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Japanese Researcher: Recriticality in July and August? (UPDATED)

Yoyo Hinuma, currently at University of California San Diego, says recriticality may have happened in one of the three reactors at Fukushima I Nuclear Power Plant in late July and again in mid August, releasing the largest amount of radioactive materials since April.

I cannot find much about the researcher, other than he was at MIT before, and that he has published papers in peer-reviewed magazines.

The article below says there was a criticality in March, but I don't know if the reporter is referring to the explosion events in March or the recriticality in one of the broken reactors as some researchers have alleged and hypothesized.

(UPDATE: I totally forgot about [the report by the UC San Diego researchers](#) that radioactive sulphur of Fukushima origin was detected in California in late March, indicating on-going chain reaction. So the Playboy magazine reporter may be right. To recap, chlorine in the seawater being injected back then captured neutron, turning to radioactive sulphur.)

(Of all magazines) the article appeared in the Weekly Playboy magazine in Japan.

Part from [Shukan Playboy Japan](#) (9/12/2011):

...実は公的機関が発表している放射線量の数値で、不可解な動きが計測されているのだ。それは、7月末から8月にかけて発生した放射線量の大幅な上昇。3月の事故直後から、事態の深刻さをネット上での論文発表などで訴え続けてきた日沼陽工学博士はこう解説する。

... Indeed, there are some inexplicable numbers reported on the air radiation levels by the government agencies. That is, a big rise in the radiation levels from late July to mid August. Dr. Yoyo Hinuma, who has published papers on the net about the seriousness of the situation since the beginning of the accident in March, explains.

「私は福島第一原発1～3号機のいずれかで、メルトダウンした核燃料が連鎖的に核分裂する『再臨界』が発生し、4月以降では最大量の放射性物質が施設外へ漏れ出したと考えています。時期は7月28日から31日頃と、8月19日から21日頃の2回。放射物質の大量流出は、発表数値が実際よりも低めではないかと疑われている東京都や横浜市の線量測定データからもはっきりと読み取れる科学的事実です」

"I think there was a recriticality in which the melted fuel started a chain reaction again in one of the reactors at Fukushima I Nuclear Power Plant, and that the largest amount of radioactive materials since April was released from the plant. It may have happened twice. The first was between July 28 and 31. The second was between August 19 and 21. That the large amount of radioactive materials were released can be clearly seen in the radiation survey data in Tokyo and Yokohama City, where it is suspected that the announced radiation levels are lower than the actual levels. So it's a scientific fact."

例えば、東京都発表のデータでは、8月19日の最大線量が前日の約1.4倍となる0.0865マイクロシーベルトを記録。この日には横浜市でも0.051マイクロシーベルトと、こちらは3月末並みの線量が観測されている。

For example, according to the data released by the Tokyo Metropolitan government, the air radiation level on August 19 was 0.0865 microsievert/hour (maximum), 1.4 times as high as the previous day. On the same day, Yokohama City measured 0.051 microsievert/hour, the level last recorded in late March.

「さらに詳しくデータを分析してみると、7月よりもよりはっきりと数値が上昇している8月のほうでは、規模が大きく継続時間が長い『即発臨界』という分裂反応が起きたと推定されます。これによって大量発生した放射性のセシウムやヨウ素などが首都圏にも達し、線量を増大させたと考えていでしょう」(日沼氏)

"Further analyzing the data, we find that August saw a more definite rise than July. It may have been caused by the so-called "prompt criticality" which is bigger and lasts longer. The large amount of radioactive cesium and radioactive iodine released as the result may have reached the Tokyo Metropolitan area, raising the air radiation level", says Dr. Hinuma.

振り返ってみれば、東京都と神奈川県「下水脱水汚泥」から高い数値の放射性ヨウ素131が検出され始めたのも7月後半から。ヨウ素131の半減期は8日間なので、3月の臨界で発生したものが7月以降になってから検出されることはありえない。また8月には、都内各区の数十ヶ所の砂場で安全基準値を大幅に上回る放射線量が測定され、砂を全交換するまで使用禁止の措置がとられた。だが、その砂場のほとんどが7月以前の計測では基準値以下だったのだ。

Looking back, it is since the end of July that the high level of iodine-131 have started to show up in the "dehydrated sewer sludge" in Tokyo and Kanagawa Prefecture. Half life of iodine-131 is 8 days, so it couldn't have come from the criticality happened in March. Also in August, radiation that exceeded the safety standard was detected in tens of sandboxes in the parks where children play, and the use of the sandboxes was prohibited until the sand was replaced. But before July, air radiation at most of these sandboxes measured lower than the safety standard.

