Evaluation of the Impact of Statistical Models on Global SuperDARN Convection Maps

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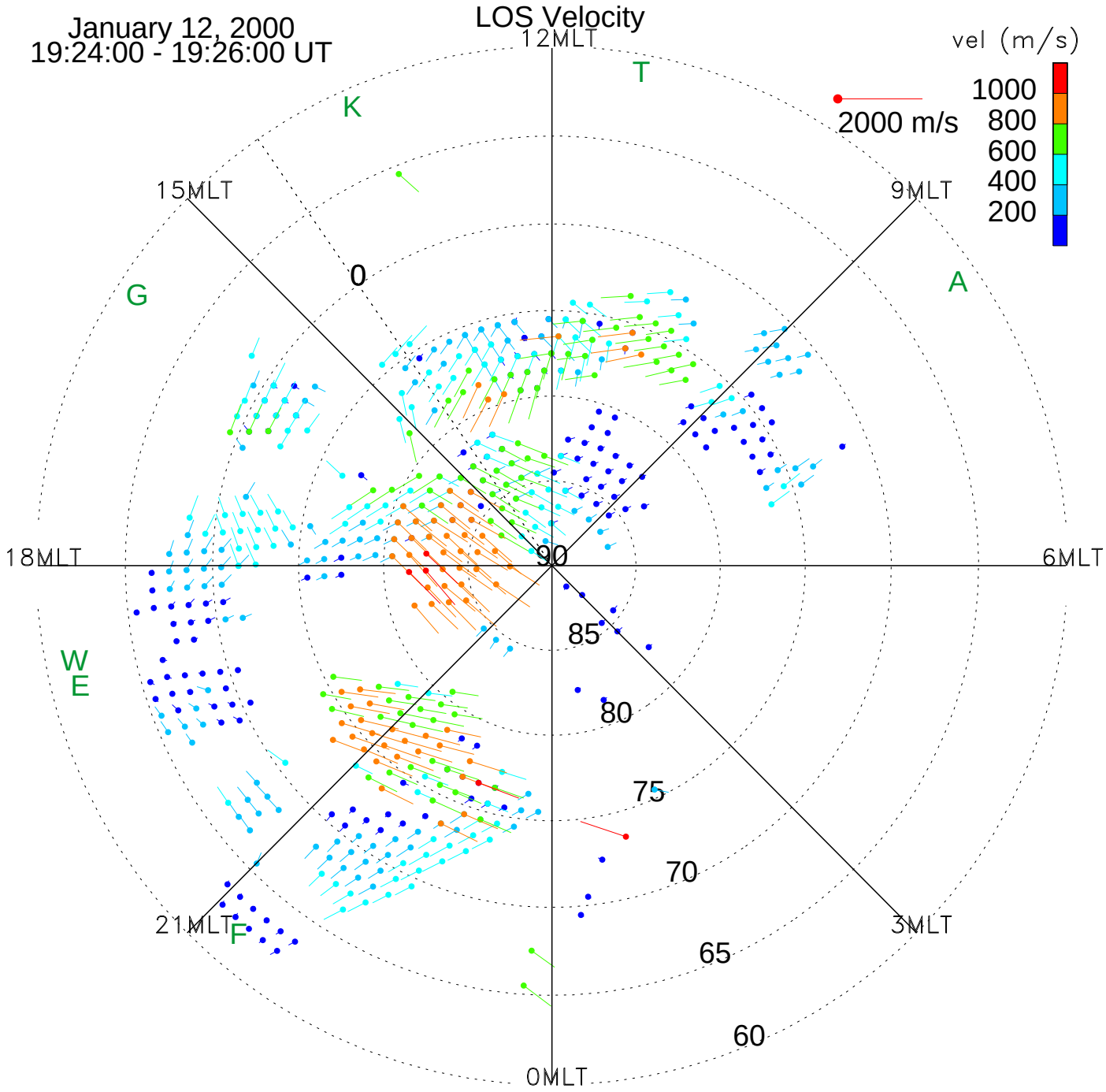
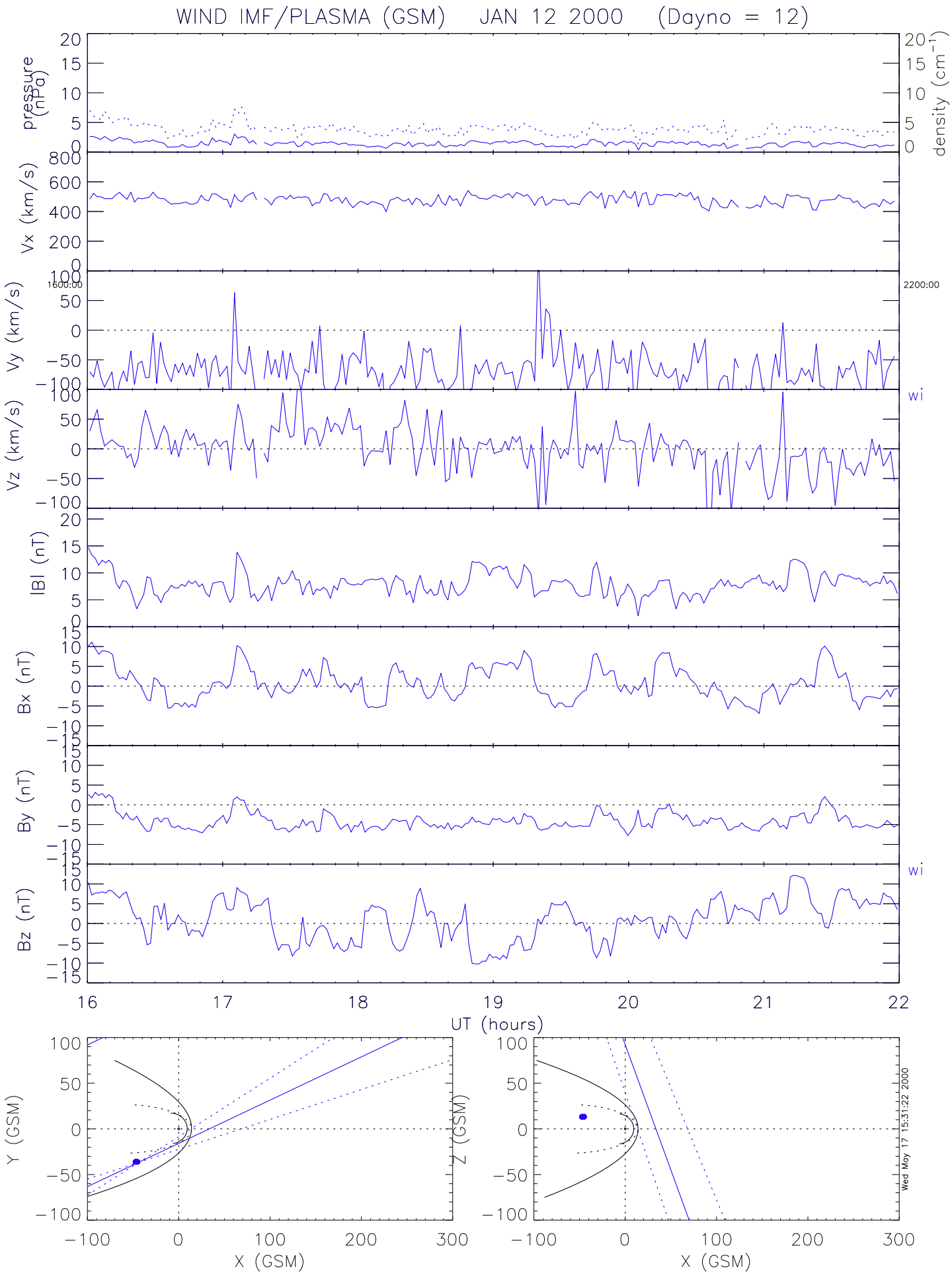
Introduction

