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Chemicals in Arctic

Why are they found in this region?

The Arctic region is composed in large part by several seas and by the Arctic Ocean, and also includes many islands and archipelagos. On these lands, the plant cover is rather rare there and human habitation is not very significant; comprising a few villages and research stations. However, we find more and more polluting substances over this vast territory where climatic conditions are known to be rough. So, one might ask why we find so many chemicals in Arctic while few industries are established there (for example, in North Siberia or in Greenland with mining, gas and oil extraction).

Let's project ourselves several hundred kilometers south of this territory surrounding the terrestrial North Pole. In these latitudes, we find many highly industrialized countries including the United States of America (USA). For manufacturing and other needs of the population, many industries settled there. Unfortunately, these industries emit many chemical pollutants which

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are released into the air as well as into waterways and oceans of the planet. As proof, per- and polyfluoroalkyl substances (PFAS), and newer PFAS have been recently found for the first time in Arctic seawater.

When emitted into the atmosphere, these chemical molecules are mixed with the surrounding humidity and are carried in the atmosphere. The dynamics of the continuous movement of the air in atmospheric currents make pollutants disperse quickly everywhere on Earth. A process called the grasshopper effect, or the global distillation, causes certain chemicals to be transported from warmer to colder regions of the Earth, and to be deposited particularly at the Poles and the mountains tops. It's therefore difficult to find an atmospheric zone that is not polluted by human activities.

When these pollutants arrive in the Arctic, the cold temperatures (a record of minus 94 °F has been detected) cause these substances to condense and accumulate in the ice of this region. The frozen ocean and cold lands of this territory are therefore heavily contaminated by atmospheric pollutants and the present warming due to global warming does not help to solve the situation. The loss of all this ice (at sea with the shrinking of the polar ice pack or on land with the melting of glaciers) causes recirculation of polluting chemicals and an augmentation of the initial problem. Also, unusual high temperatures and dry earths of these Nordic regions (due to the thawing of permafrost) bring ideal conditions for fires, thus increasing the carbon emissions in the surrounding atmosphere.

Certainly, there are international agreements to counter this pollution. Among these is the Montreal Protocol, signed in 1987, whose objective was to reduce and eliminate the substances responsible for the destruction of the



ozone layer, which protects us against the ultraviolet rays of the sun. The result has been rather mixed. Experts have detected an increase in the rate of certain chlorofluorocarbons (which damage the ozone layer) in the atmosphere for some years. Another treaty, on reduction of greenhouse gases, was the subject of negotiations in Paris recently. Unfortunately, it was not signed by several large emitters of these gases (such as the USA), which means that no legislation could be passed, and therefore, emissions continue to rise.

In closing, if you want to contribute to the decrease of this pollution as a citizen, there are several ways to do so, including the application of the rule of 3RE (reduce, recycle, reuse, enhance). These simple gestures will ensure that in the long term, people will make responsible choices, and to survive, polluting industries will have to significantly reduce or eliminate their polluting emissions.

Online links (in French and in English):

- Intense Arctic wildfires set a pollution record, by Somini Sengupta, The New York times, climate section, article wrote on July 7th 2020, https://www.nytimes.com/2020/07/07/climate/climate-change-arctic-fires.html?fbclid=IwAR1ijjTTIpMUFEJBDTIDiGrA0SuqwDHXU-NVw_pYKhvEoMLTQ6fhKzhSDsc
- Quel est l'endroit sur Terre où l'air est le plus pur? by Christophe Magdaleine, notre-planete.info, article wrote on July 2nd, 2018, <https://www.notre-planete.info/actualites/4690-endroit-air-pur-Terre>
- Newer PFAS compound detected for first time in Arctic seawater, by American chemical society, Phys.org, Science X, article wrote on July 29, 2018, <https://phys.org/news/2020-07-pfas-compound-arctic-seawater.html>



- Chlorofuorocarbures, Wikipedia, the free encyclopedia, last modification made on June 14th 2020, <https://fr.wikipedia.org/wiki/Chlorofluorocarbure>
- Global distillation, Wikipedia, the free encyclopedia, last modification made on July 2nd 2020, https://en.wikipedia.org/wiki/Global_distillation
- Arctique, Wikipedia, the free encyclopedia, last modification made on August 2nd 2020, <https://fr.wikipedia.org/wiki/Arctique>
- Greenland, Wikipedia, the free encyclopedia, last modification made on August 5th 2020, <https://en.wikipedia.org/wiki/Greenland>
- Siberia, Wikipedia, the free encyclopedia, last modification made on August 11th 2020, <https://en.wikipedia.org/wiki/Siberia>