade particles and secondary Cherenkov spot by lots of secondary cascade particles.



Similarity between inner rings of secondary Cherenkov spot (A) and inner rings of primary Cherenkov spot (B) by cascade particles of ordinary matter.

Figure 25-7-S-13

Therefore, structure of two spot is very similar as 25-7-S-13-S A and B.

However, because of lots of charged cascade particles of ordinary matter is occurred shock wave, cone formic spot is took shape as Figure 25-7-S-14.

A view of the south morass

Figure 25-7-S-14

Extended area over 20× 25 km wide displaying numerous, various sized craters that was created by lots of charged cascade particles of ordinary matter from air shower.

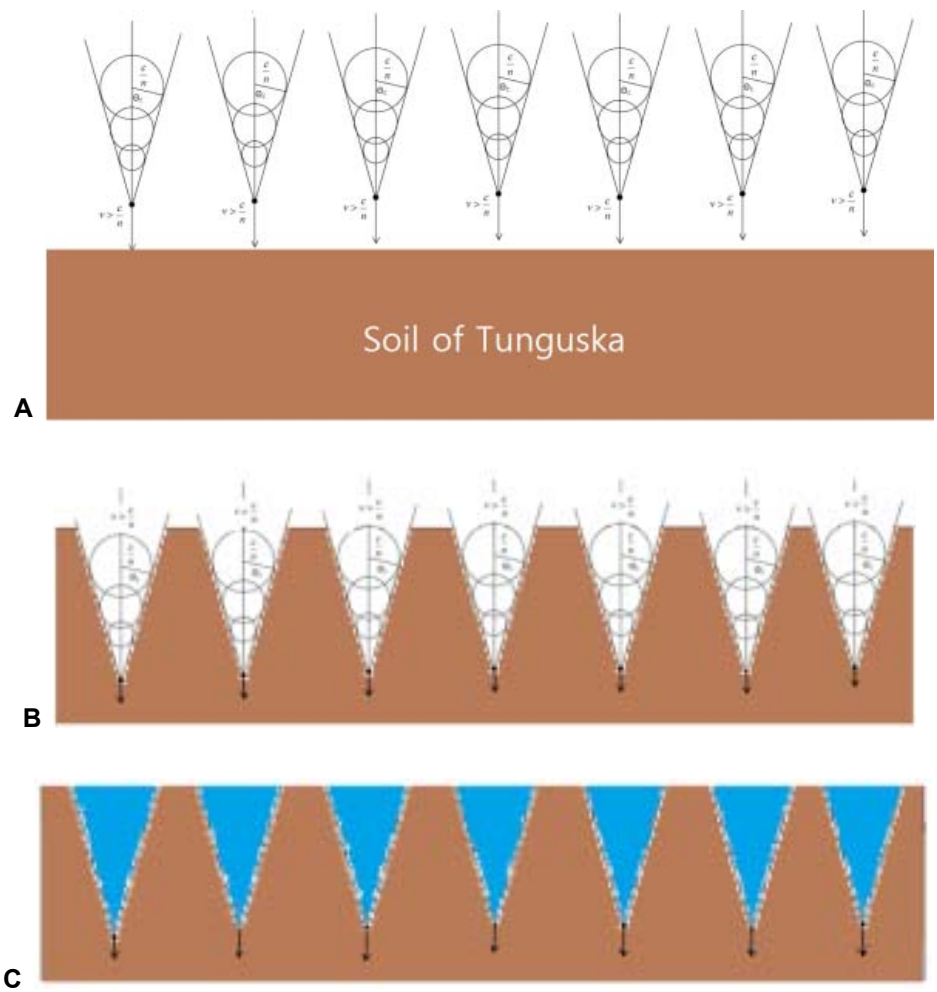
The accessory spot by lower energy charged cascade particles of ordinary matter from cosmic ray air shower is called morass spot. The accessory spot by high energy charged cascade particles of ordinary matter from cosmic ray air shower is called swamp spot. The accessory spot by high energy charged cascade particles of ordinary matter from cosmic ray air shower under water is called deep water spot.

Cherenkov radiation, also known as Vavilov- Cherenkov radiation, is electromagnetic radiation emitted when a charged particle (such as an electron) passes through a dielectric medium (such as air) at a speed greater than phase velocity of light in that medium.

When the particle is traveling fast enough, however, the limited response speed of the medium means that a disturbance is left in the wake of the particle, and the energy contained in disturbance radiates as a coherent shock wave.