- The addition of the new SuperDARN radars has significantly increased coverage in the northern hemisphere.
- Periods are now common when convection velocity measurements are available over $\sim \frac{3}{4}$ of the high latitude ionosphere.
- During such periods, particularly when the measurements span the region between the potential extrema, the solution for the global potential pattern is well-defined by the measurements alone.
- The solution using the Spherical Harmonic Ionospheric Potential Mapping Technique (SHIPMT) is insensitive to the choice of statistical model.
- We have reached an important threshold: determination of global electrostatic potential maps based on direct measurements of ionospheric convection.

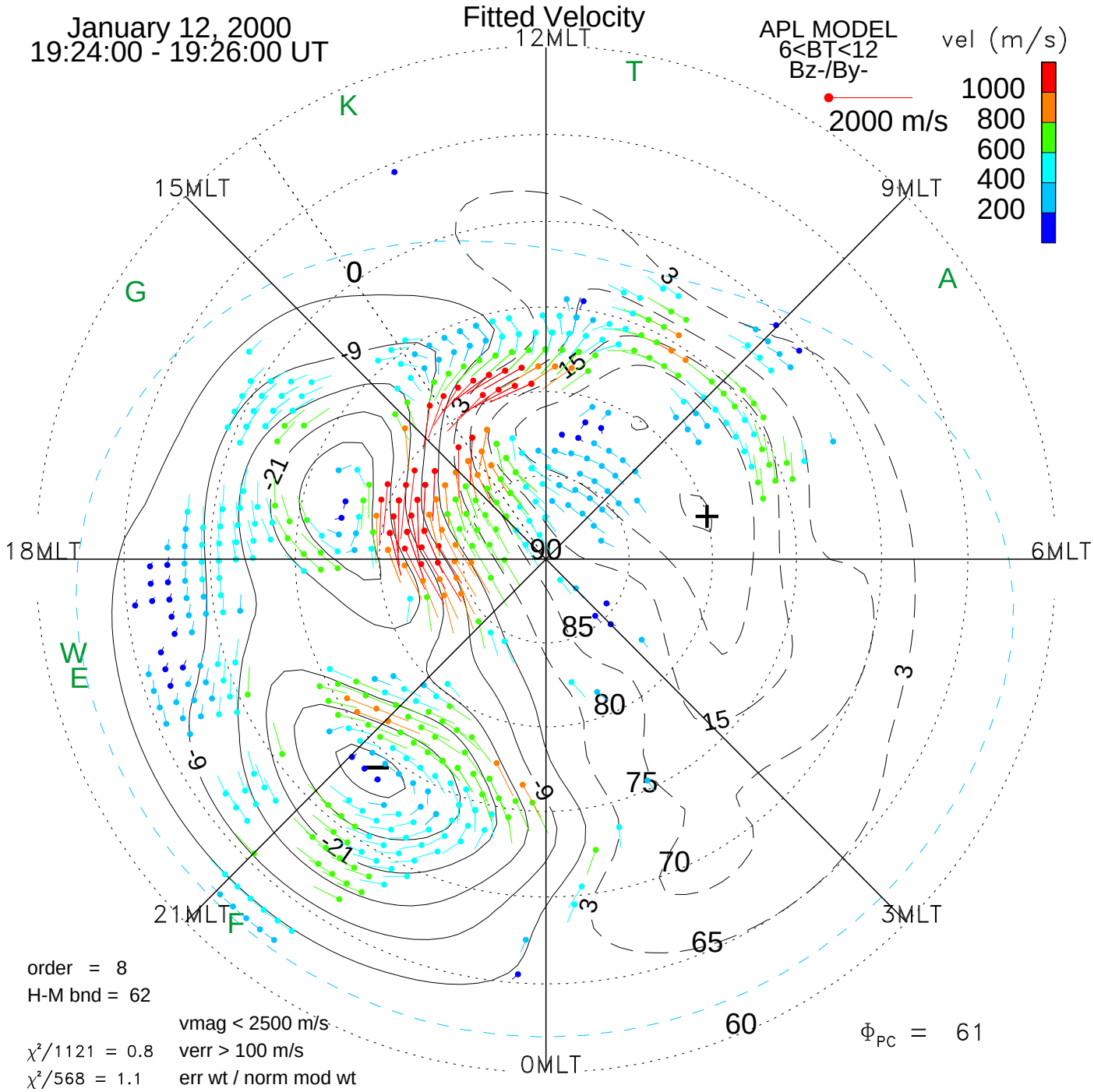
Example Period:
LOS




WIND IMF/PLASMA (GSM) JAN 12 2000 (Dayno = 12)
pressure (nPa)
density (cm^{-3})
Vx (km/s)
Vy (km/s)
Vz (km/s)
1600:00
2200:00
wi
|B| (nT)
Bx (nT)
By (nT)
Bz (nT)
wi
16
17
18
19
20
21
22
UT (hours)
Y (GSM)
Z (GSM)
X (GSM)
X (GSM)
Wed May 17 15:31:22 2000

