Determining Optimal Setting for AMIENext Procedure Using AMPERE/Iridium Data

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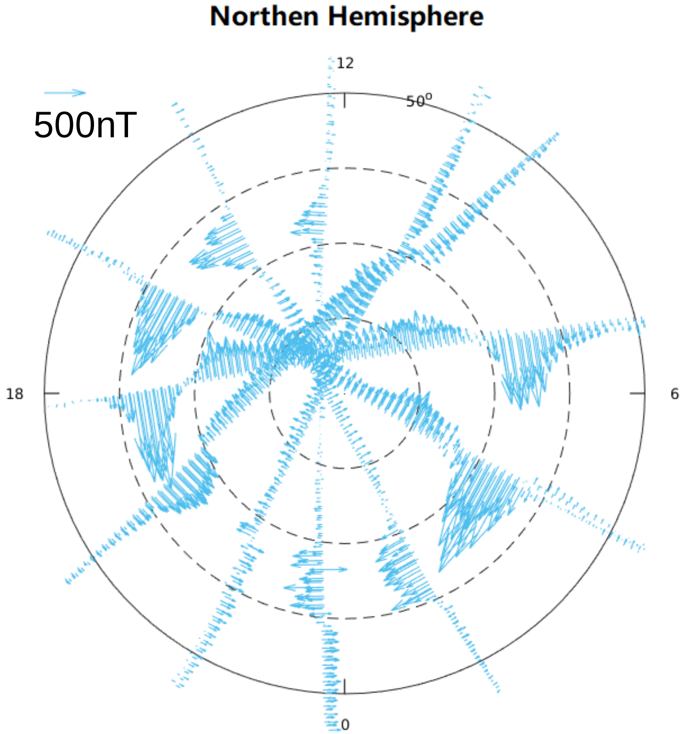
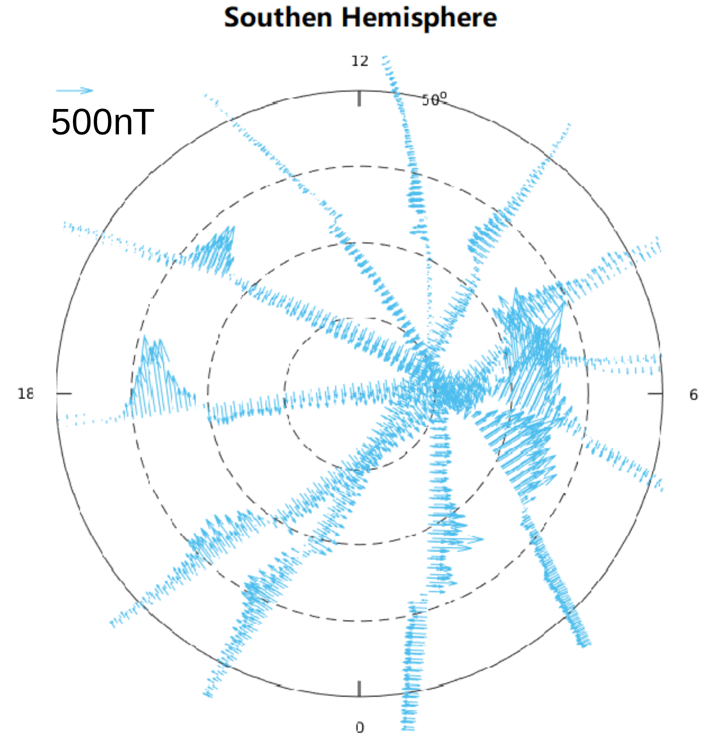
Data – Iridium Magnetic Perturbation

Active **M**agnetosphere and **P**lanetary **E**lectrodynamics **R**esponse **E**xperiment (AMPERE) program provides **Iridium perturbation data** pre-processed for scientific research with a 20-sec cadence in normal operation, 2-sec in high resolution mode.

Only **cross-track component** are extracted in our project because of a higher uncertainty of along-track data due to attitude control in aging spacecraft.

