

Using cell phones as space weather vanes

May 14 2021, by Larry O'hanlon



Magnetometers have turned cell phones into compasses, which are sensitive to geomagnetic storms. Credit: Larry O'Hanlon

Your smartphone may be able to sense space weather and even get a little disoriented by it, according to researchers, who tested how

geomagnetic storms affect the magnetic sensors in cell phones. The new research suggests that apps being developed to use cell phone magnetometers to pinpoint locations could be susceptible to space weather errors. On the other hand, millions of phones sensing changes in Earth's magnetic field could potentially create a vast observatory to help scientists understand these geomagnetic storms.

Cell phone magnetometer chips are being explored as a backup for GPS, which uses satellite signals to triangulate location and thus is often inaccurate or unavailable in places where signals can't penetrate, such as inside large buildings or underground.

"Smartphone magnetometers are being commercially explored for applications as diverse as locating customers in shopping malls for targeted advertising, to precision needle-guided surgery," wrote Sten Odenwald, of NASA's Space Science Education Consortium at Goddard Space Flight Center in Maryland, in Space Weather.

But there's a catch. Geomagnetic storms can buffet and temporarily alter the shape of Earth's [magnetic field](#). So, theoretically, they could degrade the accuracy of magnetometer chips. This degradation could be a problem if your target advertising hits in the wrong place or you're performing needle-guided surgery and miss the mark.

To find out whether phones are susceptible to the vagaries of [space weather](#), Odenwald tested the iPhone 6S, Samsung Galaxy Note 5, Samsung Galaxy S8, and Samsung Galaxy S9 in simulated [geomagnetic storms](#). Simulated storms were needed, Odenwald said, because his research took place during the recent 11-year solar minimum, when the Sun could not be counted on to provide very much in the way of sunspots and coronal mass ejections that can create significant geomagnetic storms on Earth.

In lieu of the Sun's cooperation, Odenwald used magnetic data from the powerful Halloween storms of 2003 and essentially ran the storms on the phones to see whether their magnetic signals would rise above the level of background noise. He also simulated the storms more directly by putting the phones into controlled magnetic fields.

Odenwald found that smartphone magnetometers are capable of detecting the very small magnetic field changes that accompany the strongest geomagnetic storms, especially at higher latitudes in North America, where magnetic field lines converge and dip earthward as they near the magnetic north pole. Under certain circumstances, he concluded, geomagnetic storms could be a significant source of error in compass and other positioning apps. But he also noted that the ubiquity of smartphones and their magnetometers presents an unprecedented opportunity for studying global changes in the geomagnetic field during significant solar storm events.

More information: S. F. Odenwald. Can Smartphones Detect Geomagnetic Storms?, *Space Weather* (2021). [DOI: 10.1029/2020SW002669](https://doi.org/10.1029/2020SW002669)

Provided by Eos

Citation: Using cell phones as space weather vanes (2021, May 14) retrieved 27 April 2024 from <https://phys.org/news/2021-05-cell-space-weather-vanes.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