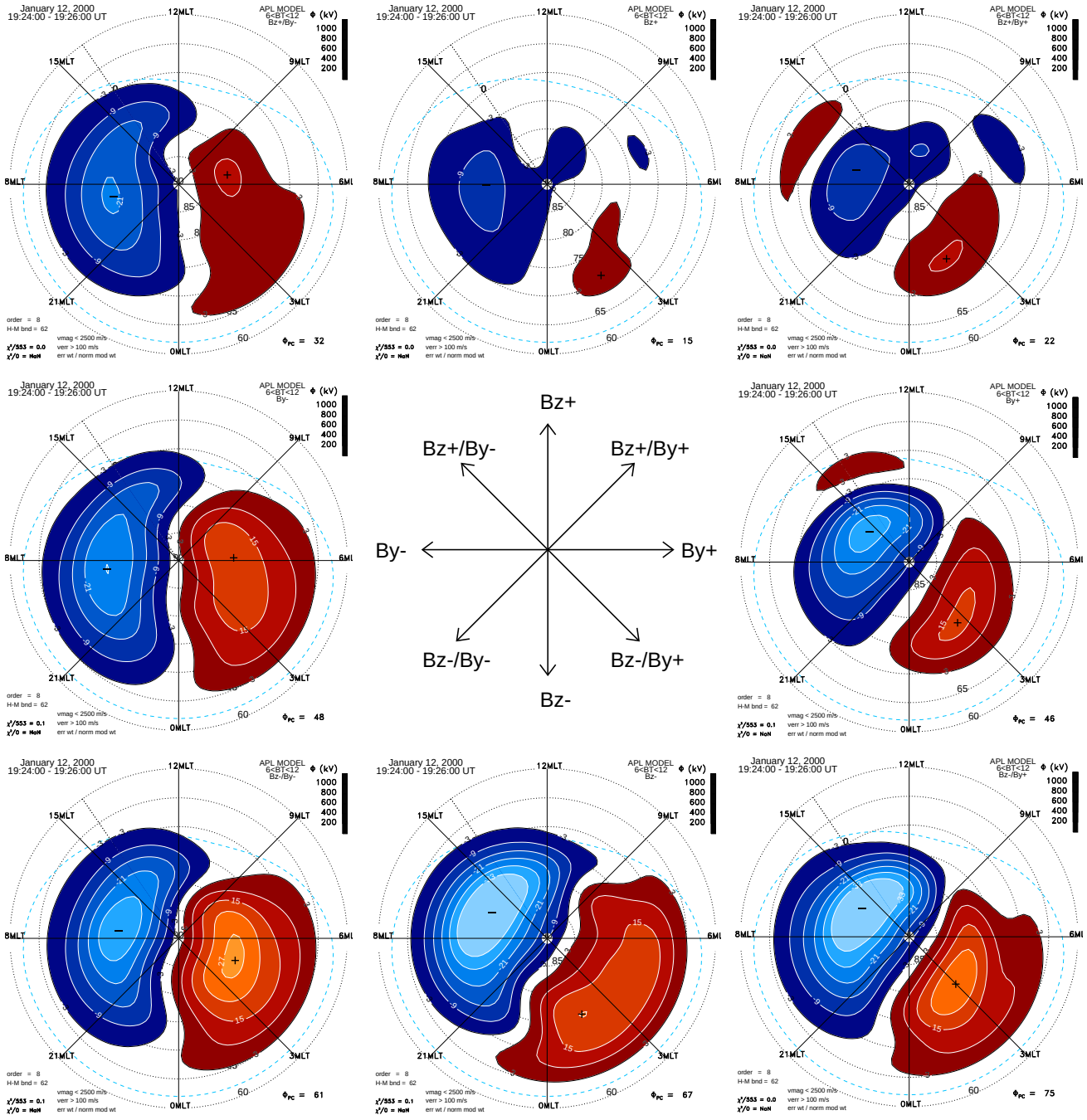
Fitting with B_z-/B_{y+}

$6 < B_T < 12$ nT

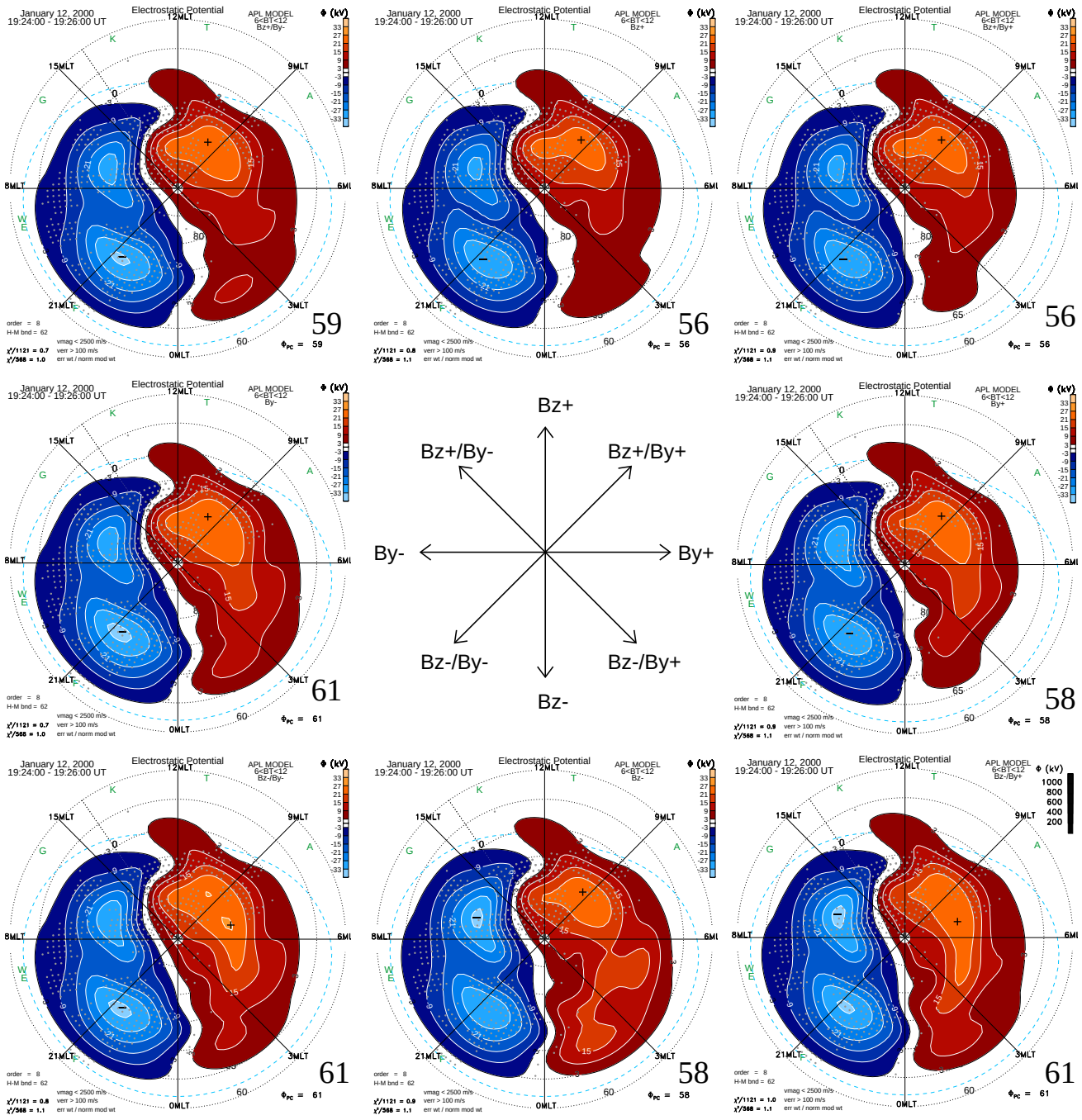


Statistical Models

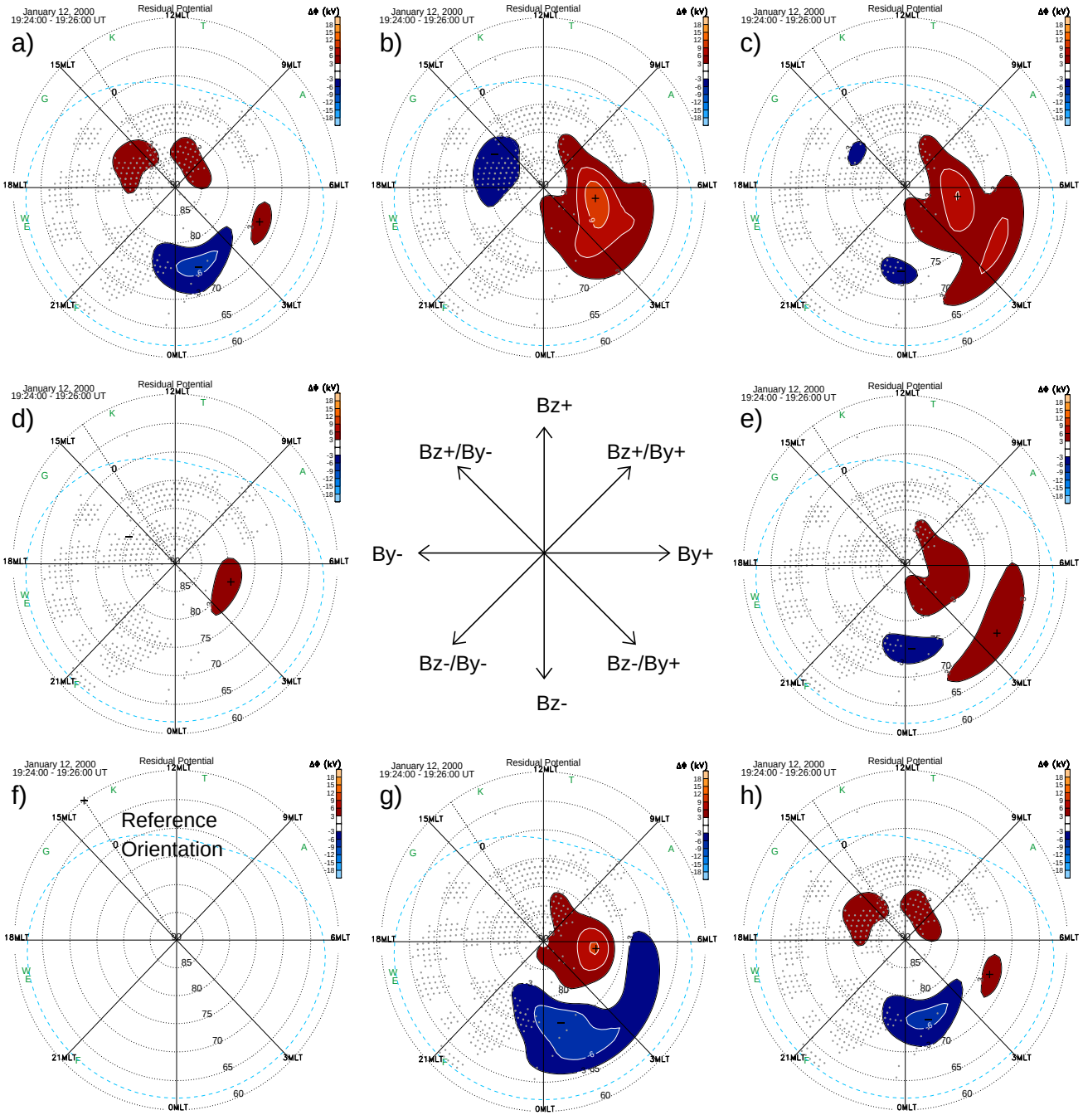
