

Uranium and other alpha emitting nanoparticles : the forgotten pollutant (Interpretation of epidemiological results)

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Abstract

55 *There is a wide list of sources of contamination by alpha emitters : radon, drinkwater, “NORMs” in*
coal, fertilizers, oil, gas, building material, ore mining, and artificial sources (atomic test fallout,
nuclear accidents...) all able to go through the food chain (esp. meat). Waste incineration burns lots
of products (eg plastics) contaminated with NORMs. Sewage also brings alpha emitters from the
60 *food chain recycled for agriculture. The IARC Group 1 list includes all alpha emitters in internal*
contamination. No study on chemicals and health ever confronted the results with that list. The very
limited effect of chemicals can be predicted from the weakness of the chemical energy the atom can
produce, approximatively one million times inferior to the energy of a single alpha decay – 3 to 7
MeVs. This is here demonstrated through an extensive study of epidemiological results, using the
radioactivity source easiest to track, natural radioactivity.

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The dangerousity of uranium has usually been associated mostly with its chemical properties [1] but
it is very doubtful that the long list of effects that has been associated with its chemical properties
70 cannot be in fact explained more accurately by alpha decay damage. The simple hypothesis made in
this paper is that the carcinogeneity, mutagenicity and teratogeneity of a contaminant is linked to the
actual kinetic energy it is able to produce per unit of contaminant. The chemical energy of the atom
is much lower than the energy of alpha decay. Only some physical contaminants such as wood
chips or asbestos are able to create damage similar to alpha decay yet the area they can
75 contaminate is limited by their sheer size, as opposed to heavy metal oxide nanoparticles which
can travel throughout the whole body.

The link between radon and lung cancer has been established long ago (the link between radon and
skin cancer is also increasingly under the spotlight), as well as the capacity of uranium and its
descendants to travel in the body – see also [2] for a direct link between low levels of increase in
80 radon exposure and birth defects. The ability of nanoparticles of uranium and other heavy metals
such as lead (the natural decay product of uranium) to accumulate in the blood and to circulate in
the nerves to the brain is demonstrated [3]. The carcinogenic effect of low doses of alpha particles
has been verified in vitro [4]. The mutagenic effect on DNA is also explained by the high relative
biological efficiency of alpha particles (see [5] for the example of a RBE of 6500, on gametes of
85 hamster, underlining the extreme sensibility of gametes and thus the already existing presumption
that alpha emitting nanoparticles will lead to strings of birth defects and hereditary diseases). The
mutagenicity even at low doses of radioactivity has also been demonstrated through a careful
epidemiological review [6] which is used in this article together with [7] as the basis for further
demonstration of the significance of the effects of alpha emitters in internal contamination together
90 with the recognition by the IARC. Some elements allow to quickly draw a map to a common source
to hereditary diseases : common genetic factors between autism and schizophrenia have been
established (see for instance [8]) and persons with Down Syndrome have also a more important
incidence of autism and of several other conditions (ADHD, Alzheimer's, blood diseases, endocrine
diseases...). The point of the paper is to show the significance of the linear no threshold model
95 through a wide ranging interpretation of the regional epidemiology of a number of diseases, pitting
them against variations of natural radioactivity. Countries with regional variations of natural
radioactivity and a good hospital system have been selected and studies showing the regional

epidemiology of diseases in these countries have been retained. They are followed with an analysis of artificial sources of contaminants.

A quick comparison with natural radioactivity levels of countries where incidence and prevalence was surveyed shows clearly a link with natural radioactivity, explained as always by either :

- direct damage in the brain, synapses, or on any other cell,... by alpha “shots” of uranium / thorium / decay products nanoparticles ([9] provides good illustration of the destructive effect of alpha shots), able to travel all across the body, through nerves, blood, lymph, and, for cancer, subsequent proliferation due to proximity effect [4], or :
- Genetic change in gametes caused by alpha shots inside gonads, leading to mutations in the genes of children even though healthy carriers of mutations can extend over generations the emergence of illnesses (two healthy carriers with damaged genes because of alpha shots giving birth to a sick child)

The bias in these studies is non existent because the bulk of the research used in this article (all the epidemiological studies that are interpreted) did not actually ponder the possibility that alpha emitters could have been involved in the observed variations.

An early version of the work exposed in this article was provided to the European Commission DG SANTE, which replied in a written letter that it “*will take the freedom to refer to it in future discussions*”. A copy of the letter of the author to the Commission and of the European Commission’s reply is in Annex 1.

1) Variations linked to natural levels of radioactivity

Natural uranium, depleted uranium, and all the radioactive decay products of uranium, as well as thorium and all the actinids, transuranics, present the same problem as they are mostly alpha emitters (there are some major beta emitters in actinids, Pu241, and Pb-210 in the uranium decay chain for instance, but these are a minority). The oxyde nanoparticles from the ground, as well as depleted uranium oxyde, are all able to travel through the body. They can for instance travel to the bone marrow and cause leukemia, but any cancer is likely to be caused by some alpha emitter because of the vast territory that nanoparticles can invade in the body – in fact, everywhere. Many other illnesses can be triggered by alpha emitters : any cell can be damaged, any function can be hindered or permanently diminished.

In France, the 2015 map of the relative risk of infantile cancer published by the French National Cancer Institute [10] reproduces quite well the map of the radon potential of the grounds, especially the ex-post estimation according to a Bayesian hierarchical model. Three of the departments known for high natural radioactivity (*Loire, Puy de Dôme, Finistère*) have an above average relative risk ([1.05 ; 1.09]) of infantile cancer (mostly blood and central nervous system). All the departments where the relative risk is under average ([0.93 ; 0.95]) are departments with low background radioactivity, according to the IRSN radioactivity map. NORMs in oil can explain why the other departments where the relative risk is high are departments with dense urban areas (*Haute-Garonne* (Toulouse), *Bas-Rhin* (Strasbourg), *Gard* (Nîmes, bordering on Avignon) and *Hérault* (Montpellier), four departments which also have some high natural radioactivity areas, and Paris as well as the *Hauts de Seine* (a very crowded area)) – the effect of the sole high natural radioactivity being

145 equivalent it is an easy hypothesis that the carcinogenic element in urban areas far from high natural
radioactivity (where building material does not come from such mines...) is NORMs in fumes.
On acute lymphoblastic leukemia in the US age-adjusted incidence is also lowest in the South, an
area with a typically very low natural radioactivity, and in non-Hispanic Blacks, whose populations
are concentrated in that area [11]. Data on leukemias also show a similar trends with rates
150 significantly lower in Blacks and Hispanics [12] which are groups concentrated in states with very
low or average natural radioactivity. For Blacks, the same is true of non-Hodgkin's lymphoma,
thyroid cancer, urinary bladder cancer, uterine corpus cancer, and breast cancer as well as (for
females, less likely to smoke) lung cancer [13]. And the overall rate of cancer incidence in
Hispanics is 20% lower than non-Hispanic Whites [14].

155 A direct correlation can be established between radon and cases of Down Syndrome, on the basis of
data collected in the USA [15]. It is possible to sort in ascending order of radon risk the ten US
states that have been tested, and to observe a direct correlation with the cases of Down Syndrome
(the more natural radioactivity the more frequent the syndrome), with Iowa and Utah having the
160 highest rates and Texas and Arkansas having the lowest (the level in Iowa is 131% of the level of
Arkansas and the level of Utah is 141% of the level in Arkansas)¹. In England, one of the least
radioactive parts of Western Europe, the rate is only 6,6 / 10 000 [16].

The higher prevalence of Down Syndrome in high natural radioactivity areas has also been
demonstrated already in 1976 in India [17], confirming that it is more than correlation.