この夏、福島第一原発で再臨界が少なくとも二度発生、新たに放射性物質が降り注いでいる可能性が高いと言わざるを得ない。

We'd have to admit that there is a high possibility that the recriticality happened this summer at Fukushima I Nuclear Power Plant, at least twice, and fresh radioactive materials are being released.

I checked the [Tokyo Metropolitan government's official measurement](#) of air radiation in Shinjuku. The maximum levels recorded on July 30 and August 19 are indeed elevated:

July 29: 0.0697 microsievert/hour

July 30: 0.0735 microsievert/hour

July 31: 0.0610 microsievert/hour

August 18: 0.0621 microsievert/hour

August 19: 0.0865 microsievert/hour

August 20: 0.0605 microsievert/hour

For July and August, the maximum air radiation level recorded in Tokyo is in 0.06 microsievert/hour range, and does not exceed 0.07 microsievert/hour, except for these two days.

Iodine-131 detected in sewer sludge in mid August in Tokyo and in Oshu City in Iwate Prefecture (among others) is attributed to the medical use, because there was no corresponding increase in radioactive cesium. Also in the case of Tokyo, radioactive iodine has been continuously detected in sewer sludge since they started to take measurements in May.

However, iodine-131 detection in sewer sludge is NOT the reason why Dr. Hinuma thinks there were two recriticality events at Fukushima I; it is what the Playboy reporter lists as a supporting evidence.

I do want to point out though that when Fukushima Prefecture detected tellurium-132 in the early morning of March 12 - that is, before the explosion of Reactor 1 building - in Namie-machi and other locations outside the plant including Minami Soma City, 25 kilometers from the plant (and they didn't bother to tell anyone for nearly 3 months), [there was no concurrent, significant detection of iodine-131 and radioactive cesium](#) even though this was clearly a precursor to the explosive event that took place that afternoon

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POSTED BY AREVAMIRPAL::LAPRIMAVERA AT 1:00 PM 

LABELS: [FUKUSHIMA](#), [RECRITICALITY](#), [YOYO HINUMA](#)

21 COMMENTS:

Anonymous said...

Fukushima, the gift that keeps on giving. This is absolutely terrifying. This thing is just never going to stop, is it?

I am unable to conceptualize what life must be like for the people of Japan right now, trying to live alongside this. How on earth can anyone remain on the main island under such conditions?

If you don't mind a personal question, Lapri, are you going to leave - or have you done so already?

Anonymous said...

I can absolutely believe this is true because in Florida, the exact same air quality and hazy look over the horizon, and odor, and lungs feeling heavy happened just as it did when we were getting verifiable releases in March thru May.

I trust my observation and I absolutely believe there were 2 more radiological releases from Japan.

Viola said...

If you take a look at the charts coming from TEPCO, you can see a spike at sub-drain Fukushima Unit 1 around these dates of July and August, and s well one between 2th and 6th of September.

You can as well see Iodine-131 coming up again mid of August, lasting until beginning September.

http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/110917e8.pdf

[arevampirpal::laprimavera](#) said...

Thanks Viola!

Anonymous said...

What is amazing is that Japanese are not aware that Fukushima is happening. The main stream televisions, newspapers and news channels are keeping the key issues very often with a positive twist. I left Tokyo just after the earthquake and Japan in July. 90% of People are brainwashed there. They think that no onw has died and Fukushima is over (apart from minor food contamination problem that are not to worry about anyway). Another reason to be sad for the ordinary people living in Japan, being brainwashed and killed at the same time. This is worst than what Goerge Orwell had in mind.

Anonymous said...

I was in Kawasaki on the 19th of August and there was a very heavy rainstorm which lasted about an hour. The wind was blowing from the North, so I checked the the municipal radiation readings at the time and noticed a really big spike in radiation across Tokyo, Kanagawa and Saitama. I captured a screen cap, but you can still check back on the respective council sites to verify it. Interestingly, the next day there was still 'no radiation detected' in the municipal fallout reports.

<http://i55.tinypic.com/2lavqee.jpg>

[netudiant](#) said...

Precipitation events seem a lot more likely than recriticalities for this one, imho.

The incremental radiation amounts are in the 20-30% range, whereas a criticality would bump things up by many thousands.

