

# Data Assimilation before 'AMIE'

Early 1980's

- KRM method
  - Ingest ground magnetometer
    - Horizontal component only

Mid 1980's

- The 'method' or 'algorithm' or 'Art's data assimilation scheme'
  - Ingest ground magnetometer
  - Ingest ISR electric field data
  - Conductance from gnd mags

Late 1980's 'going to space'

- Richmond and Kamide (1988)
- IEMP
  - Ionospheric Electrodynamics Mapping Procedure (IEMP)
- Gnd mag vertical comp
- Satellite electric field
- Satellite conductance
- Satellite magnetometer

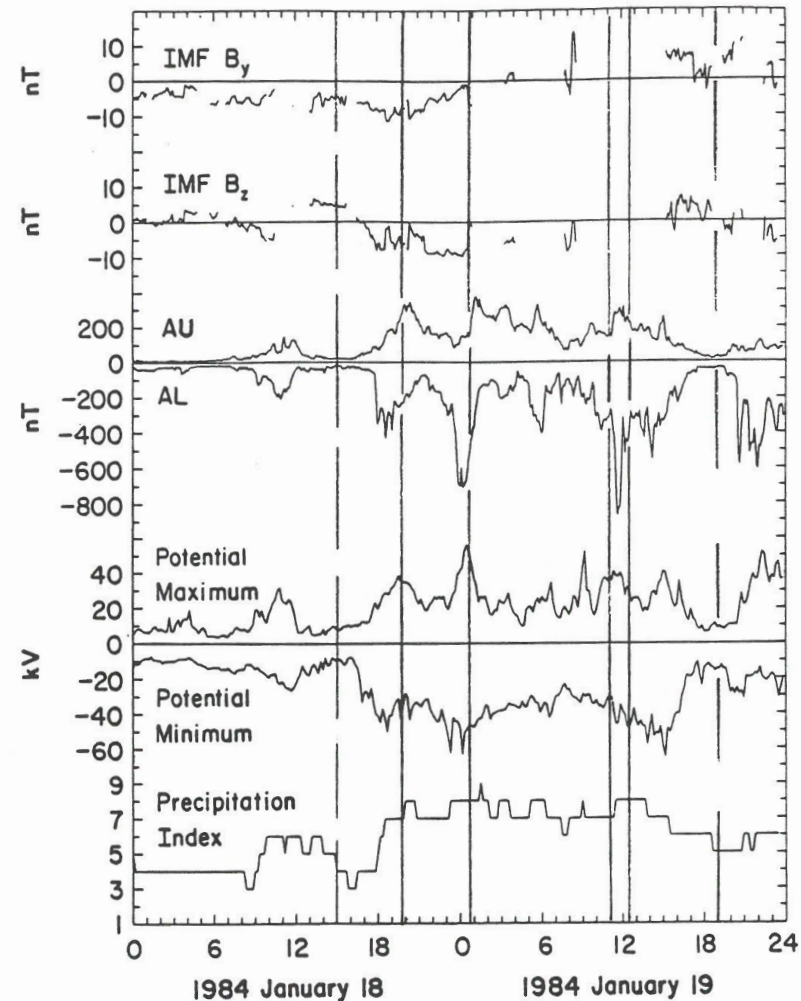


Fig 5.1 Time series plots of the IMF  $B_y$  and  $B_z$  components, the AU and AL indices, the maximum and minimum electric potentials and the Hemispheric Power Index for 18-19 January 1984 from Richmond et al., 1988. The dashed lines enclose the substorms of interest for the study.

# IEMP to AMIE

Late 1980's

- Ground magnetometer data:
  - hand "digitized" 10 min cadence
- Significant effort in understanding spacecraft coordinates
- DMSP mag averaged over 20 s
- DMSP mag body mounted
- Satellite electric field
  - Full vector and line of site
- Conductance, Conductance, Conductance!!!!
- Background model?????
- Data Weighting?????

