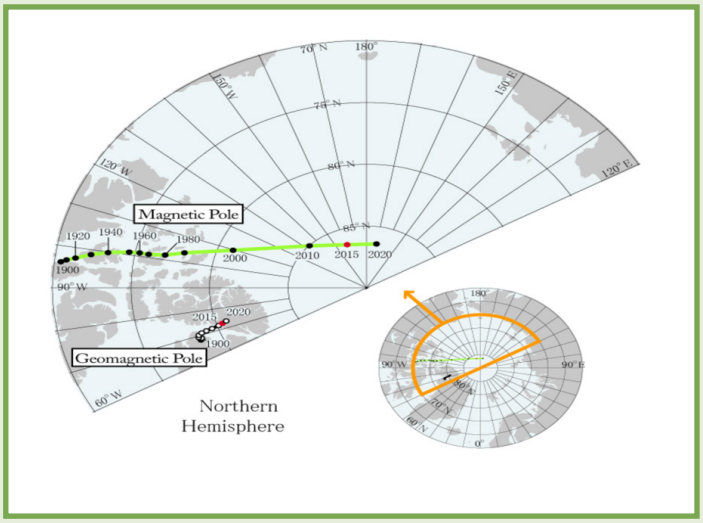
THE
ATMOSPHERICRESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

Which Way Is NORTH?

By Mark D. Schneider

This may come as a surprise, but the question at the top of the page is an intriguing one. The Earth's magnetic poles aren't fixed; they are continually migrating. Inside Earth's liquid iron outer core there are erratic shifts taking place that influence the magnetic field. Looking at the map, one can see the migration of the magnetic north pole beginning around 1900 from northern Canada, across the Arctic Ocean, and toward Siberia where its currently located near the International Date Line. These small changes add up to "corrections" every five years that require an update to the World Magnetic Model (WMM). What's unusual though, is that in recent years the pole's movement has accelerated and will require an earlier update after only four years. According to Space.com, this acceleration began in the mid-1990s and the distance that our magnetic north pole shifts has increased from approximately nine miles to 34 miles each year! The latest five year update was scheduled for December 31, 2019, however, an earlier update was planned for January 30 (when this article was written) to correct for this unforeseen "jump" in the WMM's position.

The modern day WMM is calculated using a global network of satellites and surface observatories. This advanced network can calculate the WMM's position much more accurately than ever before, leading to the possibility of a more frequent update schedule. We rely on the WMM more than you might think. NATO and the US Department of Defense use the WMM for strategic positioning and operations, and it provides our cell phones and navigation devices with an accurate setting for magnetic north. Smartphones use magnetometers



Credit: World Data Center for Geomagnetism/Kyoto University.

along with accelerometers and GPS to point you in the right direction. A small magnetometer computer chip inside your phone is able to measure the Earth's magnetic field and communicate that information by varying its electrical voltage output. Various smartphone Apps such as Compass, Quick Tools, etc. are then able to read this data and display it for use.

When we use compasses to navigate, adjustments must be made for declination. When travelling from the western border of our state eastward to the Red River Valley, one must add close to ten degrees to their compass to adjust for true north (further west) and approximately five degrees further east. Aviators adjust the heading indicators in their airplanes to match a magnetic compass and then a "true heading" is calculated by adding or subtracting for declination between magnetic north and true north.

Earth's magnetic core appears to be weakening and there is a possibility that the Earth's magnetic poles could "switch" or trade places within a few thousand years. The main impact would be to weaken the shielding against incoming solar radiation, which would degrade use of weather and communications satellites and make magnetic compasses less accurate. The last switch in Earth's magnetic poles occurred around 780,000 years ago, so in our lifetimes, we probably won't notice much more than a periodic update to one of our cell phone Apps.

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