A common analogy is the sonic boom of a supersonic aircraft or bullet. The sound wave generated by the supersonic body propagate at the speed of sound itself; as such, the wave travel slower than speeding object and cannot propagate forward from the body, instead forming a shock front. In a similar way, a charged particle can generate light shock wave as it travel through as insulator.

Figure 25-7-S-15-A show such situation by lots of high energy charged cascade particles of ordinary matter from air shower above Tunguska site.



Swamp spots and swampization by shock wave from lots of charged cascade particles of ordinary matter of air shower

Figure 25-7-S-15

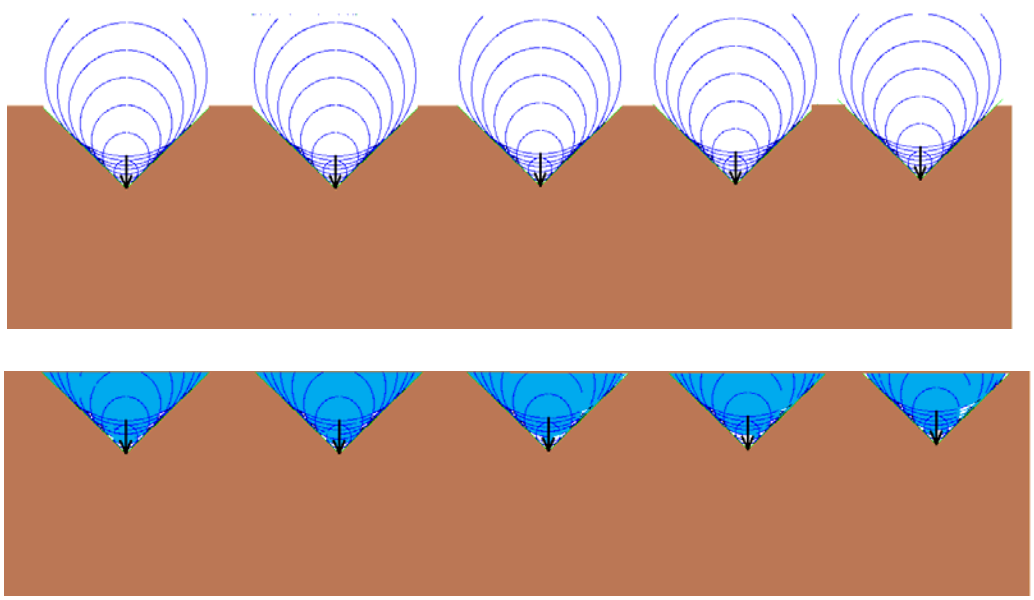
By such shock wave as 25-7-S-15-A soil of Tunguska site is dug as cone shape.

That is none other than swamp spot (~5m).

After swamp spot forming of bombarded ground of Tunguska site is changed swamp by raining and melting snow.

That is none other than northern swamp and southern swamp of Tunguska site instead typical meteor crater as barringer crater.

In a same way is occurred morass by lots of low energy charged cascade particle of ordinary matter from air shower as Figure 25-7-S-16

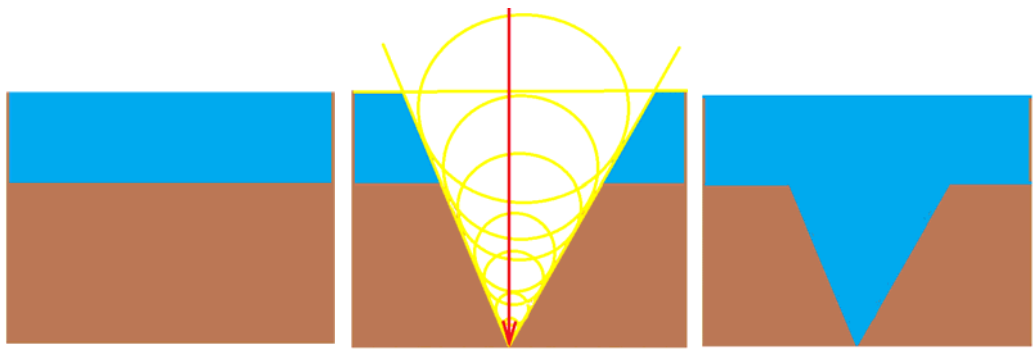


Morass spots and morassization by shock wave from lots of charged cascade particles of ordinary matter

Figure 25-7-S-16

Therefore, Tunguska morass ($< 5m$)is shallower than two swamp of Tunguska (~5m).