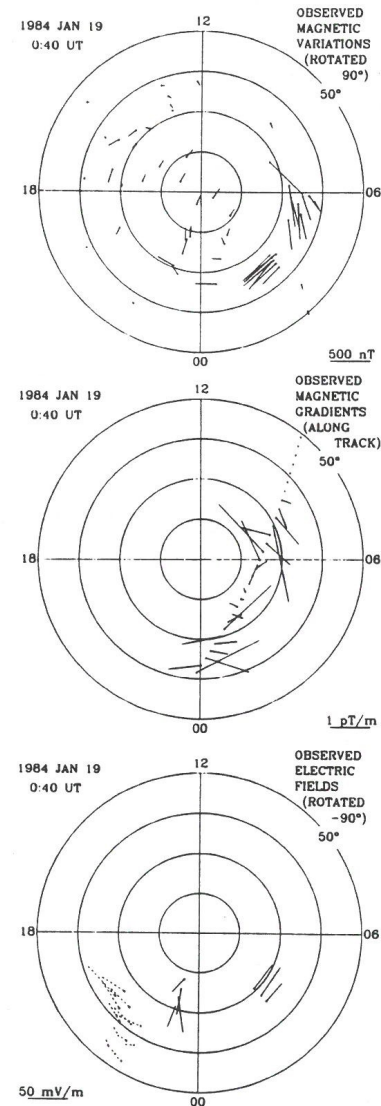


Fig 5.16 Observations used by the IEMP for 0040 UT 19 Jan 1988.

# First Space-based Magnetometer Data DMSP F-7 Body Mounted

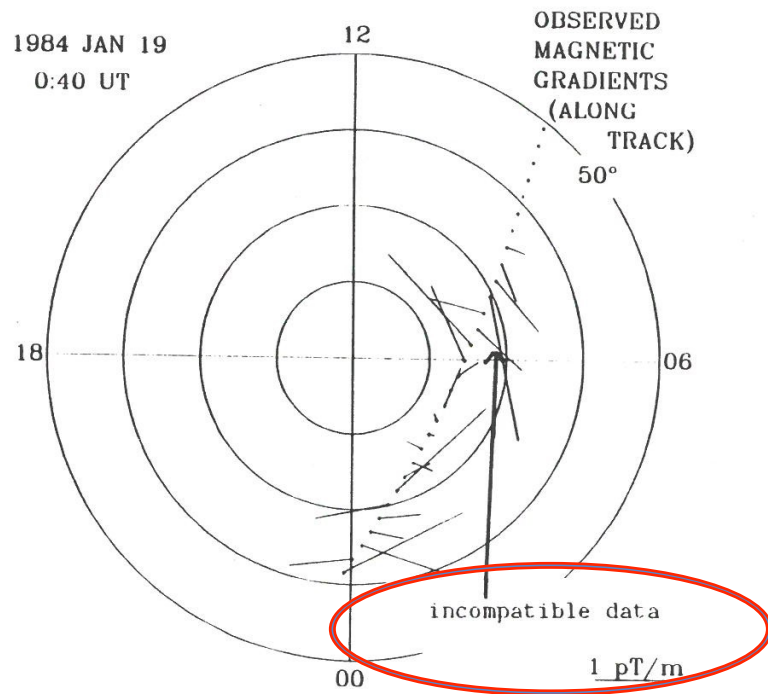


Fig 5.18 Gradients in the DMSP satellite data for 0040 UT, incompatible data are indicated