It does not help to cry wolf every time there is a fluctuation in the radiation measurement. That merely distracts from the harder task of getting the authorities to deal with this disaster and its repercussions honestly.

Anonymous said...

I've been watching those graphs every day since March 15th and that kind of clear spike (0.066 u/Sv to 0.1 u/Sv in Kawasaki) during a rain shower has happened exactly once since the initial fallout. According to the metropolitan government site, Tokyo radiation maxed out at 0.5u/Sv on March 15th, five times (not 'many thousands') more than the 'precipitation event' under discussion.

I agree that a transient re-criticality should have led to a much bigger spike on site at the plant 260km away - for Dr. Hinuma's theory to be correct you'd have to believe in a conspiracy on behalf of TEPCO to cover that up. Would you put it past them?

You sound like you've given it some thought - what, in your opinion, explains this particular 'precipitation event' ? Naturally occurring radon decay products? If so, where did the 2,300 bq/l iodine in the sewage come from? Hospital discharge?

As for your accusations about 'crying wolf' and 'distracting the authorities', I'm not sure if you are referring to this blog, Playboy or Dr. Hinuma. It is true that the Japanese Government is spending a significant amount of energy trying to manage the flow of information online, but It sounds like you'd agree that that energy could be better spent directly addressing the disaster rather than reading blog posts.

Anonymous said...

The fluctuations seem far too minute to be statistically significant. Even 0.6 to 1.0 is not much. Radiation is a random event, sometimes it goes up, sometimes down. If they measure once a day then this is the result. If it goes over several hours or days, different story. I could probably give you a 0.3 or 0.4 number for each day and argue there is a downward trend or "spike".

Anonymous said...

looks like somebody from the government is visiting this site now.

Anonymous said...

Well whoever they are, they are certainly are not a statistician!

According to the metropolitan government, the hourly radiation reading in Shinjuku right now is 0.0557 uSv/h. An hour ago, it was 0.0553. Same time yesterday, 0.0552. Last week, 0.0554. Last month, 0.0571. Two months ago 0.0570. Rather than making stuff up to justify your assertions, look at the data - it's mathematically absurd to say that 0.6 to 1.0 is statistically insignificant.

Once again, here is a screen capture showing hourly readings on August 19th in Ibaraki, Kanagawa, Tokyo, Saitama and Fukushima:
<http://i55.tinypic.com/2lavqee.jpg>

Anonymous said...

Sorry, I left a decimal: I meant the fluctuation between 0.006 and 0.01 is insignificant. It is too small. Not to mention the difference between 0.069 and 0.073. Particle counts are random events. Have you ever seen a counter averaging readings? It can run up and down the scale and if you catch it in the wrong moment, you can get a reading too high or too low. Unless they have measured for a set time period and then averaged it, then it might be meaningful.

Regards

"The Government"

Anonymous said...

What about the fluctuating radiation readings in reactor 1's drywell? I thought that was clear evidence of the corium repeatedly going critical.

And what about the Sulfur-35 that has been detected recently? That's clear evidence of criticality occurring in the presence of salt water.

James said...

"Have you ever seen a counter averaging readings?"

- yes I have. Have you bothered to look at the monitoring data? No you have not.

The readings are available as hourly averages, and the hourly maximum and minimum are also conveniently provided.

If the hourly average radiation reading, over an entire month, is +/- 0.005, then a jump of 0.040 is statistically significant - if you try plotting it at home with some graph paper you'll get it.

<http://monitoring.tokyo-eiken.go.jp/monitoring/index-e.html>

Atomfritz said...

Radiation is not random. What a rubbish! If it were random, there won't be any atomic clock.

As Tepco does neither publish the neutron flux at the reactors, metered just outside the containment, nor, for example, the Xenon-135 radiation, there is no absolutely sure way to tell if there have been recriticalities.

However, the coincidence of I-131 appearing at similar levels over days (no decaying noticeable) together with Cesium radiation jumps looks very suspect and demands investigation.

From my limited knowledge I could not rule out criticality happening.

Recriticality of only a few kilograms small blob of the hundreds of tonnes of corium would not cause a relevant increase of Cesium emissions but could well explain the reappearance of I-131.

Again, it would be easy for Tepco to publish the metered neutron flux to avoid "baseless rumors" about recriticality.

The fact they do not do so clearly shows that they want to hide something important.

Anonymous said...