In same way is occurred deep water spot (50m~70m) by very high energy charged cascade particle of ordinary matter from air shower as Figure 25-7-S-17.

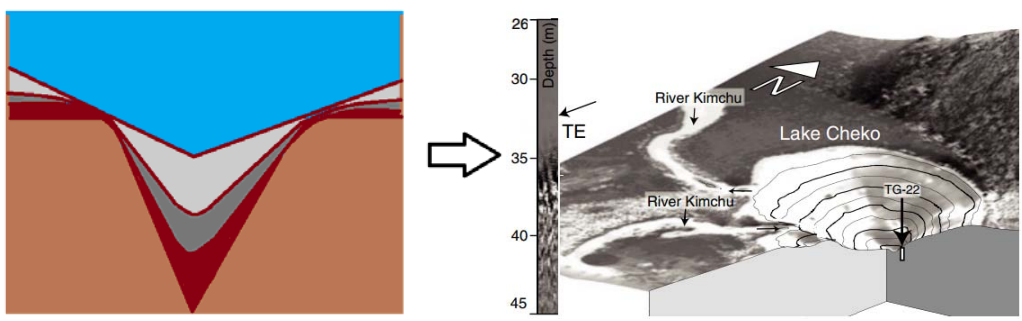


A B C

Deep water spot and deep water spotization by shock wave from very high energy charged cascade particles of ordinary matter of air shower

Figure 25-7-S-17

However, such sharp cone shape deep water spot can be changed bowl shape by alluvial and fluvial deposits as Lake Cheko as Figure 25-7-S-18.

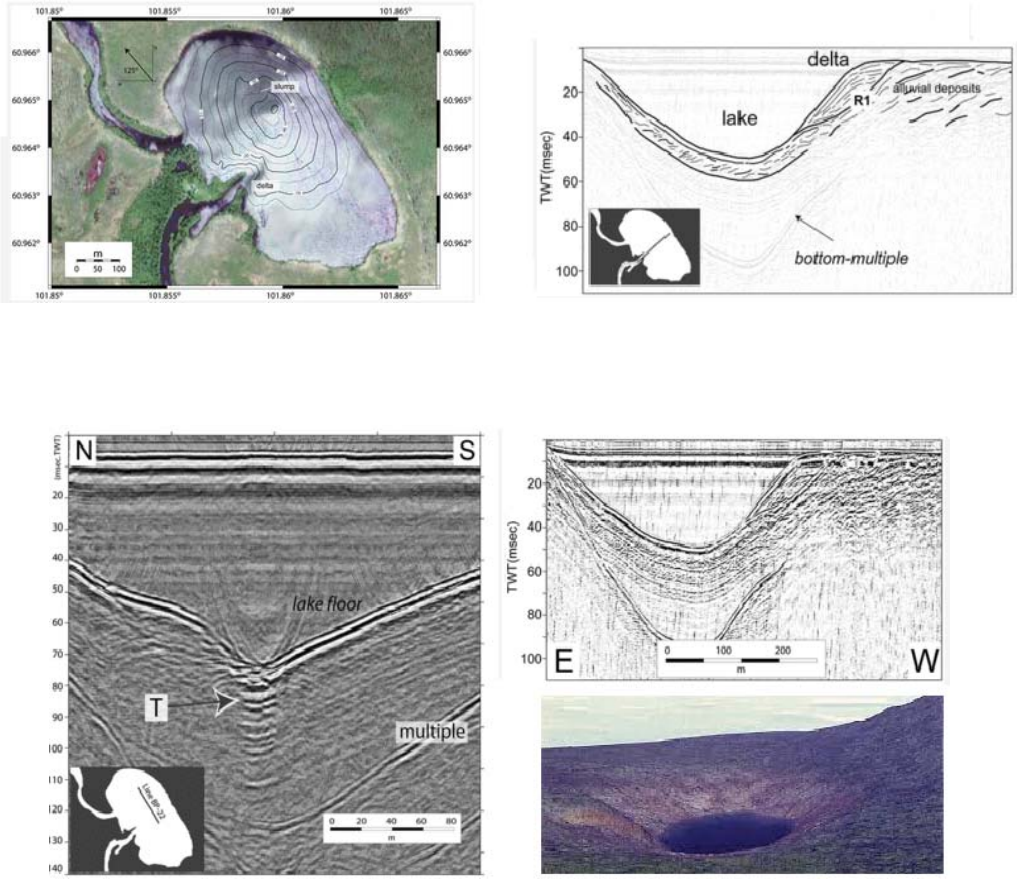


A B

Lake Cheko is deep water spot by shock wave from very high energy charged cascade particles of ordinary matter of air shower