165 There is a more important prevalence of Down Syndrome in Hispanics in the USA [15], but it is
extremely important to remember that the Iberic mountains (North-West of Spain) are one of the
most naturally radioactive parts of Europe, which could explain a specific genetic heritage in
American Hispanics having ancestors from that area. The pathway of cancer is linked to immediate
contamination. Given the amount of alpha emitting sources and their oversight in most research on
170 cancer, the case for a genetic origin of cancer, as for low levels of exposure to non radioactive
chemicals, and for a viral origin of cancer, is extremely limited and all studies must be done again
taking carefully into account alpha emitters.

Near the Iberian mountains, there also is an elevated rate of autism, according to a national study
undertaken in Portugal [18] on more than 332 000 children (questionnaires sent to directors of
175 schools). The Azores, known for their very elevated radon levels due to volcanism, have according
to this study the most elevated rate of autism, and the South of continental Portugal (which has the
lowest natural radioactivity in the country) has the lowest level. The level in Lisbon is also
significant but the main source of potable water of the city is in Castelo de Bode, on the Rio Zêzere,
an affluent of the Tage which takes its source in the naturally radioactive Iberian mountains². The
180 autism rates reported in the Iberian mountains are four times the rates in the South. Gonads are
more likely to accumulate heavy nanoparticulates and the higher rates of variation in genetic
mutations (as compared with cancer epidemiology) can thus be extremely easily explained by the
natural accumulation of nanoparticles in gonads (shown also below by the extreme gonad cancer
rates in areas bombed with depleted uranium – see again comments above on the extreme RBE of
185 alpha shots on gamets of hamsters found in [5]).

In Finland, mental illnesses, including schizophrenia (see [19], and [20] for a map of mental
handicap in Finnish adults) are correlated very well with geological outcrops of uranium, which are
concentrated in the North-East of the country according to the GTK (Finnish geological service)

1 Please note that the Georgia data was obtained only in Atlanta, and that the metropolis is located right upon an area
which has a high natural radioactivity, unlike the rest of the state, according to the available map for US levels

2 It is very easy to see the trace of radioactive sediments in the final part of the Tage in the LNEG radiometric map of
Portugal http://www.lneg.pt/download/7078/radiometric%20map%20of%20Portugal_portal.png demonstrating the

5 contamination of potable water in the city

190 map of deposits and mines, in black schist, quartzite and not in granite [21]³ : the exploitation had been planned in Sotkamo together with other ores, there is a mining project in Nuottijärvi and a former mine in Paukkajanvaara, most of the other mining claims / deposits are in Lapland.

Natural radioactivity is higher in the South but uranium is cast into granite and dissolves thus much less easily in water ; uranium mines lead to a very high contamination of the surrounding environment and, in general, uranium from more porous ore is more easily drained into water. Furthermore lichens, the feed of the reindeer, an important protein source in Lapland, may absorb important levels of radioactive elements, for instance radon-222.

200 Cancers and Down Syndrome are the swifter to conclude on because of the easy diagnostic and the anterior research. DNA damage may be one factor affecting meiosis, but direct impacts of alpha particles from radioactive sources that have migrated into the gonads, if they are occurring during the meiosis process are likely to be another major element involved. The Finnish results directly contradicts usual claims that schizophrenia is concentrated in cities (diagnosis is certainly quicker in cities because of the frequency of human contact and there are more clinicians available) and a more careful survey of other countries should produce similar results. For autism the Portuguese study was wide-ranging, furthermore the peak of autism cases in the Azores is again difficult to associate with other types of contamination than radon (there is no big industry in the islands). All of these results also confirm the ability of radon and its decay products as well as of uranium and thorium dissolved into water to travel into the body and reach vital areas such as bone marrow, gonads and the central nervous system.

On neuromuscular diseases, in spite of the low incidence of the diseases, the epidemiological data available [22] still allows to draw conclusions. One can compare for instance England, the Netherlands, Denmark and Norway, Eastern China (Jiangsu...), the US “Old South” including Texas, where the levels ought to be low, with the US, France, Germany, Ireland, Scotland, Italy, Spain, Australia, Japan where they should be higher. For *Myasthenia gravis* the epidemiology matches perfectly this differentiation on natural radioactivity grounds. For Guillain-Barré syndrome too, the matching is absolutely perfect (it makes sense that the levels are low in Eastern China and Cantabria). For amyotrophic lateral sclerosis there is a good amount of data, especially on incidence, there are several matches (low level in Texas, in England, in Uruguay, higher level in Ireland, Nova Scotia (high uranium potential), Scotland, France, Missouri, Italy, Sweden, Japan in one study, Germany) but a few discording elements (Netherlands, Norway have a higher level than expected), though *these are countries where the diagnosis is maybe easier thanks to the high quality of health services* (and these are diseases for which the variations are more difficult to detect due to the low incidence).

For inclusion body myositis [22] provides data that may be partly conflicting but in [23] the levels are low in the Netherlands, higher in Australia and highest in Minnesota (two areas of uranium mining). Some other neuromuscular diseases have high levels in low radioactivity areas (e.g. Duchenne, Becker). One simple explanation is an anterior contamination (before populations migrated and settled down elsewhere) and mutation of maybe a single gene in a few subjects that may have stayed in the genetic pool (because of the limited level of immigration in e.g. Norway and England until the industrial revolution). It is important to understand that (as already suggested by [6] in the concluding remarks) very low variations of radioactivity may lead to a strong regional divergence after dozens of generations (and, in some cases, even far in the past before the age of coal use, events such as volcanic eruptions can change the exposure of a population to alpha emitting nanoparticles, making genealogy of the mutation harder). The idea of a “genetic

3 a map of mines and mining claims is also provided by a local groups of activists against uranium mining https://pyrophor.files.wordpress.com/2017/05/uranium_industry_in_finland_2012-02_-_laplands_people_against_uranium_power.jpg confirming that extraction took place and is planned in the North East

predisposition” is thus very difficult if not simply absolutely impossible to establish with human means.

240 2) Confirming the effects of massive depleted uranium bombings

	World increases	Depleted uranium diseases	Afghanistan	Iraq	Pakistan	Alpha emitters can
245	0,18	Leukemia	1	0,42	0,5	damage absolutely
	0,29	Lymphoma	0,55	0,33	0,41	anything from the
	0,27	Brain / nervous system	0,78	0,54	0,58	inside of the body.
	0,36	Other malignant neoplasms	0,68	0,34	0,68	Nanoparticulates
	-0,06	Birth defects	0,17	0,52	0,1	travelling anywhere
	0,08	Testicular cancer	0,57	0,51	2	can hurt any cell and
250	0,3	Ovary cancer	0,93	0,6	0,58	cause every kind of
	0,019	Oesophagus cancer	0,58	0,36	0,37	dysfunction. These
	0,02	Stomach cancer	0,3	0,3	0,2	effects can be shown
	0,35	Colon and rectum cancer	1,1	0,5	0,6	using mass aggregates
	0,38	Prostate cancer	0,81	0,35	0,62	and juxtaposing them
	-0,105	Thalassemia	0,28	0,2	0,65	with variations in
255	0,083	Sickle cell traits and disorders	0,44	0,3	0,49	exposure to
	-0,06	Other haemoglobinopathies and haemolytic anaemias	0,58	0,27	0,37	radioactivity, and,
	0,57	Other endocrine, blood and immune disorders	1,14	0,7	1,29	unfortunately, the vast
	0,16	Ischaemic stroke	0,66	0,28	0,5	fields of use of
	0,27	Ischaemic heart disease	0,61	0,37	0,57	depleted uranium
	0,023	Rheumatic heart disease	0,4	0,22	0,349	weapons have
	0,24	Cardiomyopathy, myocarditis, endocarditis	0,84	0,45	0,75	
260	0,22	Other circulatory diseases	0,89	0,41	0,74	