for $6 < B_T < 12$ nT



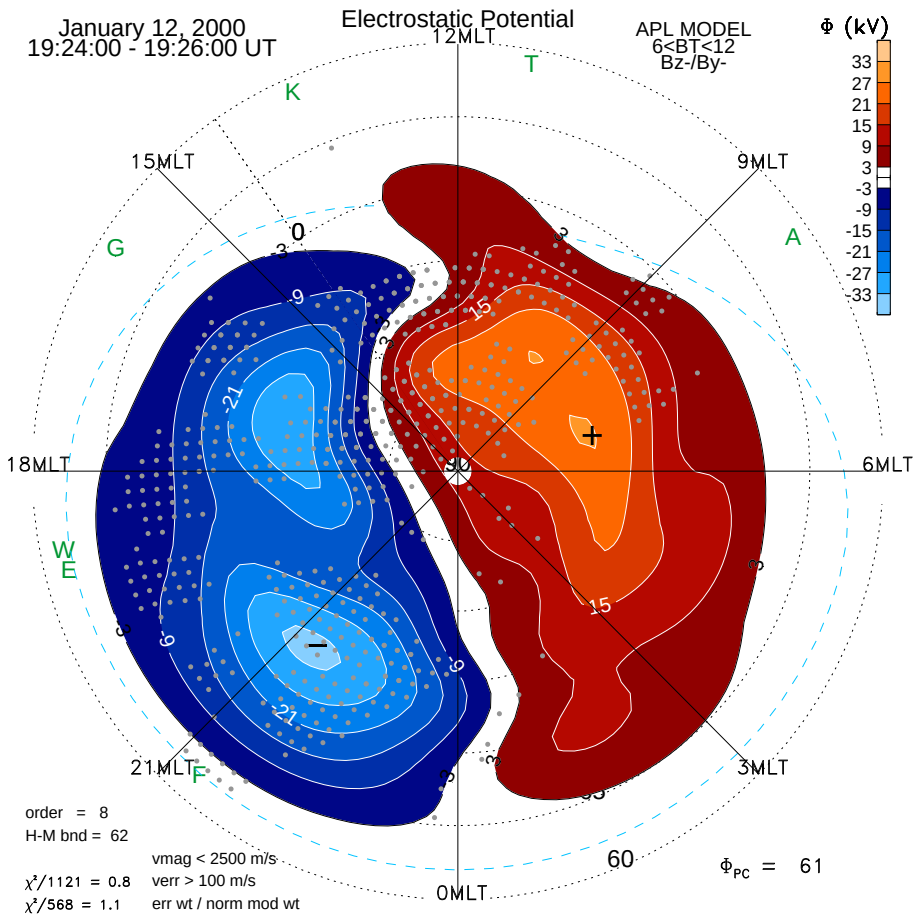
Fitted Solutions for $6 < B_T < 12$ nT

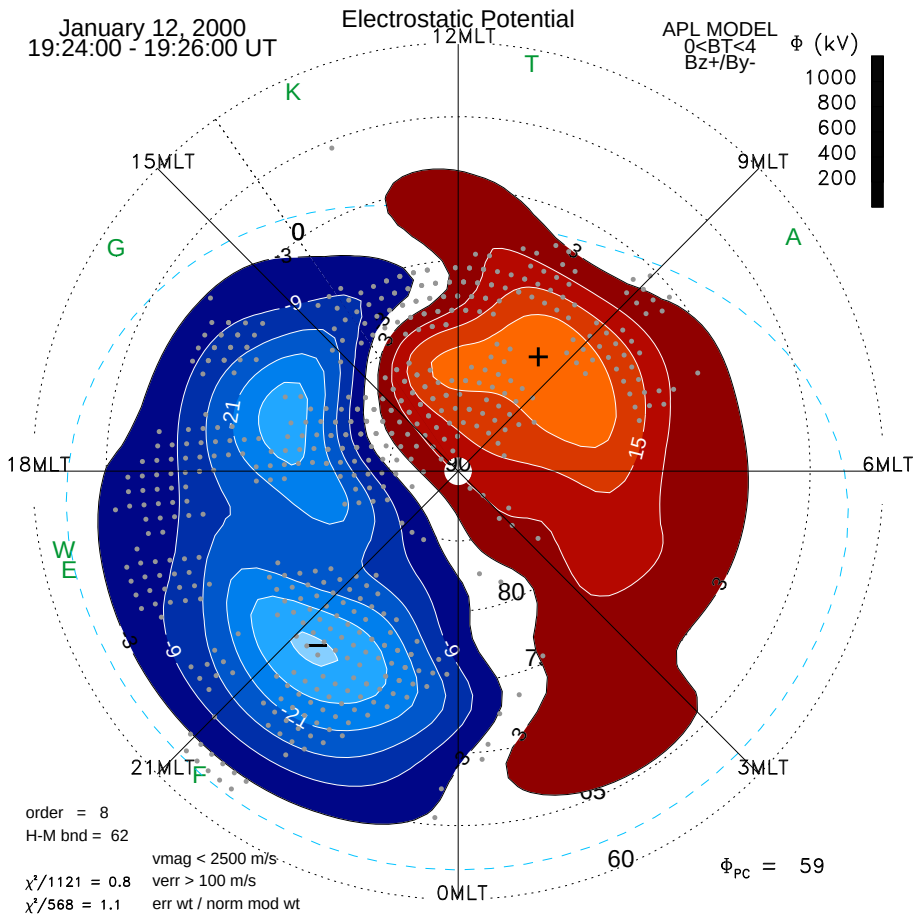


Residual Potentials for $6 < B_T < 12$ nT



