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Swarm Expert Support Laboratories

# Swarm equatorial electric field (EEF) L2 product, an introduction

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The day-time eastward equatorial electric field (EEF) in the ionospheric E-region plays a crucial role in equatorial ionospheric dynamics. It is responsible for driving the equatorial electrojet (EEJ) current system, equatorial vertical ion drifts, and the equatorial ionization anomaly (EIA). Due to its importance, there is much interest in accurately measuring and modeling the EEF for both climatological and near real-time studies.

The Swarm satellites make it possible to derive estimates of this equatorial electric field from measurements of the geomagnetic field. Indeed, due to the near-polar orbits of each satellite, the on-board magnetometers record a full profile in latitude of the ionospheric current signatures at satellite altitude. These latitudinal magnetic profiles can be modeled using a first principles approach with empirical climatological inputs specifying the state of the ionosphere. Since the EEF is the primary driver of the low-latitude ionospheric current system, the observed magnetic measurements can then be inverted for the EEF.

The determination of the EEF using this principle has been implemented as a chain to routinely provide such estimates as Swarm Level 2 products

Details of the algorithm for recovering the EEF from Swarm geomagnetic field measurements are provided in [AD-1].

## Applicable Documents

- [AD-1] Alken, P., Maus, S., Vigneron, P., Sirol, O., Hulot, G., Swarm SCARF Equatorial Electric Field Inversion Chain, *Earth Planets Space*, 65, 1309-1317, 2013, doi:10.5047/eps.2013.09.008  
<http://www.terrapub.co.jp/journals/EPS/abstract/6511/65111309.html>