Illustration 1: Figure 1

provided the biggest live experiment for medical science ever known in the history of mankind. The simple study of DALYs 2000-2015 provided by the World Health Organization, looking at data in Iraq, Pakistan and Afghanistan allows to see it (Figure 1). Pakistan has a GDP per person of 1 547 \$, Afghanistan of 586 \$ and Iraq of 5 165\$ as of 2017 according to World Bank data yet a few increases are even sharper in Pakistan. A rapid chi-square calculation confirms that Afghanistan, Iraq and Pakistan are highly correlated (chi-square is ~91,37 for 38 degrees of freedom) and that their average evolution is totally decorrelated from the average world evolution. The link ovary - testicle cancer and birth defects is particularly obvious and demonstrates with force the common cause : depleted uranium dust going down the body because it is a heavy metallic element and circulates with gravity down the body. Testicles, for instance, seem slightly more exposed than ovaries (confirming once again the effect is linked to DU dust as they are more of a receptacle than ovaries and we actually find that the biggest increase in the whole dataset to be for testicular cancer in Pakistan) but they are all very exposed to contamination.

The effect is here also clearly confirmed for bone marrow, immune and endocrine disorders (to be linked with the hypothesis of the abilities of nanoparticulates to travel anywhere and damage any vital cell) as well as heart diseases and circulatory diseases, sickle cell traits (a clear case of genetic effect) and disorders, haemoglobinopathies and haemolytic anaemias. Birth defects are in fact the only diverging dataset which suggests either censorship from local authorities or lack of transparency of local communities regarding birth defects which may be or have become a taboo in the more remote places that have been the main targets of missiles and bombs in Afghanistan and Pakistan (especially as the use of depleted uranium in these countries is much less known than in Iraq). Yet one alternate hypothesis (on the genetic damage [7] notes that at high doses we can

expect sterility or fetal loss instead of e.g. a birth defect) which seems more likely is that the acute contamination has produced more severe birth defects and much more miscarriages explaining why the total amount of birth defects does not increase as much in Pakistan and Afghanistan while the rest of the diseases increases more violently. This hypothesis is entirely confirmed by the extreme rate of maternal, foetal and neonatal loss in Pakistan [24] which has for instance a stillbirth rate (56,1 / 1000) more than twice as elevated as the rate found in India (27,9 for the highest) and even more than in Zambia (21) and Kenya (21,2). Another table provided by the WHO Global Health Observatory data repository for stillbirths [25] is also topped by Pakistan (with 43,1, Nigeria second with 42,1, Afghanistan at 26,7) and another onground study collecting data on 53 524 births in Kabul provides a stillbirth rate of 38 [26]. Pakistan has a GDP per person much higher than Burundi (320 \$), Malawi (338 \$), Sierra Leone (499 \$) or Liberia (456 \$) and gets a much higher rate of stillbirths than these countries according to the second table. The record level of stillbirths in Pakistan and Afghanistan matches the very high level of testicular and ovary cancer and leads directly, for a country massively bombed and while we have significant proof of the use of depleted uranium in such missiles and bunker busters, to the idea of contamination by heavy depleted uranium dust. And it is the only common sense answer to such a common explosive trend for all illnesses recorded by the WHO.

The high increases found in neighboring countries (Jordan, Saudi Arabia and in a lesser significance Israel) could easily be linked to the winds blowing depleted uranium dust from the warfields. The fact that the increases are higher in Jordan and Saudi Arabia than in Israel also suggests that the origin of the regional variations all come from Iraqi depleted uranium dust. That depleted uranium contamination from other war fields may be one of the factors in cancers and other diseases found for instance in Gaza and must be pondered by all researchers willing to point at Israeli strikes (the data on cancers and birth defects in Gaza is sparse and contradictory).

The three tested countries follow quite clearly the same trend over all diseases : Afghanistan and Pakistan have similar increases, Iraq is behind. This is simply a proof that uranium dust tends to behave the same way in any body and that thus on aggregate on large groups of population it is possible to predict the approximate number of cases for each illnesses.

Tribunals granted compensation to the victims of radium (cancers, especially in the jaw) before World War 2. In fallout areas near Chernobyl the strong increase in cases of Down Syndrome has been documented [27]. In Fallujah in Iraq where depleted uranium weapons have been used, the observed rate of Down Syndrome [28] is 49 / 10 000 (30 cases over a sample of 6 049 births), a study which also showed very elevated rates of birth defects of all kinds in the population of the city (see also [29] for link between congenital anomalies and uranium contamination in the parents). An explosion of autism and ADHD cases has been noted in Fallujah after the bombings by Dr Samira Alaani and identical results were reported by Dr Christian Sueur in French Polynesia together with other pervasive developmental disorders and several other diseases [30]. For schizophrenia, epilepsy and mental disorders in general the rates found in Vietnam are much higher in Thanh Hoa (North, area bombed massively during the Vietnam War) than in the South (Ben Tre) [31]. There is significant proof (for instance a document on the manufacturing of depleted uranium from the Y12 plant published in 1972 which already noted that depleted uranium fires present “a radiological hazard” (as opposed to a chemical hazard) and that “adequate respiratory protection” is needed in the vicinity of uranium fires [32]), together with the fact that mental illnesses in the country follow the same trend than in Finland and of course the massive amount of birth defects in Vietnam and Cambodia, that depleted uranium was already used in the Vietnam War and that dioxin is not the true responsible of the birth defects and other illnesses after the conflict. In the Seveso accident in Italy in 1976, for instance, the actual amount of birth defects after the dioxin leak was not significant [33], contradicting again the link made between Agent Orange and birth defects in Vietnam. This confirms again the full validity of the claim that chemicals are very unlikely to

trigger in themselves birth defects or other hereditary diseases in children except in the unlikely case of massive contaminations especially as the likelihood that a significant enough amount of molecules reach gonades before killing the individual is much lower than for actinids which are naturally heavy nanoparticulates able to travel through the internal barriers of the body “in silence” (without causing rapid intoxication and death) and that can be easily carried down with their weight.

Thalidomide has certainly been wrongly accused of a number of evils, especially birth defects, like pesticides and many other non radioactive chemicals. In addition to the high number of natural sources of alpha emitters that have been listed above, the outbreak of birth defects leading to accusations on that newly issued drug happened right during the most intense atmospheric nuclear testing period (which of course included uranium and plutonium dust, ~90% (depending on the efficiency) of the fissile material of a nuclear weapon does not fission) and this combined with the findings in [34] also reported in [7] compels to conclude on the invalidity of research linking thalidomide with birth defects until new research identifying effects separated from alpha emitters is carried out (which again seems more than unlikely to succeed due to the very low chemical energy of the atom, and simply very difficult to carry out due to the quasi impossibility to research alpha emitters 60 years afterward except perhaps if good biological samples from the mothers e.g. at least biopsies of ovaries are still available). The most simple explanation on cancers (exposure to alpha emitting nanoparticles) should certainly be re-weighted against the supposition that a genetic predisposition to cancer is involved (the pattern for cancer seems to be the proximity effect [4] and nothing more and it depends on the actual amount of energy dispelled onto the cell), however this paper also shows a large pattern of birth defects and other mutations from parental contamination leading to the idea that even if the genetic predisposition thesis for cancer was proven it could quasi-certainly spill from parental contamination by alpha emitters.

The thesis that exposure leads to an increase in the male/female sex ratio [7] is also confirmed by the extremely high proportion of boys in the birth defect cases in Fallujah Hospital (after screening of all the cases provided by Dr Alaani over more than a year).

