

New synoptic map data products for space weather modeling

Alexei A. Pevtsov and SOLIS Team

(L. Bertello, A. Hughes, O. Burtseva, G. Petrie)

US National Solar Observatory

Synoptic/Carrington maps



Traditional data products:

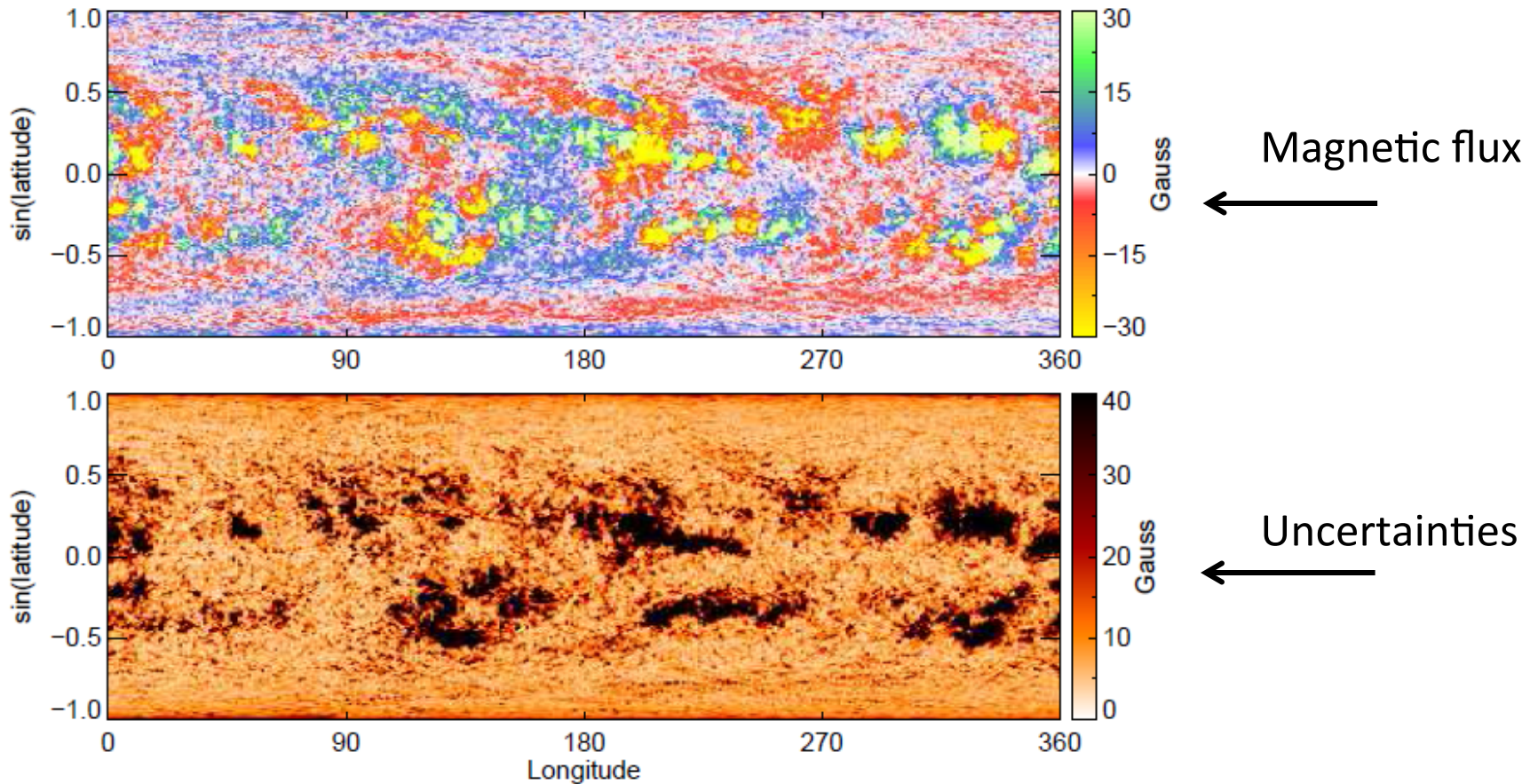
- Pseudo-radial magnetic field: $B_{r-p} \sim B_{LOS}/\cos(r/R)$
- No uncertainties in B_r