Figure 25-7-S-18

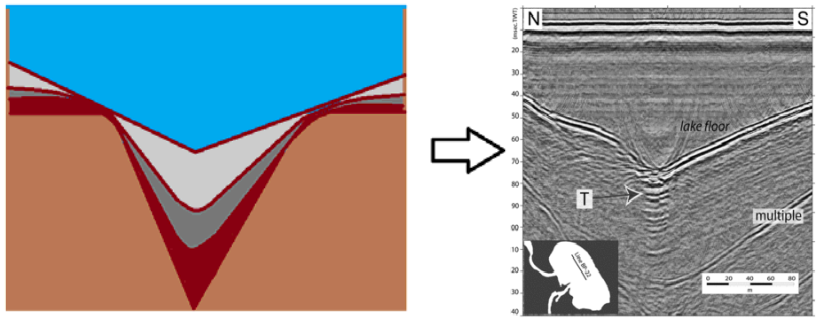
Figure 25-7-S-19 show low–frequency seismic reflection profile BP-26 crossing the Lake Cheko southern slope, delta and continuing upstream the River Kimchu by L. Gasperini et al.



Structure of Lake Cheko

Figure 25-7-S-19

Alluvial and fluvial deposit are less homogeneous and show the typical pattern of fluvial valley infill caused by lateral migration of meanders according to L. Gasperini et al (Sediments from Lake Cheko(Siberia),a possible impact crater for the 1908 Tunguska event).



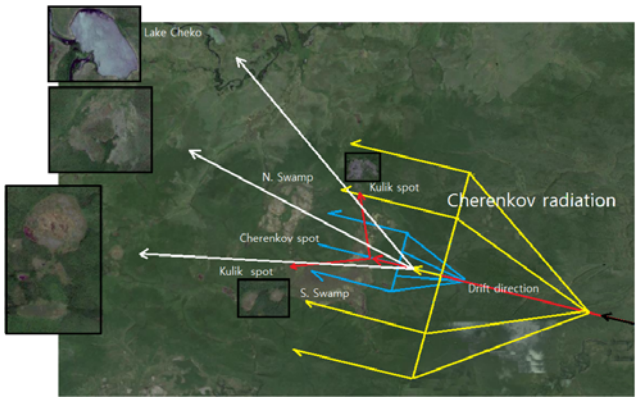
N-S oriented, time-migrated seismic reflection profile BP-22 across the lake center

Figure 25-7-S-20

Therefore, we can conclude that Lake Cheko is deep water spot by sharp cone shape shock wave of very high energy charged cascade particles of ordinary matter of cosmic ray, but not an impact crater by meteor as "Evidence that Lake Cheko is not an impact crater" by G.S. Collins, N. Artemieva, K. W*ü*nnemann, P. A. Bland, W. U. Reimold and C. Koeber.

However, this deep water spot is called Longo-Gasperini spot in CFLE theory

Figure 25-7-S-21show total Cherenkov spots, Kulik spots, Longo-Gasperini spot and related accessory spots on large Tunguska explosion site by cosmic ray air shower.



Double Cherenkov radiation, double Cherenkov spot and double Kulik spot and related accessory spots.

Figure 25-7-S-21

Now, we can better understand why 3~4 flat epicenter are in Kulik's achive photo.

Kulik's arxive photo

Figure 25-7-S -22

Figure 25-7-S -23 show where anomalous 3 bright nights were observed the 30 June- 1july 1908.