The main issue with calculating the effective dose for internal contamination with alpha emitting nanoparticles is the extreme diversity in organ sensibility and the impossibility to assess the actual localisation of the nanoparticles. It is not possible to offer anything else than range of probabilities based on a comparison with the existing body of human exposure cases. All factors of contamination, including depleted uranium fallout pushed by winds from the Middle East (as has been noted famously in Aldermaston [35] and can be also easily verified by looking at EURDEP data showing a statistical increase of the total gamma levels in Northern Europe after the end of March 2003, a 3,3 nanoSv/h increase was for instance noted in Lelystad, Netherlands, and similar increases confirmed by IRSN radioactivity beacon data samples in France (see Annex 2 together with a tracking of the April 14 2018 depleted uranium fallout with EURDEP beacons)) have to be accounted, making this a very difficult work. All of these factors, without exception, should be isolated from their results by researchers still believing it is possible to identify any health effect of non radioactive chemicals.

In Bhopal the author emits the hypothesis that uranium was in fact manipulated together with methyl isocyanate for research on uranium extraction from sea water. It is difficult to bring on ground evidence to support the hypothesis yet cyano agents are used for uranium extraction and research was done for instance on methyl isophosphonate-based uranium extraction and on a ligand prepared by condensation of the amino-H2TPBC with commercially available diethoxyphosphinyl isocyanate [36]. It is also interesting to note (in [32]) that Union Carbide was involved in the manufacturing of depleted uranium since it published a document on its manufacture under a contract for the US government in the Y12 plant, and thus may have also been more in an industrial

position to undertake activities related to nuclear fuel processing and related technologies abroad.
385 Secrecy obviously surrounded the manipulation of uranium in the plant for commercial and / or military motives.

3) Comments

390 In the Group 1 list of the IARC, asbestos and asbestiform fibres, fluoro-edenite fibrous amphibole, crystalline silica dust, wood dust and erionite are associated to an obvious physical destruction by the fibres of cells that explain the triggering of cell proliferation.

Sun and cosmic radiations (which in fact includes neutrons which also have a high relative biological efficiency, and more importantly protons that due to their positive charge will behave as
395 alpha particles and focus all of their energy in the superficial area of impact, as well as some other atomic nuclei that can also be expected to have a very high RBE due to their mass) have to be accounted as well. Their effect is hypothesized to be quite low (please note that there are particle impacts explaining events such as the 993-994 spike in ¹⁴C in wood remains). Skin cancer has generally a single starting point which may suggest a proximity effect from the impact of a single
400 "excess" proton or neutron (above the threshold of resistance of the body which can be significantly elevated with consistent use of e.g. sun cream as the weakening of skin cells by UVs will clearly allow for a more destructive effect of particles onto weaker cells and thus an increased likelihood that a cell proliferation is triggered). It is difficult to differentiate the effect of UVs from the effect of cosmic particles here. These particles may be expected to have as well a destructive effect onto
405 the genetic content of gametes and on the rest of the body (for neutrons) yet for instance high variations of Down Syndrome were also found in Kerala depending on the natural radioactivity while exposure to sun can be assessed to be quite similar (the variations of altitude are not very significant and do not impact as well neutron exposure according to [37]), and the rate of Down Syndrome and the cancer ratios studied in the USA and the rate of schizophrenia in Finland follow
410 in fact a trend opposite to sun exposure (they are higher in northern areas like Iowa and North Eastern Finland than in the south coast of these countries), allowing to deduce sharply that the effect of cosmic particles is not significant.

A quick estimation, on the basis of the rates of variation of the diseases studied in this paper linked to the sole variation of natural radioactivity, and given the high importance of other sources
415 (NORMs for instance : the World Nuclear Association points to up to 15 millions of Bq of ²²⁶Ra, up to 2,8 millions of Bq of ²²⁸Ra per kilogram of hard scale and up to 200 000 Bq of ²²²Rn per cubic meter of natural gas, suggesting a more significant contamination of fuels than the ²²⁶Ra already found in a study on diesel dated back 1977[38] – the fact that oil is becoming harder to find and involves more shaped charges⁴ due to the exhaustion of the easiest to extract oil fields means

10 4 The book of the author *Depleted uranium, the invisible genocide and the seeds of terrorism* which was provided to the European Commission in the email quoted at the beginning of the article and that the European Commission read « with great interest » explains why « NORMs » in oil and gas are not of natural origin but linked to shaped charge technology and can be substituted with deuterium without reducing the productivity of the extractive industries. Nuclear weapons for mass destruction require hypercriticality (millions of critical masses, achieved through violent compression and moderation with paraffin) so the first nuclear weapons only went slightly above criticality and were used for armour
15 piercing, they still are used everywhere and extractive industries also use it, with radium and beryllium for the neutron source (a very elevated amount of radium is required, representing far more radioactivity than the small amount of highly enriched uranium used, and is the actual explanation for the absence of radioactive equilibrium in the byproducts of drilling ; it is clear that the choice of using radium instead of for instance tritium is explained by the need to make the contamination appear natural, as the author explains in his book). A simple fusion source with deuterium (thanks to
20 compression, a few deuterium atoms will fuse and produce enough neutrons to start the blast) is much cleaner. Tritium would be more efficient but would create a radioactive contamination and it is also much costlier while the gain of using tritium can simply be achieved by using more deuterium.

420 that the numbers of the 1977 study are certainly much lower than what it is today) is that alpha emitting nanoparticulates account for more than 99,5% of birth defects and de novo mutations and more than 97% of cancers, in average.

It is the logical conclusion of the multiplication of the effects of a single source (natural radioactivity studied in this paper through its variations) by all the sources that have been numbered
425 (they include NORMS in oil and gas, coal burning, phosphated fertilizers and the use of human sewage epuration residues for agriculture which will also contaminate fields with the alpha emitters passing into faeces, the fallout from atomic tests, depleted uranium bombings and their fallout, accidents such as Tchernobyl, the spreading of tailings from uranium mines due to lack of care of waste in the industry, as well as the contamination of meats from all sources, and the incineration of
430 human wastes that incorporate all these sources of alpha emitters e.g. plastics, food residues... – not to mention some alpha emitters in volcanic ash). The hypothesis is that all studies on thalidomide, for instance, failed to account properly of all these sources and that there have been as many false positives as there have been studies on thalidomide. The same argument goes for pesticides and all other chemicals (TCDD, benzene, POPs, etc), arsenic, lead, mercury and all non radioactive atoms
435 at low level, as well as helicobacter pylori, all the virus seen as causal for cancer, etc. Alcohol for instance was produced with food stuff grown with phosphated fertilizers and / or residues of human sewage – same for betel quid and tobacco and for tobacco the actual contamination with alpha emitters has been already clearly demonstrated. Leather is a byproduct of the meat industry likely to accumulate alpha emitters as meat does ; hence a consistent contamination with leather dust (IARC
440 Group 1 carcinogen) exposes to the incorporation of these alpha emitters. The glass industry, for instance, and all other plants where workers are exposed to furnaces burning with coal or oil lead to an exposure and glass itself when it is heated will expose the workers to more alpha emitters because the glass is produced with sand likely contaminated (any soil even with low natural radioactivity incorporates very low amounts of alpha emitters) and even though the uranium and its
445 decay products are present in an oxydated state they will oxydise even more (from UO₂ to U₃O₈) and as oxyde nanoparticulates will contaminate the workers as well. The same goes for metal smelting (from the contamination of ores like soils) and the manipulation of mineral sands (zircon, tantalum, niobium, rare earth elements mining for instance) and building materials as well (as soils). What has been accounted as side effects of pharmaceutical drugs in experimental research may be
450 for instance solely the result of a high radon level in the experiment room leading to a few disruptions ; and the wider the set-up of the study (especially if research is undertaken on the long term outside a laboratory) the harsher it is to find all sources – even if a study happens on a short period of time stochastic effects cannot be eliminated because relatively high amounts of exposure can be expected to have rapidly emerging effects on the body.