# Fitted Field Aligned Currents

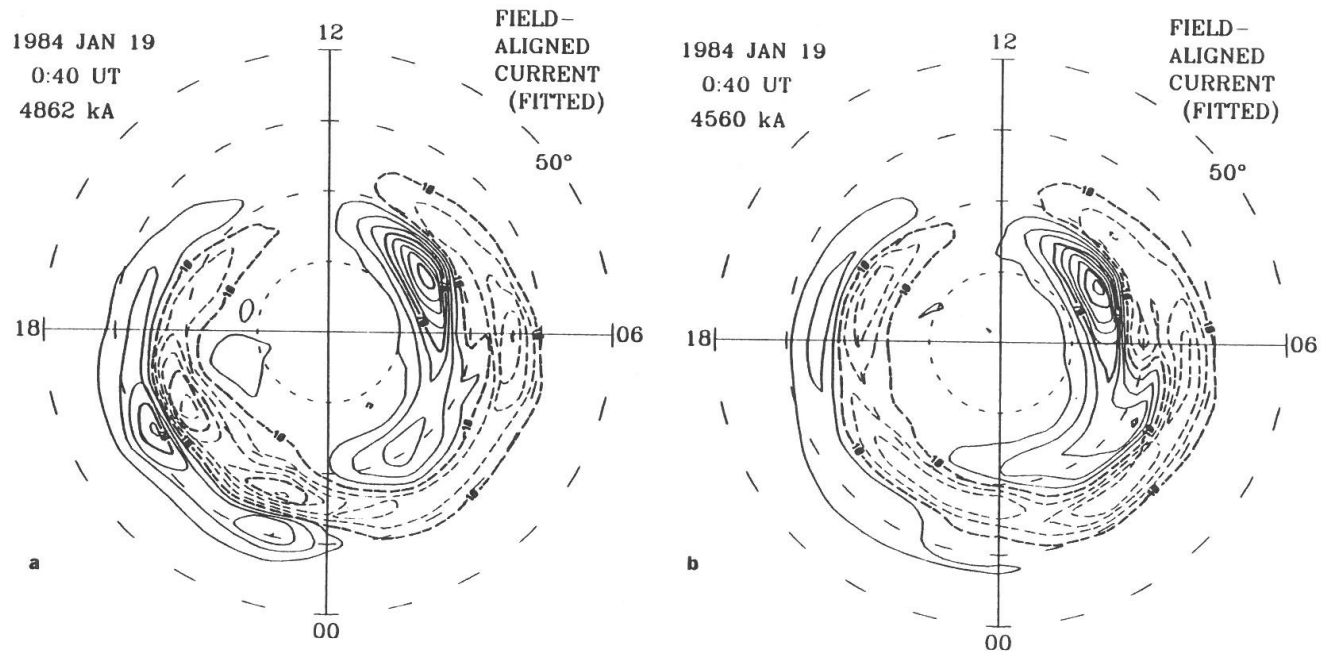


Fig 5.17 Fitted field-aligned currents for 0040 UT (a) DMSP satellite included and (b) DMSP satellite data excluded