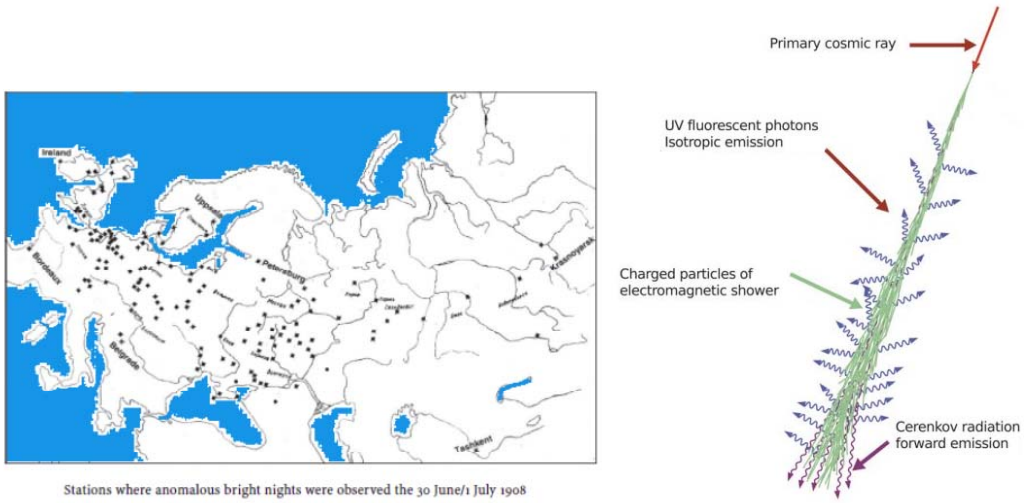


Figure 25-7-S -23

Now, we can clearly explain what cause of 3 bright nights is. That is UV fluorescence photons isotropic emission by super ultrahigh cosmic ray air shower.

Figure 25-7-S -24 show modern cosmic rays detector.

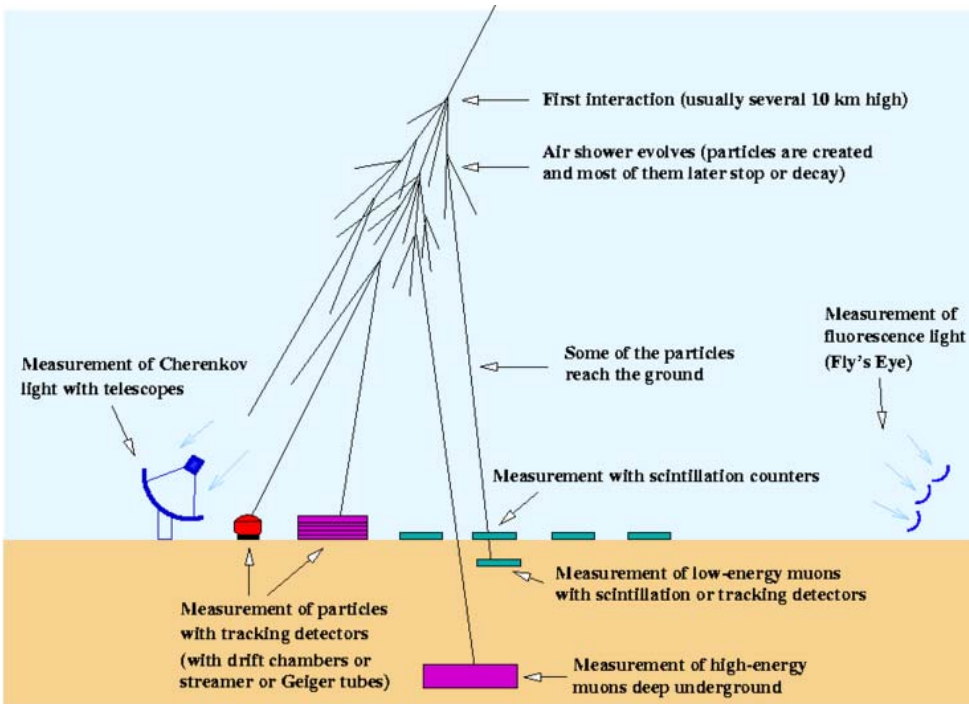
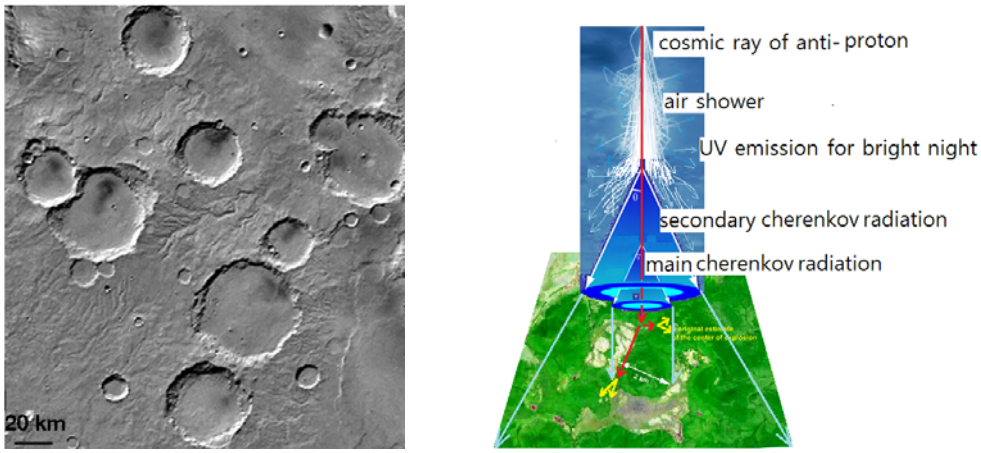