455 A phenomenon that can very easily be associated with the fact that decay after decay the half lives of actinids tend in average to diminish is the latency of onset of several diseases – for instance in the Gulf War syndrome. The first decay of the atom can take long but be followed by decays coming faster and faster (in the ²³⁸U decay chain and even more sharply in the ²³²Th decay chain), increasing over time the production of alpha particles and the likelihood of cell proliferation or significant nerve damage (for instance). The same phenomenon is for instance an excellent explanation for the spiking of Down Syndrome in children of older mothers together with the more general accumulation of actinids. The delayed onset of the Gulf War syndrome has been widely reported (in [39] for instance). The ageing of the body also of course contributes to the cell damage
465 yet the peculiarity of the actinid decay chains is an indispensable explanation for that delayed onset.

It may also be suggested quite logically that the paths for genetic changes are the same for humans, the fauna, flora and even bacteria or virus. Virus inside humans or cattle in highly contaminated areas are more likely to meet a nanoparticulate emitting an alpha shot that may affect its RNA (for

instance) and lead to the emergence of new forms, some more aggressive due to stochastic effect. It seems that many of the most dangerous bacteria and virus have appeared in areas of high natural radioactivity : for instance the “Spanish Flu” in China according to the *Institut Pasteur*, and the 1347 Black Plague in Mongolia. For the Zika mutation the first outbreak started in French Polynesia and the link with artificial contamination from French nuclear tests may be suggested – the virus would have absorbed defective RNA from an individual that was born with microcephaly due to parental contamination with uranium and / or plutonium. The virus could have also simply mutated (without any input of human genome from RNA transfer) due to alpha emitting nanoparticles.

Conclusion

The linear no threshold model for alpha emitters is entirely confirmed. The same mechanism explains obviously the apparition of competitive mutations, that can thrive through natural selection, yet it is for the first time shown that the same mechanism that is the main responsible for evolutionary processes in genetics is the main responsible for hereditary diseases, cancers, birth defects. The increase in the use of depleted uranium in conflicts closer to the European continent, as well as the need to extract oil from more difficult-to-tap pockets needing more shaped charges due to resource depletion, and the increase of use of phosphated fertilizers, the increase in meat consumption, industrial activity and road traffic, explains very well many informal reports about a global increase of cancers and other illnesses in the European continent. Harsh measures should be implemented to stop contamination : prohibiting radioactive ammunition and cleaning the already existing contamination, and providing to the public world maps of natural radioactivity as well as clear information on its dangers on the long term. It is absolutely possible to rely on private businesses that have an incentive in providing these services (companies providing water treatment, for instance) and this ought to be much more efficient than relying on bureaucratic work – except for the prohibition of radioactive ammunition, of course, where tribunals should intervene.

To encourage people to drink treated water, to fight radon in dwellings, to discourage human consumption of meats that accumulate intakes of radioactivity because for instance of the water given to animals, to reduce the use of phosphate fertilizers (including for animal feed production) or, more simply, to extract alpha emitters from phosphates, coal, fuels, etc (or replace alpha sources with deuterium in shaped charges), for instance, the author believes (as a PhD student in economics) that market solutions, i.e. private undertakings and liberty of choice are the best way to achieve not only cost-efficient solutions but also social acceptability esp. in regions of high natural radioactivity where it would hurt the sensibility of inhabitants to forbid them for instance from drinking untreated water.

Figure legends :

Figure 1 : WHO DALYs evolution for 2000-2015

Ethics

No study approval was obtained.

Acknowledgements

Thanks must be given to Dr. Samira Alaani for providing relevant information on the health situation in Fallujah General Hospital. The author also wishes to thank Dr Chris Busby for the very interesting input.

515 Data sharing agreement

More data on the massive use of depleted uranium in conventional warheads is available at the following link : <https://depleteduranium.org/2016/06/19/politically-correct-uranium-weapons/>

The ebook which was sent to the European Commission in the letter mentioned in the introduction of the article can be downloaded for free : <https://depleteduranium.org/books>

520 Funding

No funding was obtained for this research.

Competing interest

525 None declared (the author, for instance, has no material link with the radon extraction industry or the water treatment industry which is anyway embryonic, and does not draw any income from his campaigning against depleted uranium weapons).

Patient consent

Not required. No patient and no public involvement, all data was collected anonymously.

Contributing statement

The sole author did all the research and writing work for this article.

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Annex :

Annex 1.

De Moi <pyrophor.asso@gmail.com> ✨

Sujet **Pesticides and autism ? Not really linked. Agent Orange and birth defects ? Not linked at all !** 26/11/2017 08:43

Pour cab-andriukaitis-webpage@ec.europa.eu ✨

Répondre Transférer Archiver Indésirable Supprimer Autres

Dear Commissioner Andriukaitis,

I am glad to come with you with what could be good news for parts of the European chemicals industry. Indeed, while it is sure that a good level of prevention is needed for EU citizens regarding exposure to pesticides, especially in the immediate vicinity of vineyards, apple farms and other agricultural areas, there seems to be no overall direct link between pesticide use and child cancer. In France, child cancer levels are high in *naturally radioactive areas*, because for instance of radon, of uranium in tap water, but low in areas where pesticides are sold in the higher amounts to farmers. There are, of course, accidents for farmers manipulating products, yet on the aggregate level the environmental effect seems low, thanks to the strict EU legislation.

Furthermore, Agent Orange is not linked to the birth defects in Vietnam. Depleted uranium, which was used massively by the US army, is. I make these claims in *Depleted uranium, the invisible genocide and the seeds of terrorism*, book which I enclose as PDF copy. The data on autism I have found is also a bright demonstration that pesticides and agriculture are not linked to it. It increases solely in areas with high natural radioactivity. I believe that studies linking autism to pesticides have totally forgotten the factor of radioactivity variations. Autism has skyrocketed in Fallujah after the US bombings in 2003 2004.

In all cases the mutagenic effect of alpha-emitting nanoparticles inside the body is on cause. The pattern is mostly internal contamination by uranium, radon or another alpha emitter, on the form of atoms of radon, or very small nanoparticles of uranium / thorium oxyde (and their decay products) in tap water. These atoms or nanoparticles can reach the blood, nerves, lymph, and from there land into ovaries / testicles where alpha "shots" damage gametes. For all of the above, see PDF copy of my book.

I have made a quick list of alpha emitters sources in the environment, at the end of the book. By "fuel" I also mean natural gas (see subchapter on oil drilling and fracking). Most NORMs are not naturally occurring but the product of shaped charge technology (neutron sources used for starting them up). It is possible to use deuterium as a neutron source instead of alpha emitters. But many other measures should be taken regarding uranium & its decay products as well as thorium & its decay products in tap water, building concrete, phosphated fertilizers, coal ash and fuels. And let's not forget Rn220 as well as U235 and its decay products, which are also naturally present.

Best regards,

Florent Pirot

Illustration 2: Letter to the European Commission dated 26/11/2017



EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY
Food and feed safety, innovation
Pesticides and biocides

Brussels,
SANTE/E4/WR/gb(2017)49099

Dear Mr Pirot,

Subject: Your email dated 26 November 2017 "Pesticides and autism?"

I thank you for your mail addressed to Commissioner Andriukaitis, who asked me to reply on his behalf as my unit is responsible for the legislation concerning pesticides and for providing your publication concerning depleted uranium and its impacts on human health.

