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DIFI-4 and beyond: modeling the ionospheric magnetic field from an optimal Swarm constellation

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The Dedicated Ionospheric Field Inversion (DIFI) algorithm provides a time-varying, spherical harmonic model of the ionospheric field at mid- and low-latitudes (Sq and equatorial electrojet fields). The model is derived from at least one year of Swarm L1b data and observatory data. It is valid at ground and satellite altitude. It includes daily, seasonal and solar cycle variabilities, and a description of the secondary (induced) field originating in the weakly conducting mantle. We will report on a new model, DIFI-4, based on four years of Swarm data and developed as part of the ongoing Swarm level 2 project. This model is expected to be of higher quality than the previous one (DIFI-3, released last year), because of the better local time coverage of the Swarm constellation. The difference between the local time ascending nodes (LTAN) of the lower pair (Swarm A and C) and the upper satellite (Swarm B) has been increasing by 1.55 hour/year since launch, and is expected to reach 6 hours in 2018. We will further exploit this optimal constellation configuration to investigate the year-to-year variability of the ionospheric field. Because of the geomagnetic secular variation, which makes features such as the dip equator and the South Atlantic Anomaly slowly move and change in shape, the Sq and equatorial electrojet current systems are indeed expected to slowly evolve over a few years.