

## New physics?

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The Sun can affect a lot of things on Earth - but the rate of radioactive decay isn't normally considered to be one of those things. Credit: NASA.

Radioactive decay – a random process right? Well, according to some – maybe not. For several years now a team of physicists from Purdue and Stanford have reviewed isotope decay data across a range of different isotopes and detectors – seeing a non-random pattern and searching for a reason. And now, after eliminating all other causes – the team are ready to declare that the cause is... extraterrestrial.

OK, so it's suggested to just be the Sun – but cool finding, huh? Well... maybe it's best to first put on your skeptical goggles before reading through anyone's claim of discovering *new physics*.

Now, it's claimed that there is a certain periodicity to the allegedly variable radioactive decay rates. A certain annual periodicity suggests a link to the varying distance from the Sun to the Earth, as a result of the Earth's elliptical orbit – as well as there being other overlying patterns of



periodicity that may link to the production of large solar flares and the 11 year (or 22 year if you prefer) solar cycle.

However, the alleged variations in decay rates are proportionally tiny and there remain a good deal of critics citing disconfirming evidence to this somewhat radical idea. So before drawing any conclusions here, maybe we need to first consider what exactly good science is:

• **Replication** – a different laboratory or observatory can collect the same data that you claim to have collected.

• A signal stronger than noise – there is a discrete trend existent within your data that has a statistically significant difference from the random noise existent within your data.

• A plausible mechanism – for example, if the rate of radioactive decay seems to correlate with the position and magnetic activity of the Sun – why is this so?

• A testable hypothesis – the plausible mechanism proposed should allow you to predict when, or under what circumstances, the effect can be expected to occur again.

The proponents of variable radioactive decay appeal to a range of data sources to meet the replication criterion, but independent groups equally appeal to other data sources which are not consistent with variable radioactive decay. So, there's still a question mark here – at least until more confirming data comes in, to overwhelm any persisting disconfirming data.

Whether there is a signal stronger than noise is probably the key point of debate. The alleged periodic variations in radioactive decay are proportionally tiny variations and it's not clear whether a compellingly clear signal has been demonstrated.

An accompanying paper outlines the team's proposed mechanism -



although this is not immediately compelling either. They appeal to neutrinos, which are certainly produced in abundance by the Sun, but actually propose a hypothetical form that they call 'neutrellos', which necessarily interact with atomic nuclei more strongly than neutrinos are considered to do. This creates a bit of a circular argument – because we think there is an effect currently unknown to science, we propose that it is caused by a particle currently unknown to science.

So, in the context of having allegedly found a periodic variability in radioactive decay, what the proponents need to do is to make a prediction – that sometime next year, say at a particular latitude in the northern hemisphere, the radioactive decay of x isotope will measurably alter by z amount compared to an equivalent measure made, say six months earlier. And maybe they could collect some neutrellos too.

If that all works out, they could start checking the flight times to Sweden. But one assumes that it won't be quite that easy.

## The case for:

Jenkins et al. <u>Analysis of Experiments Exhibiting Time-Varying</u> <u>Nuclear Decay Rates: Systematic Effects or New Physics?</u> (the data)
Fischbach et al. <u>Evidence for Time-Varying Nuclear Decay Rates:</u> <u>Experimental Results and Their Implications for New Physics.</u> (the mechanism)

## The case against:

- Norman et al. <u>Evidence against correlations between nuclear decay</u> rates and Earth–Sun distance.

- The relevant Wikipedia entry

Source: Universe Today



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