@Atomfritz: come on, you seem a competent person. You are not going to compare an atomic clock ("the most accurate atomic clocks first cool the atoms to near absolute zero temperature by slowing them with lasers and probing them in atomic fountains in a microwave-filled cavity", Wikipedia) with a blob of Fukushima fallout sitting on a rooftop at the base of a sensor in Shinjuku. The mix of the isotopes is random to start with, whatever hits the sensor is also random. It is a totally uncontrolled environment that screams variation.

Guys, I am not disputing that something shady is going on by Tepco. But taking the Shinjuku measurements alone (@Areva: why are you taking only the maximum values? If the source is random you have to take the average, not only the extremes. As a trader you should know this) is no basis for any theory whatsoever. That's what I am taking issue with in this blog post.

It even says on the page http://monitoring.tokyo-eiken.go.jp/mon_air_data_1day.html: "Before Fukushima accident, average readings were between 0.028~0.079". How is that for variance??

The graphs at <http://i55.tinypic.com/2lavqee.jpg> clearly show that something is going on. The image is a little small. Nonetheless, we know there are ongoing minor releases at the plant and I have seen these waves in graphs before August. Unfortunately this is the "new normal" current state. You'll need a lot more evidence for whatever claims IMHO. And even then I would assume that values will be a lot higher, not just x1.4 at Ibaraki etc. So it is sad that stuff is coming out, but are these significant events, I am not so sure.

Atomfritz said...

anon 5:57

Yes, it is of course a matter of decay events and measurement time. If you measure one gram of radium (definition of the Curie, $3.7E+10$ Bq/sec), sampling times of milliseconds or even microseconds will give exactly reproducible measurements. On the other hand, soil measurements for small concentrations of plutonium isotopes usually need a measurement time of many hours to eliminate the "random decay noise" that you get if you have insufficient counts. In the long run, nuclear decay is statistically so exact that it can be used to prove relativity theory at speeds of commercial airplanes, way below light speed.

Thank you for the link to the Tokyo monitoring results!

The variation in the range of 51 nGy (28 to 79) is indeed random, but not due random decay but due to weather conditions and so the varying re-mobilization of soil-precipitated radionuclides into the air due to wind, nuclear bomb testing, other nuclear plants' emissions etc.

So we can tell for sure that the spikes on July 28 and 29 and August 19 are by far outside of this "random noise margin".

However this alone is no proof that this radiation originated from Fukushima Daiichi.

To remember, the German 300MWe PBMR of Hamm-Uentrop a few days after the Chernobyl cloud reached Germany had an accident that led to its decommission. There were big releases that in the public were initially believed to be Chernobyl radiation.

The PBMR operators succeeded to cover-up this accident for about one year. The releases have only been estimated because the radiation measurement network of the PBMR conveniently happened to be under maintenance at that time, very similar as it was the case at TMI, btw.

However, the charts in the document Viola linked to in her above comment show Iodine-131 re-appearing at units #1 and #3. To me this indicates that there were several re-criticalities of varying size and duration, some lasting for days.

Where else should the Iodine have come from? I have no idea.

Anonymous said...

The definitive answer would be to do neutron counts. TEPCO does not do neutron counts, or does not publish them.

Anonymous said...

AtomFritz,

Atomic clocks don't use radionuclides. There's no connection.

Also, a few kg wouldn't go critical; the entire corium would go critical as a whole, or not at all. Think about it.

Anonymous said...

I agree with the clock thing, but "as a whole..."? if the entire corium is all in one place that is...being that it's melted through the floor and out the door leads me to think it's not. Plus, no matter the size, some radionuclides can go critical spontaneously. Plutonium chunks were blown far and would not have to "ignite" the entire corium blob if they decided to fission even if it were all in one piece.

Atomfritz said...

The stuff probably has splashed around after dropping from the RPV.

In BWRs there is a big cavity under the RPV and you cannot expect the corium dropping there like candle wax.

The precipitate is a random mix of core contents, and as the control rods melt away way before the fuel rods, you can suppose that the later melt is not "moderated" with neutron absorbing stuff that much as the initial melt.

So it seems plausible to me that later droplets could easier contribute to recriticalities than the first ones.

And yes, thanks for hinting that atomic clocks don't use radionuclides. I got confused, most older of them use Cs or Rb isotopes, however no radioactive ones. Anyway, I am not interested in clocks but reactors :)

But, in the long run it's the same: the average time of atoms changing energy levels is statistically extremely exact. Like decay.

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