36-min window around 11:40 UT, May 20th, 2010 with 20-sec cadence

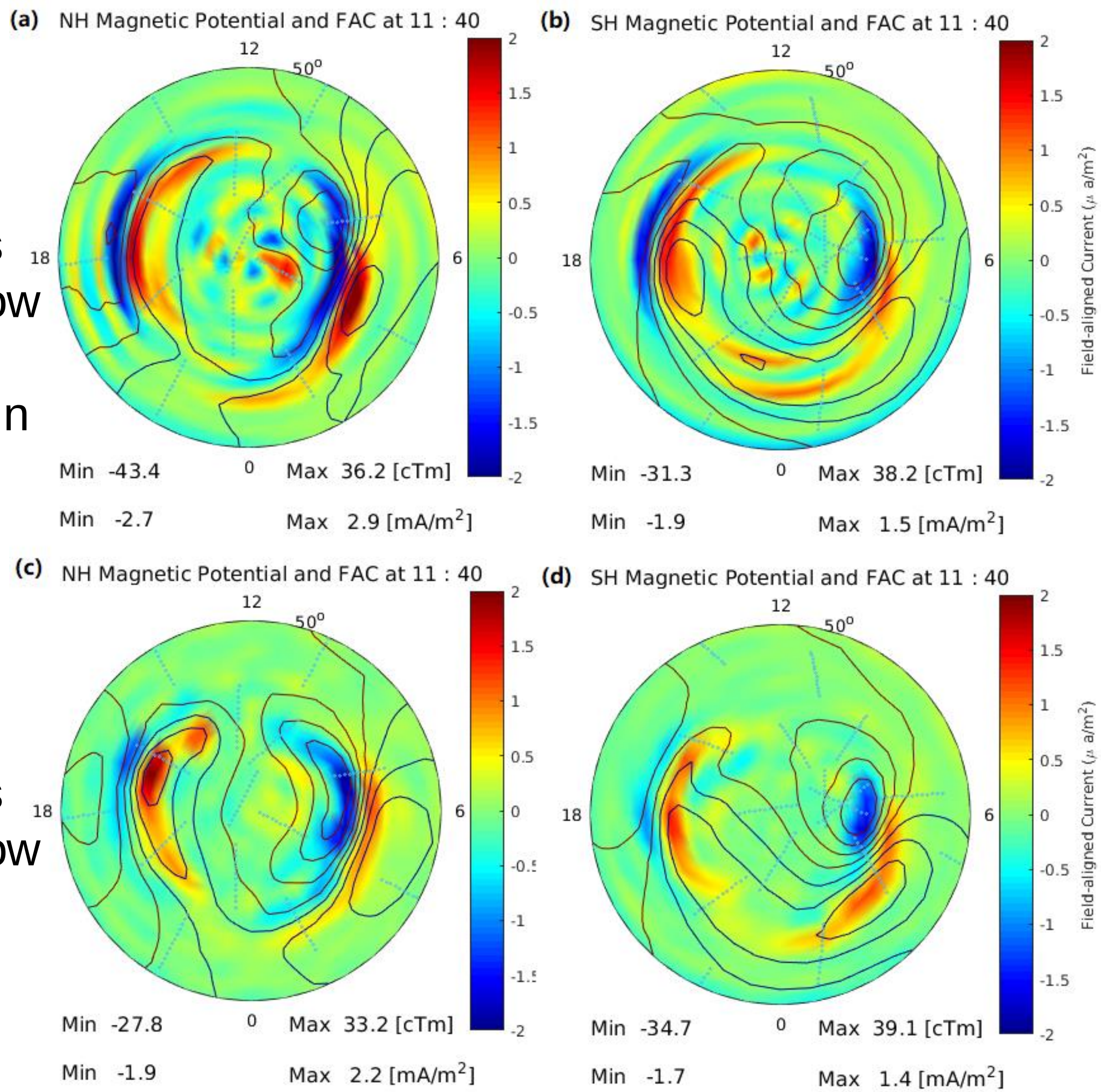




Impacts of the Background Model and Background Error Covariance on AMIENext Analyses

mean and EOFs window = 36-min

mean and EOFs window = one day



Optimal interpolation (OI) analyses of magnetic potential and FAC are generated from the new AMIENext procedure (Matsuo, 2015) by assimilating observations over 4 minutes every 2 minutes.

AMIENext magnetic potential pattern in line contours and FAC pattern in color contours for both hemispheres at 11:40 UT on May 29th, 2010

