for consistency early in the mission and, although the separation so far is quite small, we look for early signs of local-time dependent differences in the modelled field.

Presenting Author: He M.

Abstract Title: Comparison of Gradient and FAC Estimation Techniques for Swarm

Abstract Topic: First science results, Presentation of the outcome of the Cal/Val activities, Presentation of user projects and their initial results

The constellation of Swarm satellites allows estimating spatial gradients and field-aligned currents (FACs) using differences of measurements at two or, occasionally, even three points in space. This presentation compares a recently developed least squares (LS) gradient estimator with existing finite difference (FD) schemes for quasi-static structures. The planar gradient is constructed from observations along the trajectories of the pair of Swarm spacecraft on close orbits. To facilitate error analyses and consistency checks, and to show how arbitrary combinations of planar gradient estimators and constraint equations for the out-of-plane derivative can be formed, the two-spacecraft LS and FD techniques and a three-spacecraft LS scheme are integrated in a common framework. We study the accuracy of LS and FD planar gradient estimators, discuss the implications of imperfect constraint equations for error propagation, and address the effects of sub-scale structures. The two-spacecraft LS scheme and three different types of constraints are applied to Cluster FGM observations of a planar and essentially force-free plasma structure in the interplanetary magnetic field.

Presenting Author: Heilig B.

Abstract Title: Monitoring the plasmapause by SWARM

Abstract Topic: Plans for exploitation projects

Recently a new method for monitoring the plasmapause location in the equatorial plane was introduced based on magnetic field observations made by the CHAMP satellite in the topside ionosphere (Heilig and Lühr, 2013). Related signals are medium-scale field-aligned currents (MSFAC) (some 10km scale size). The method is planned to be applied to the SWARM constellation. The signals related to the

plasmapause on the dayside are often appear mixed with other phenomena (e.g. ULF waves). Now making use of the special constellation of SWARM we will be able to discriminate temporal and spatial variations and detect the dayside plasmapause more clearly.

We plan to build an empirical plasmapause model, similar to the CHAMP-based model (Heilig and Lühr, 2013). The model will be validated by means of ground (EMMA magnetometer network) plasmapause observations, as well as by the in-situ plasma observations of the Van Allen Probes.

Heilig, B., and H. Lühr (2013) New plasmapause model derived from CHAMP field-aligned current signatures, Ann. Geophys., 31, 529-539, doi:10.5194/angeo-31-529-2013

Presenting Author: Heilig B.

Abstract Title: ULF waves in the topside ionosphere

Abstract Topic: First science results

Different types of ULF waves (dayside compressional Pc3s, FLRs, night side Pi2s, etc) have been successfully identified in the topside ionosphere. ULF observations in this region can help us to understand the wave structure in the magnetosphere, wave propagation, and also the effects of the ionosphere (transmission, reflection, mode conversion).

Because of the fast orbiting of the LEO satellites Fourier analysis is not applicable, special techniques are needed to resolve ULF signals. We use the wavelet analysis for spectral analysis. ULF waves are interpreted in a mean field aligned coordinate system. LEO observations are compared to ground observations along the EMMA magnetometer chain.

The first results clearly show that the quality of SWARM magnetic observations is high enough for successful ULF wave detection. We present the first examples of ULF events (dayside compressional Pc3s, night side Pi2s) detected by the SWARM trio. Our preliminary results confirm that the coherence length of compressional Pc3s is several thousands of kms on the dayside. We also demonstrate how the mission can contribute to our growing knowledge on ULF wave phenomena.