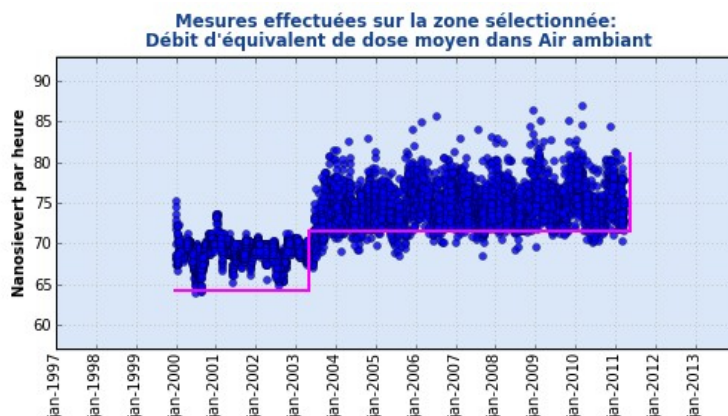
It is with a lot of interest that I took note of your findings and I will take the freedom to refer to them in further discussions on this topic with other interested parties.

Yours sincerely,

Klaus Berend
Head of Unit

Illustration 3: 2. Reply on 5/01/2018

665 **Annex 2.**



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Illustration 4: IRSN chart for gamma dose levels outdoor

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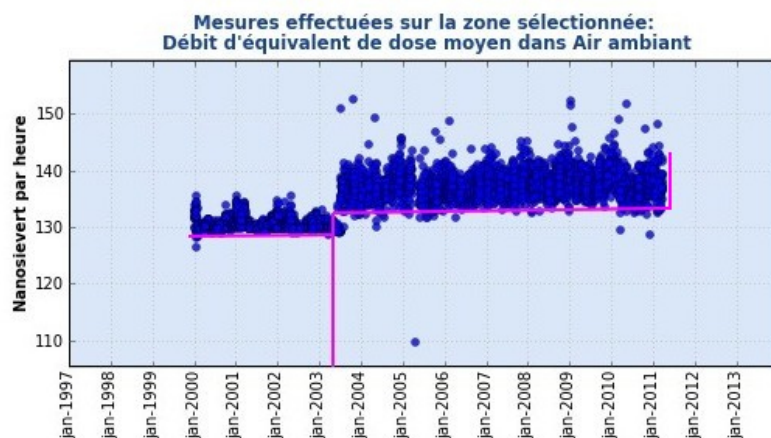
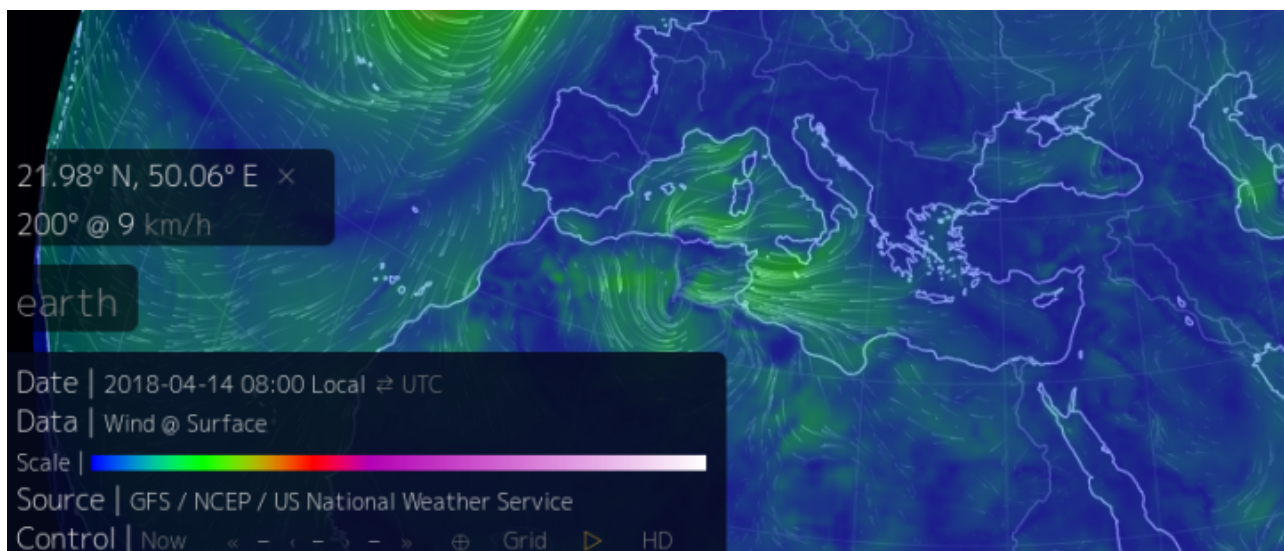


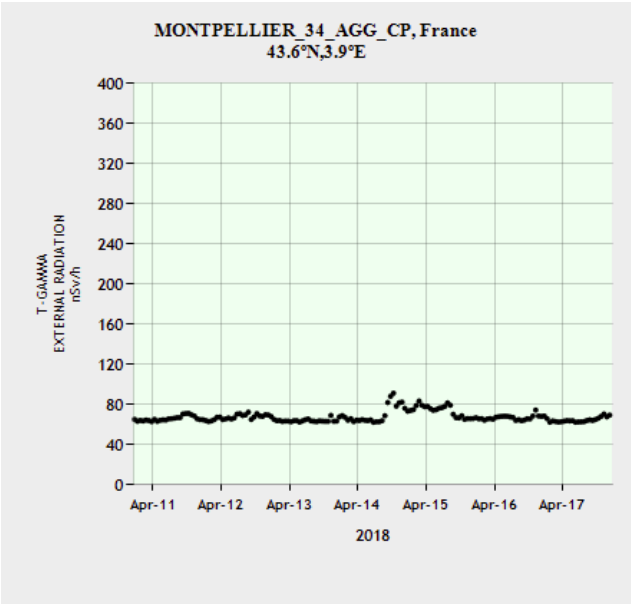
Illustration 5: IRSN chart for gamma dose levels outdoor for Perpignan (southern France)

685 It is also possible to track quite well the cloud of depleted uranium dust from the April 14 2018 (very early in the morning) strikes in Syria through EURDEP data : the winds at the time of the impact were powerfully blowing through the Mediterranean ;



