

Short Commentary

Weakened Magnetic Field and the Resurgence of Mosquito-Borne Arboviruses

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Five epidemics of mosquito-borne arboviruses- Zika virus (ZIKV), Dengue virus (DENV), Yellow Fever virus (YFV), West Nile virus (WNV) and Chikungunya virus (CHIKV) have emerged in the Western Hemisphere, particularly in South America since late 2013. The reason we are seeing such a sudden, sharp rise in these mosquito-borne arboviruses is unknown. Although climate change, mass human migrations and poor hygiene are often cited as primary causes for the sudden resurgence, it is likely that a more fundamental cause exists, and its discovery could have a profound effect in determining future public health strategy [1].

In June 2014, after just six months collecting data, ESA's Swarm programme confirmed the general trend of the magnetic field's weakening, with the most dramatic declines over the Western Hemisphere; but in other areas, such as the southern Indian Ocean, the magnetic field had strengthened since January (Figure 1).

New data released by the European Space Agency (ESA) reveals that our geomagnetic field is weakening by around 5% a

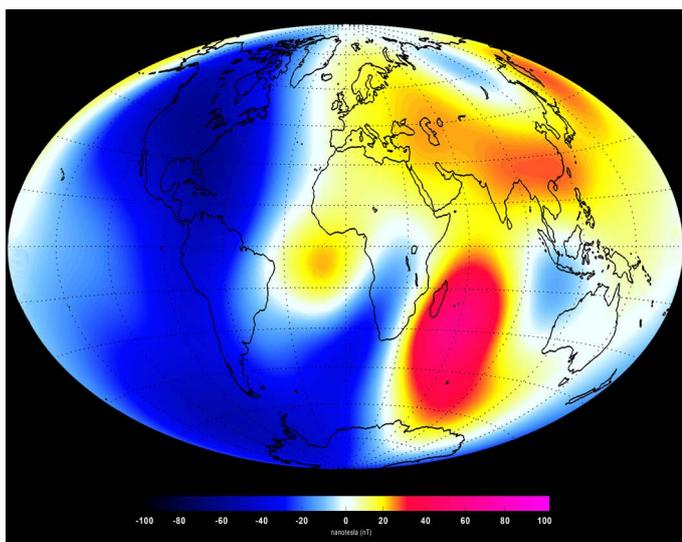


Figure 1: Changes in Earth's magnetic field from January to June 2014 as measured by the Swarm constellation of satellites. Shades of red represent areas of strengthening, while blues show areas of weakening over the 6-month period.

year, which is nearly ten times faster than previous estimates [2]. Furthermore, this effect is not uniform over the Earth; the field is weakening faster in some places than others. For example, the South Atlantic Anomaly (SAA) is a large depression of the Earth's magnetic field characterized by values of geomagnetic field intensity that are around 30% lower than expected for those latitudes. This region covers a large area in the South Atlantic Ocean and South America. According to Swarm satellite monitoring results, Earth's magnetic poles may be getting ready to flip, the field has weakened by about 3.5% at high latitudes over North America, while it has strengthened about 2% over Asia [3]. The region where the field is weakest – the South Atlantic Anomaly – has moved steadily westward and weakened further by about 2% between 1999 and May 2016 [4].

Previous studies have suggested that the mosquito is an insect sensitive to the magnetic field, and the weakening of the magnetic field may have increased the mosquito's reproductive speed and spatial density [5]. The currently emerging arbovirus epidemics in the past four years are mostly transmitted to humans by bites from mosquito vectors. The rapid weakening of Earth's magnetic field in the Western Hemisphere probably speeded up an increase in the population of mosquitoes thus promoting the rapid spread of these mosquito-borne arboviruses.

Thus, we make the bold suggestion that a surveillance of magnetic field may serve as a potential warning of future mosquito-borne arboviruses. Together with other epidemiological data such information might prove to be a useful factor for strategic disease control planning of mosquito-borne arboviruses.

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http://www.esa.int/Our_Activities/Observing_the_Earth/Swarm/Swarm_reveals_Earth_s_changing_magnetism

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Author contributions

These authors contributed equally to this work.

Competing Interests

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