

## Swarm's precise sense of magnetism

## May 8 2014



Data from Swarm were used to generate a model of the magnetic field from Earth's lithosphere. The image compares the Swarm model with the Chaos-4 model and shows good agreement, especially considering Swarm is still only in the calibration and validation phase of the mission. The colours in the image show differences between the two models. Credit: ESA/DTU Space–N. Olsen

(Phys.org) —Although they were launched only five months ago, ESA's trio of Swarm satellites are already delivering results with a precision that took earlier missions 10 years to achieve.

Engineers have spent the last five months commissioning the identical



satellites and carefully guiding them into their orbits to provide the crucial measurements that will unravel the mysteries of Earth's magnetic field.

Swarm has a challenging task ahead.

Together, the satellites will measure and untangle the different magnetic readings that stem from Earth's core, mantle, crust, oceans, ionosphere and magnetosphere.

In addition, information will also be provided to calculate the <u>electric</u> <u>field</u> near each <u>satellite</u> – an important counterpart to the magnetic field for studying the upper atmosphere.

Two satellites are now orbiting almost side by side and have started their operational life at 462 km altitude. The third is higher, at 510 km.

The readings made at different locations will be used to distinguish between the changes in the magnetic field caused by the Sun's activity and those signals that originate from inside Earth.

Swarm is now in its fine-tuning phase but it has already produced enough information to build models of the magnetic field for comparison with existing models.

This proves that only a few months of Swarm data agree very well with a decade or more of predecessor missions.

For example, the image above shows the differences between Swarm's version of the magnetic field from Earth's crust compared to the 'Chaos-4' model. There are very few differences, demonstrating that the mission is working well.



ESA's mission manager, Rune Floberghagen, said, "Although it has certainly been a big job getting the three satellites ready for operations, we are all very happy with how well the mission is doing so soon after launch.

"Scientists will start to have access to the mission's magnetic field data in a couple of weeks."



Earth's magnetic field: The magnetic field and electric currents near Earth generate complex forces that have immeasurable impact on our everyday lives. Although we know that the magnetic field originates from several sources, exactly how it is generated and why it changes is not yet fully understood. ESA's Swarm mission will help untangle the complexities of the field. Credit:



ESA/ATG Medialab

Over the coming years, this innovative mission will provide new insight into many natural processes, from those occurring deep inside the planet to weather in space caused by solar activity.

In turn, this information will yield a better understanding of why the <u>magnetic field</u> is weakening.

The first results and status of the <u>mission</u> will be presented at a Swarm science <u>meeting</u> on 19–20 June in Denmark.

Provided by European Space Agency

Citation: Swarm's precise sense of magnetism (2014, May 8) retrieved 27 April 2024 from <u>https://phys.org/news/2014-05-swarm-precise-magnetism.html</u>

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.