IMF Magnitude

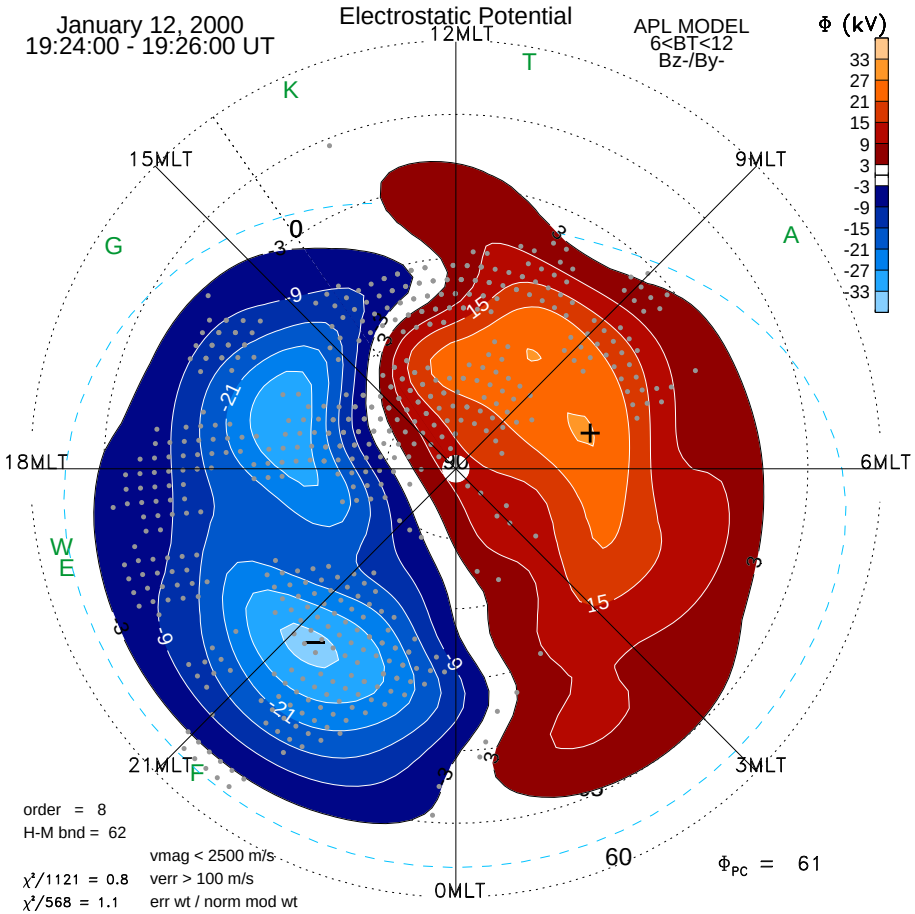


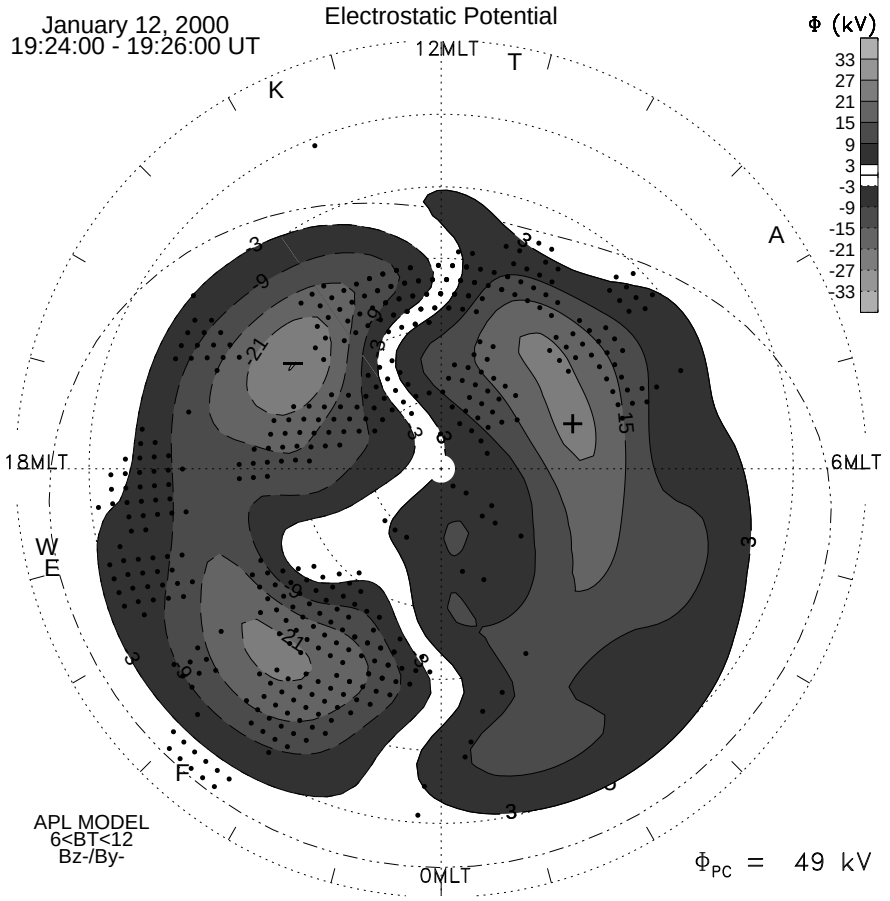


$6 < B_T < 12$ nT

$0 < B_T < 4$ nT

Sans Goose Bay

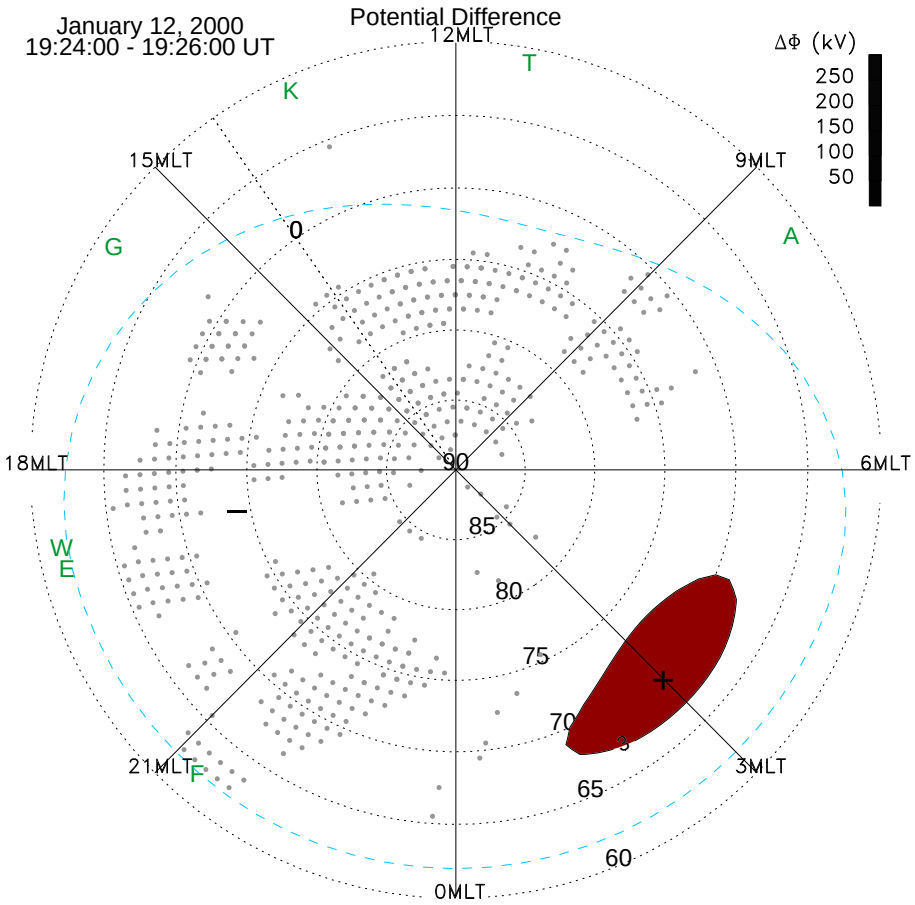