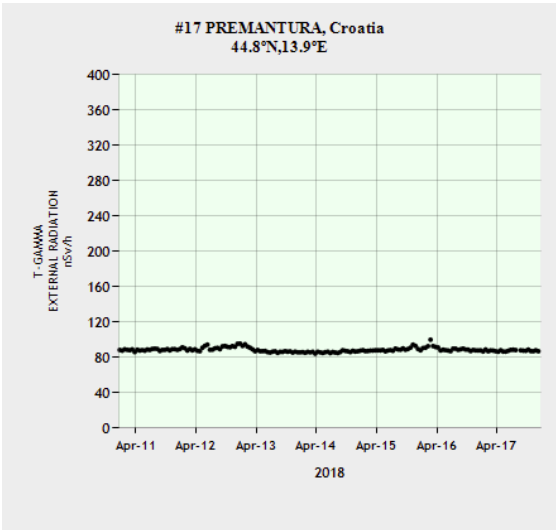
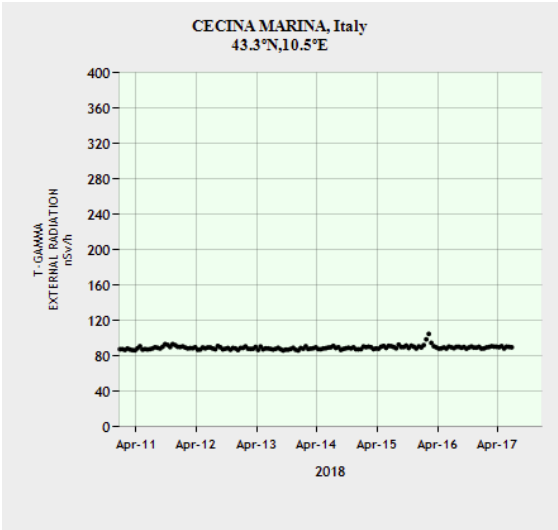
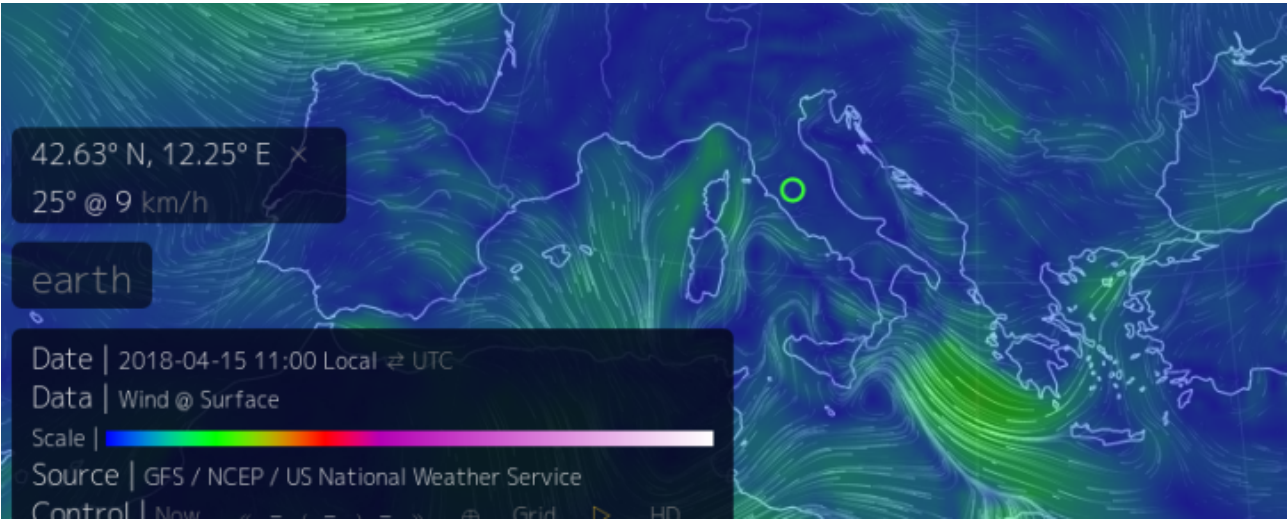
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We find a first « spike », the most important, in Montpellier a few hours after the strike, which is conclusive with the winds going fast to the West on the night of the strike in Syria

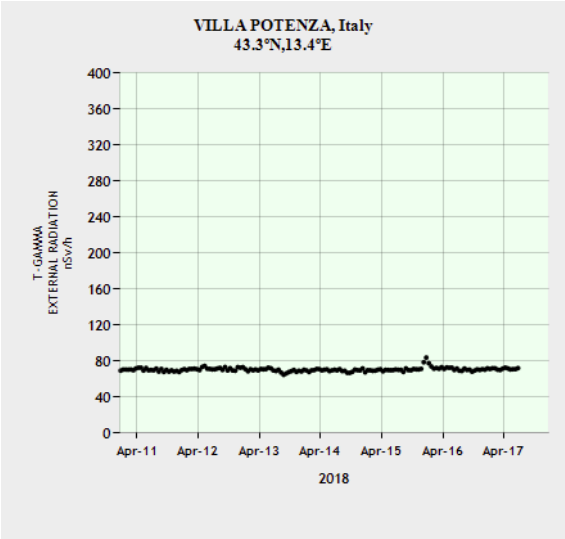


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Then the winds change direction more to the East and the South ; hence some of the DU dust is pushed more to the East, flies above Corsica, Sardinia and then back to the North toward the cursor



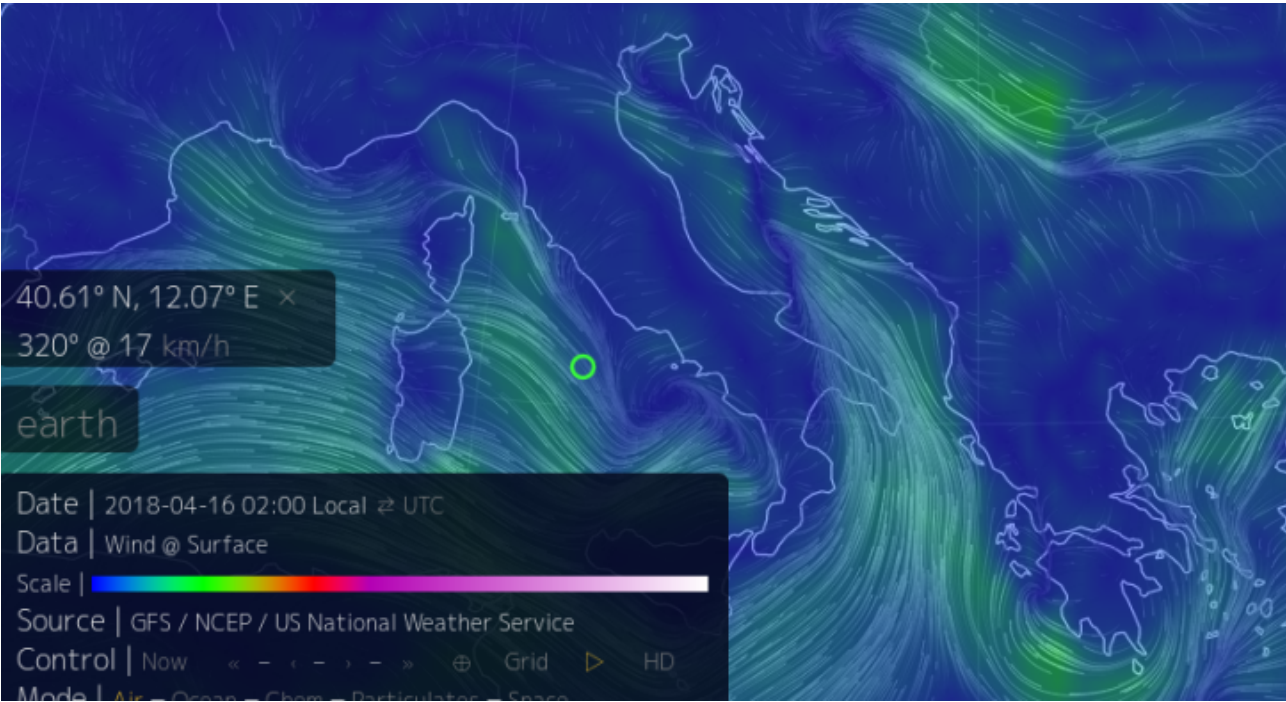
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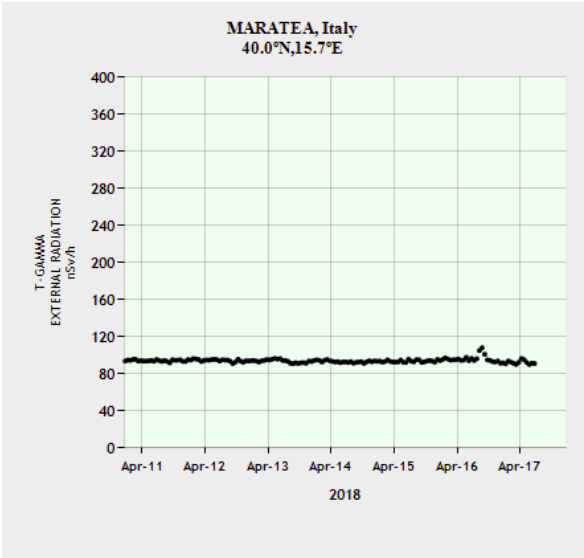
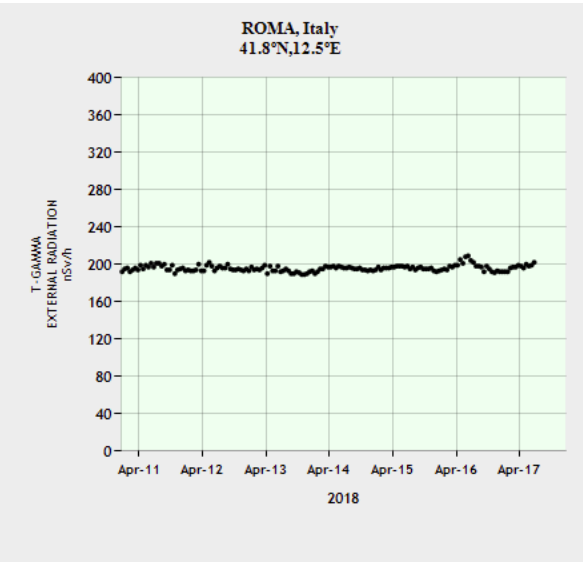
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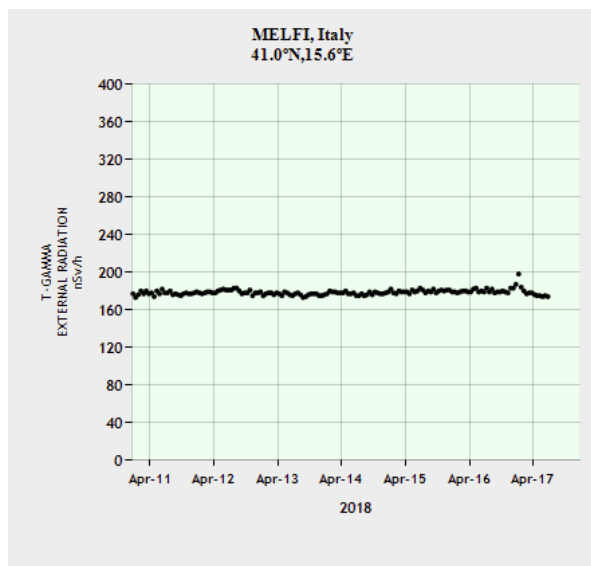
We see it moving slowly progressively towards the South East as the winds have totally changed direction and are aiming to the South East



