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South Atlantic Anomaly evolution by means of Swarm data

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The study of the South Atlantic Anomaly (SAA) is an important challenge nowadays not only for the geomagnetic and paleomagnetic community, but also for other areas focused on the Earth Observation. This large magnetic anomaly is characterized by values of geomagnetic field intensity around 30% lower than expected for those latitudes and covers a large area in the South Atlantic Ocean between Southwest Brazil and South Africa. This great depression of the geomagnetic field strength at the Earth's surface has an internal deep origin: it is caused by a prominent patch of reversed polarity flux in the outer core. Since the Earth's magnetic field has an important protective role for the all geosphere because it deflects a large part of the solar radiation that would otherwise reach the Earth's surface, a large increase of the SAA could have dramatic consequences for human health and technologies. In the last three decades, an almost constant monitoring of the SAA has been carried out using satellite data showing a clear picture of the behaviour and evolution of the SAA, which area is growing alarmingly during the most recent years at the Earth's surface and at the core mantle boundary. In this context, the ESA Swarm mission (constituted by a constellation of three satellites in near-polar low orbits at two different altitudes) is providing detailed measurements of the intensity and directional elements of the geomagnetic field with high-precision and resolution never reached in the former space missions. This work aims to analyse in detail in space and time the SAA from the Earth's surface up to the satellite altitude. In order to carry out this study, comprehensive geomagnetic models at regional and global scale will be performed using the dataset provided by the Swarm satellites and all the available ground data. This kind of study is crucial to understand the evolution of the Earth's magnetic field in this area, and to possibly predict its future behaviour.