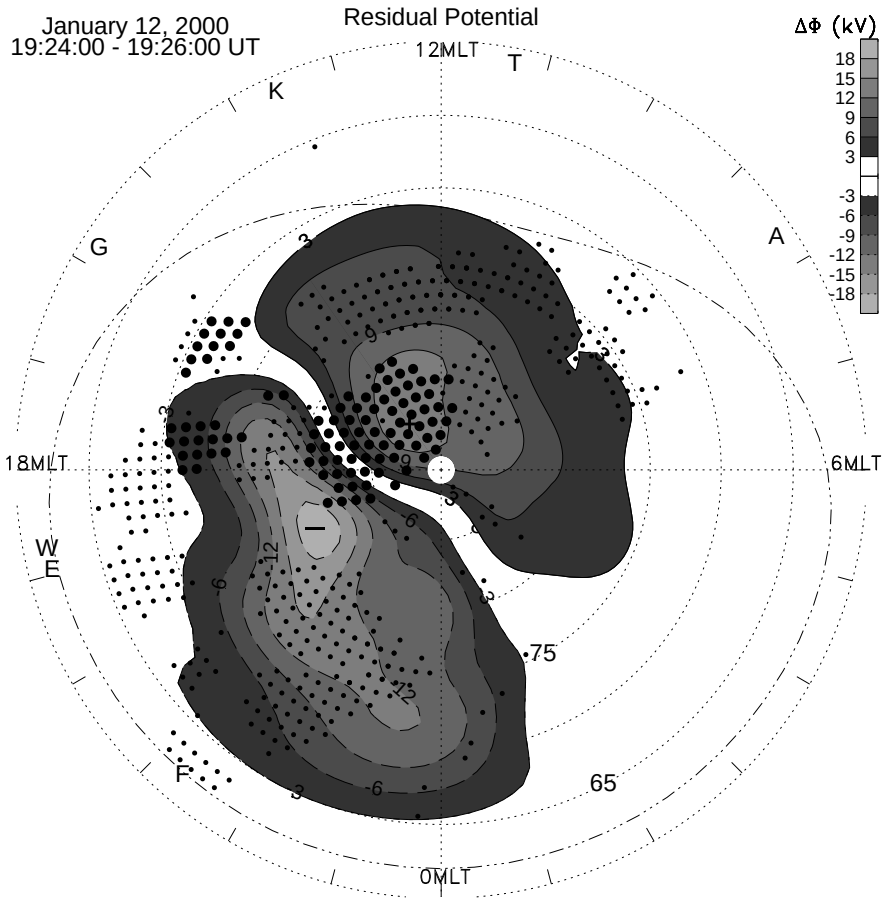
All radars

w/o Goose Bay

Residuals



$0 < B_T < 4$ **nT**



sans Goose Bay

Summary

- This example illustrates that fittings with SHIPMT are insensitive to the statistical model during periods of suitable coverage:
  - large region of the high latitude ionosphere
  - spanning the potential extrema
- During such periods Φ and Φ_{PC} are well-defined by measurements alone.
- We expect periods of suitable coverage to now be common with the additional radar coverage and apparent increased scatter rates.