Background Model and Error Covariance

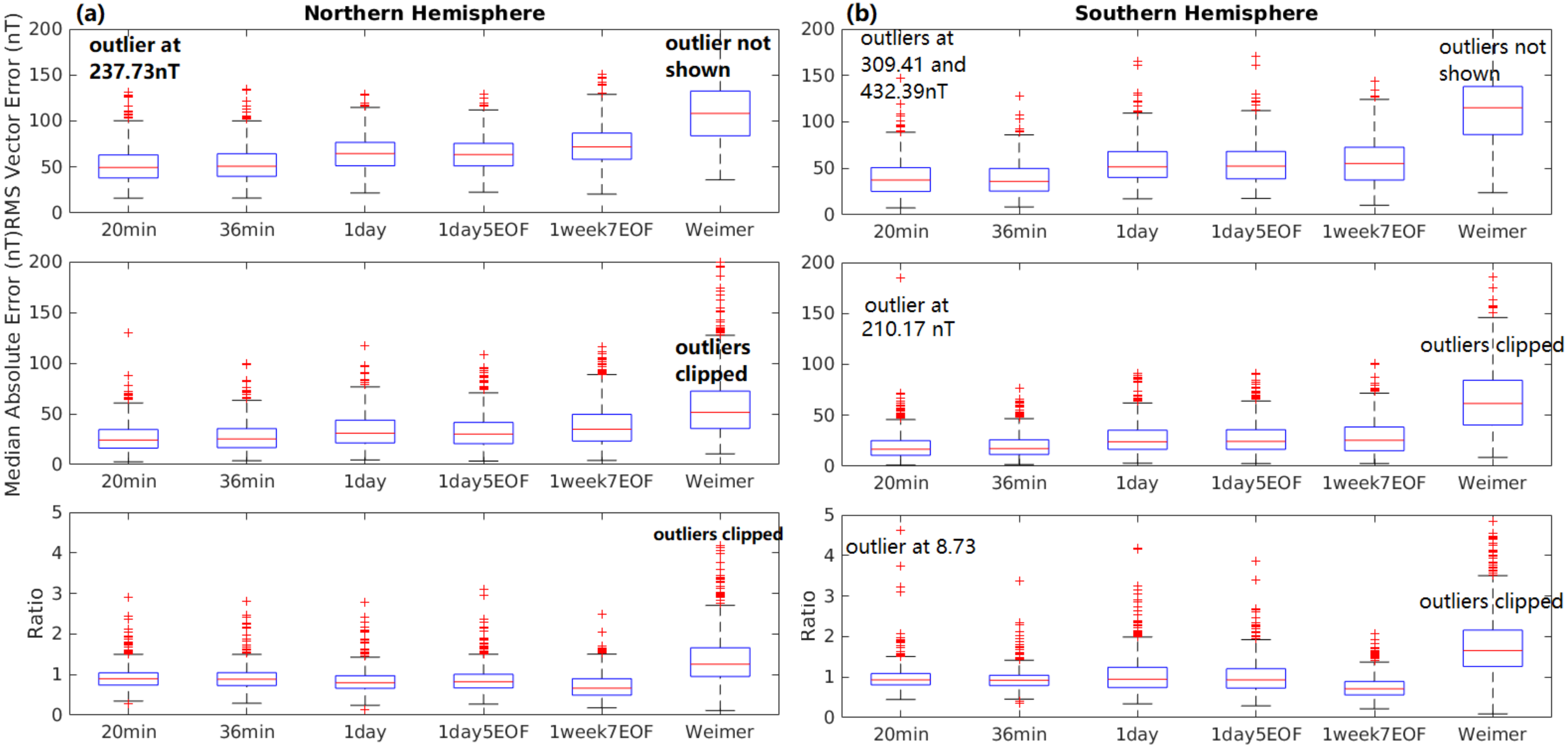
assimilation procedure settings including

- **Use of sample mean vs. empirical model as background**
- **Use of different windows for estimation of mean and Empirical Orthogonal Functions (EOFs)**
- **Number of EOFs used to parameterize the background covariance**

	Background Model	Background Covariance
20min	+/- 10-min data mean	+/ 10-min data 3 EOFs
36min	+/- 18-min data mean	+/- 18-min data 3 EOFs
1day	One day data mean	One day data 3 EOFs
1day5EOF	One day data mean	One day data 5 EOFs
1week7EOF	One week data mean	One week data 7 EOFs
Weimer	Weimer (2005) model	+/- 18-min data 3 EOFs

Results Good Model-Validation Agreement

- Iridium Observation Cross Validation



- DMSP Comparison

	Mean RMSE (nT)	Median RMSE (nT)
NH	147.65	97.02
SH	128.21	76.70

comparable to the agreement found between Iridium and DMSP observations during the same time period discussed in Knipp et al. (2014)

Future work

- We will look into the influence of constructing the background error covariance **B** in different ways in terms of the time-dependent coefficients $\alpha^{(i)}$.

$$\mathbf{B} = \mathbf{\Psi}\,\mathrm{cov}(\boldsymbol{\alpha}, \boldsymbol{\alpha}^T)\mathbf{\Psi}^T$$

- Optimal settings will be determined for various time scales and characteristics of different solar wind drivers, in particular (Richardson and Cane, 2012)
  * corotating high-speed stream
  * slow flow
  * transient flows originating with CMEs.

Poster: IT poster session, Wednesday, DATA - 05

References And Acknowledgements

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