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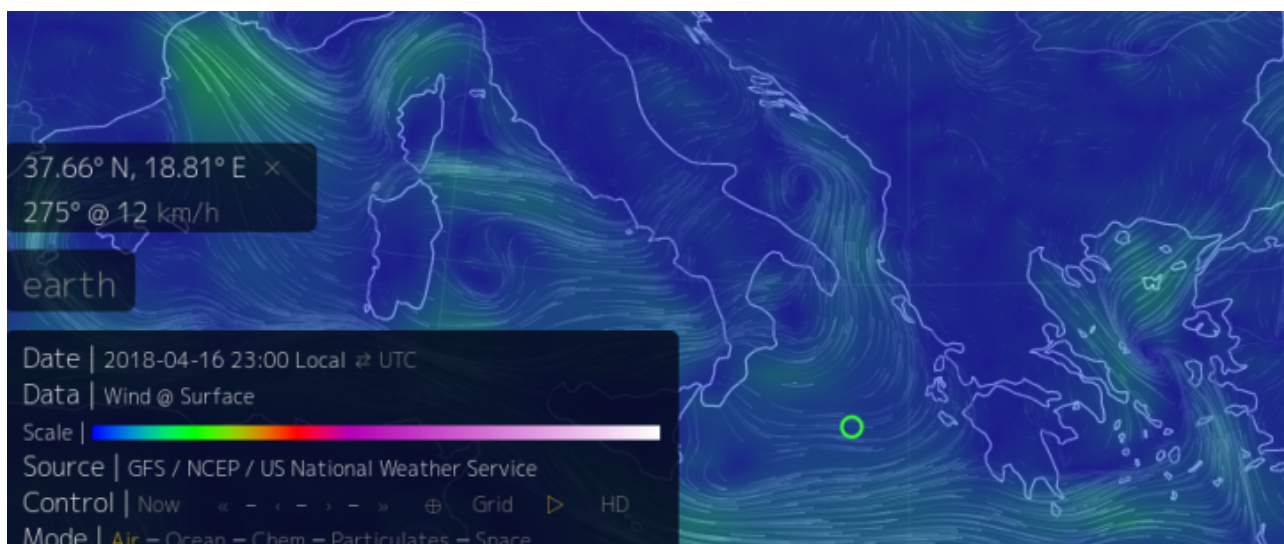


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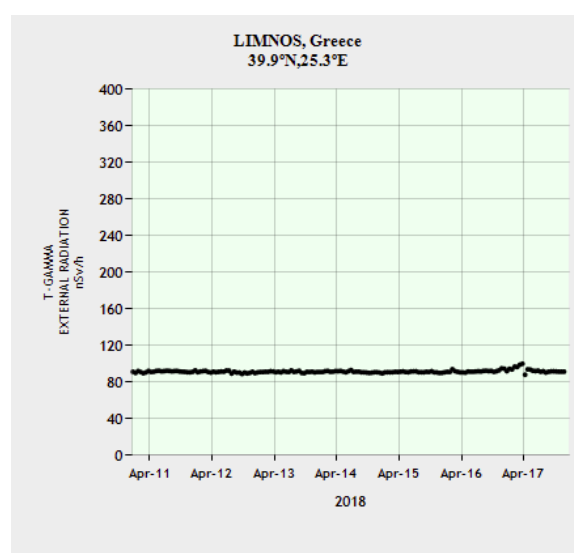
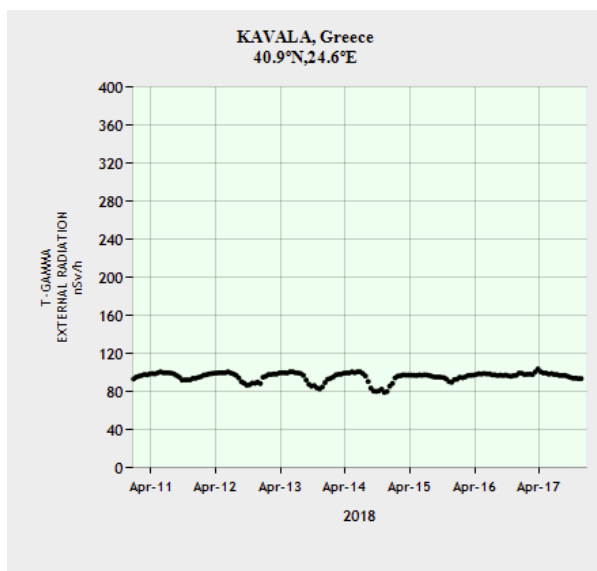


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745 And while winds keep flowing to the East we find smaller peaks in Greece (as the cloud has progressively lost of its heavy DU dust content)



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All the beacons that have been selected are in coastal areas more exposed to maritime winds.

The resource used for the gamma dose charts is

<http://eurdepweb.jrc.ec.europa.eu/EurdepMap/Default.aspx> and for the winds

<http://earth.nullschool.net/>.

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