With DMSP

Without DMSP

# Fitted Hall Conductance

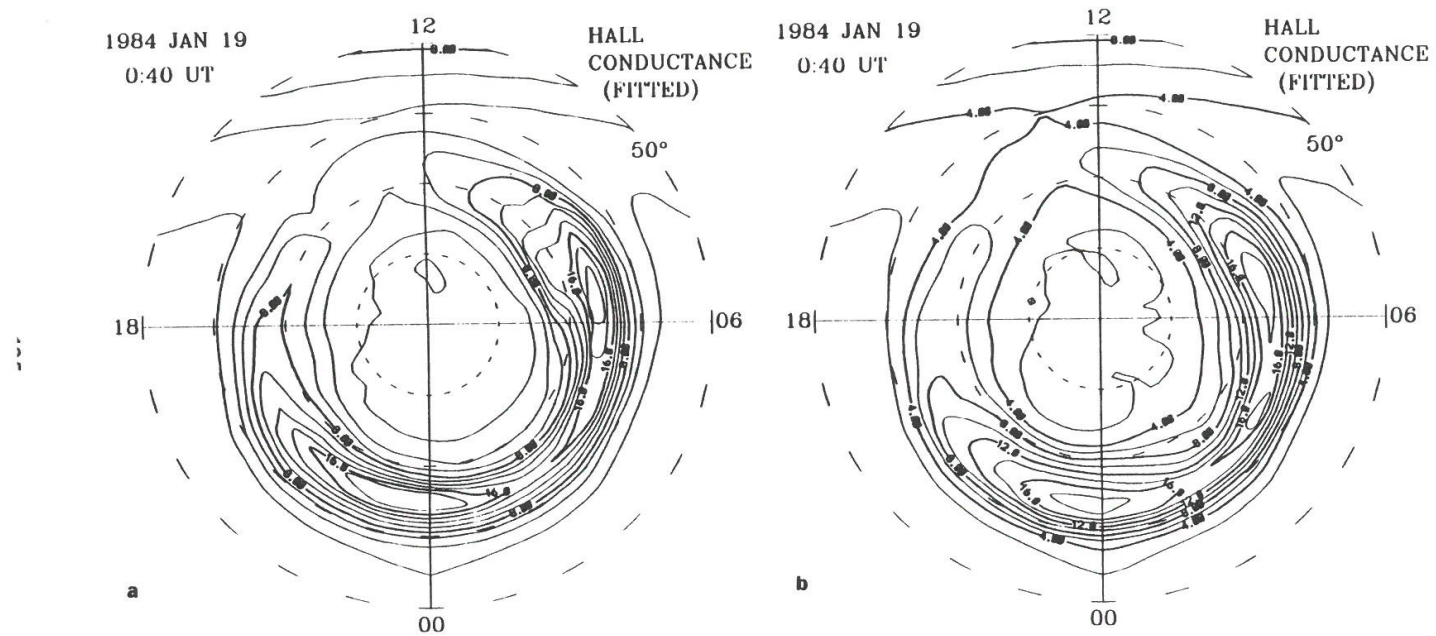


Fig 5.23 Fitted Hall conductance distribution for 0040 UT (a) DMSM satellite data included (b) DMSM satellite data excluded

With DMSM

Without DMSM

# Fitted Electric Potential

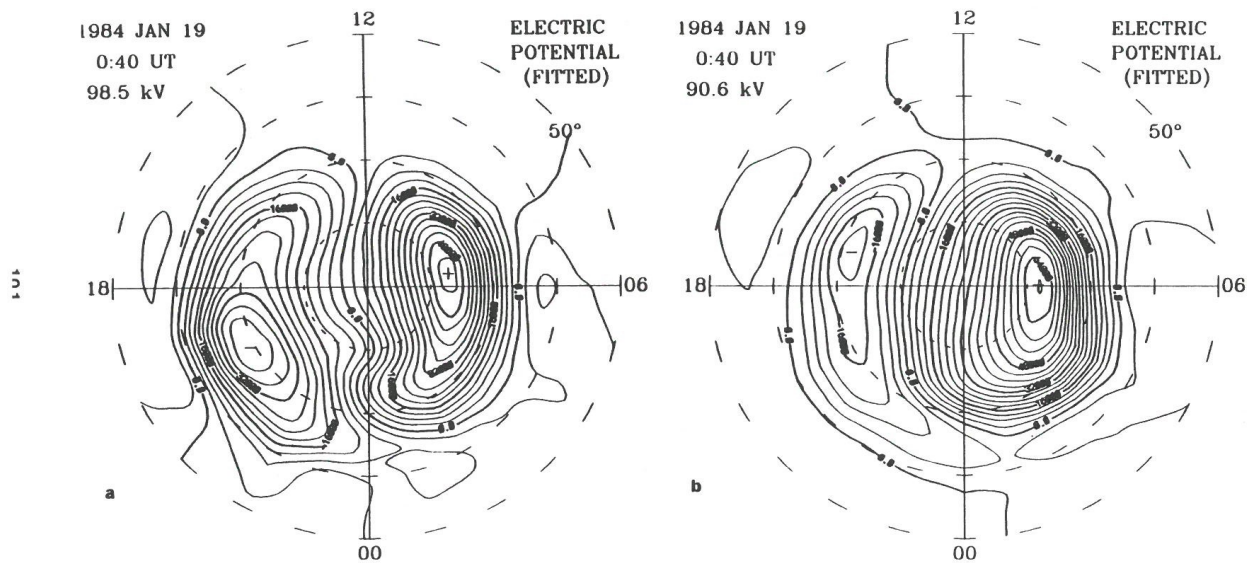


Fig 5.19 Fitted electric potential distributions for 0040 UT (a) DMSP satellite include and (b) DMSP satellite data excluded.

With DMSP

Without DMSP

## How to Proceed with AMIE Development (1988)

- Work on and improve conductance estimates
  - More global influence on AMIE outcomes
  - Better data quality
  - More data
- Hold on satellite magnetometer ingest
  - Wait for better data
  - Wait for more global coverage
- The time has arrived!