Figure 25-7-S -24

Even if there were not meteor crater on Tunguska site, however, super ultrahigh energy cosmic ray remain us are large plenty tracks as cosmic morass, cosmic swamp, cosmic spots, lots of small cosmic ponds and cosmic Lake on Tunguska site as modern cosmic ray detector as Figure 25-7-S -24.

Cosmic ray air shower theory of Tunguska explosion can explain all of strange, special phenomena of Tunguska event logically, consistently and satisfactorily from α toω.



A B

(A) Mars flat craters (Viking Orbiter Image: $37.5^0S, 148.5^0E$) from "What we know about Mars from its impact craters" by Nadine G. Barlow.

(B) 30. June. 1908. 7:17 AM (Local time) Podkamennaya Tunguska River (60^0 55′N $101^0$57′E) in Siberia, Russian Empire.

Figure 25-7-S -25

If Cosmic ray air shower theory of Tunguska explosion were correct, we can expect that similar feature of Tunguska event should be found on Mars. Because the atmosphere of the Mars is the layer of gases surrounding Mars composed mostly of carbon dioxide and the atmospheric pressure on the Martian surface average 600 pascal, about 0.6% of Earth' mean sea level of 101.3 kilopascals. That is enough condition for cosmic rays Martian air shower.

Surprisingly, we have clear evidence of similar Cherenkov-Kulik spot on Mars as Figure 25-7-S -25-A. Here, important point is not only similar flat structure (no Ejecta blanket of impact crater),but also almost same size of maximum damaged area of Tunguska event and Martian flat crater (40 ~60km) and lots of small accessory craters by lots of charged cascade particles from cosmic ray.

Therefore, we can conclude that Tunguska Cosmic Body (TCB) of 1908 is super ultrahigh energy cosmic ray of anti-proton as Figure 25-7-S-25-B. According to CFLE theory TCB is called TCR (Tunguska Cosmic Ray).

Source of Figures

25-7-S-1: (A) "Tunguska: a cosmic air burst paradigm, how we investigate these phenomena, and the search for viable mitigation strategies 24/09/2009" page 10 by George Sola at the Open University. Credited by Longo et al tri at universities of bologna and Tomsk

(B, C) Comet and asteroid risk: "an analysis of the Tunguska event RMS special report" by risk management solution INC.

25-7-S-3: Astronomy news: date Jan 27 23:47 2006

25-7-S-4: The CORSIKA air shower simulation from "Air Shower Simulation" by Marco Alania, Ignacio J. Araya, Adolfo V. Chamorro Gomez, Humberto Martinez Huerta, Alejandro Farra Flores and Johannes Knapp.

25-7-S-6: Google Map

25-7-S-8:1908 Tunguska blast Feb.10, 2011 23:20 from "Before its news"

25-7-S-11: A: "Satellite View of the Kulikovsky paleo volcanic complex" from the book of "Tunguska event" by G. Longo, Chapter 18, page 307.

25-7-S-14: "preliminary results from the 1961 combined Tunguska meteorite expedition" from Meteoritica, Vol.1963 by K.P. Florensky

25-7-S-19: Magnetic and seismic reflection study of Lake Cheko, a possible impact crater for the 1908 Tunguska event by L. Gasperini, L. Cocchi, C. Stanghellini, G. Stanghellini, F. Del Bianco, M, Serrazanetti, C. Carissiano and from http://en.wikipedia.org/wiki/Tunguska.

25-7-S-20: "Evidence that Lake Cheko is not an impact crater G.S. Collins, N. Artemieva, K. W□nnemann, P. A. Bland, W. U. Reimold and C. Koeber

25-7-S-21: Google Map

25-7-S-23: from the book of “Tunguska event” by G. Longo

25-7-S-25:Viking Orbiter Image from the” What we know about Mars from its impact craters” Figure.17 by Nadine G. Barlow at Department of Physics and astronomy, Northern Arizona University, Flagstaff, Arizona 86011-6010, USA

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