New data products (SOLIS/VSM):

- Synoptic maps of uncertainties (noise + evolution)
- Vector field (3 components)
- Composite maps (photospheric B_r)
- Pseudo-radial (chromospheric) B_r maps

I. Synoptic maps of uncertainties

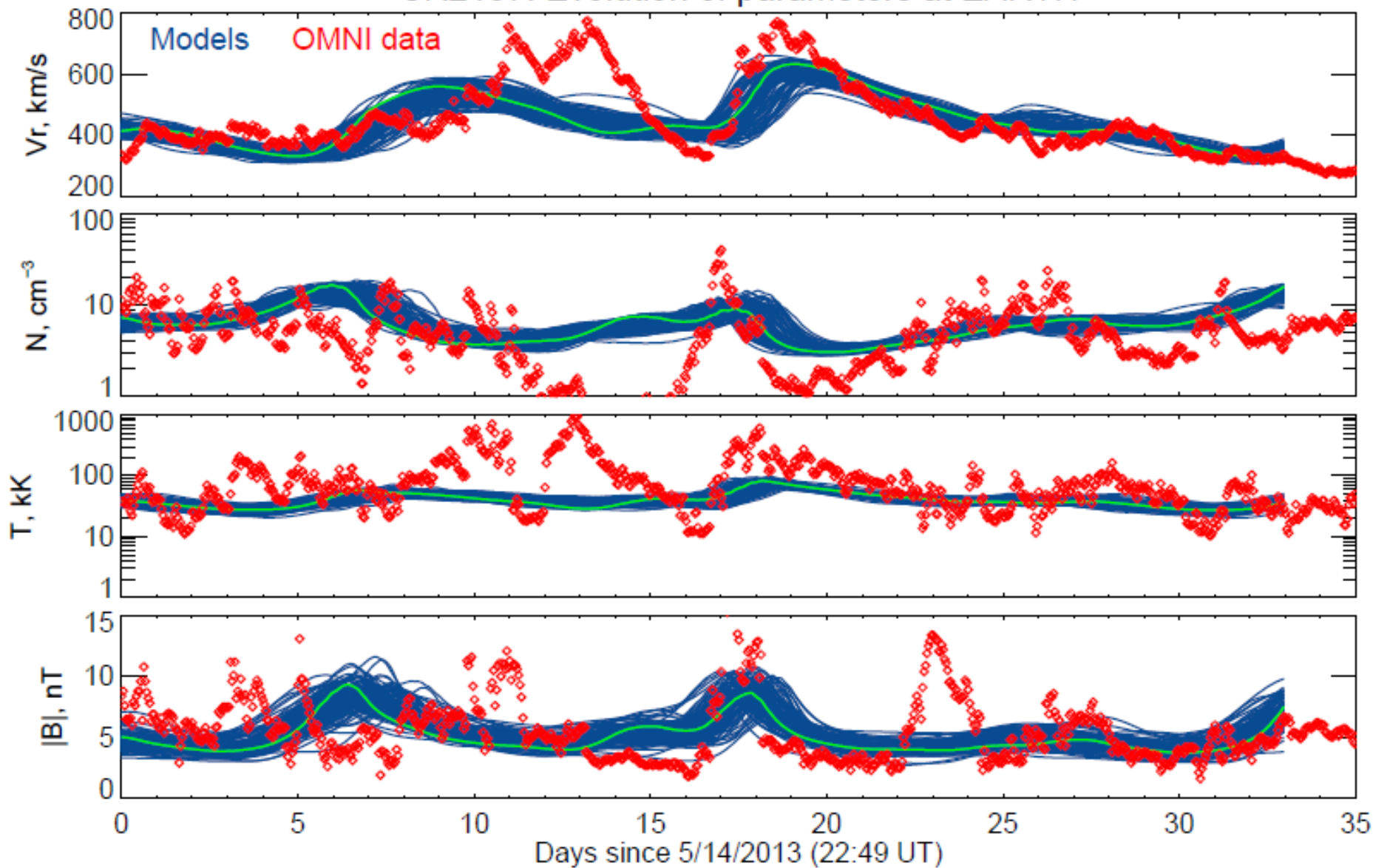
CR2137



NSO: SOLIS/VSM and HMI (2010-2015)

Bertello et al (2014)

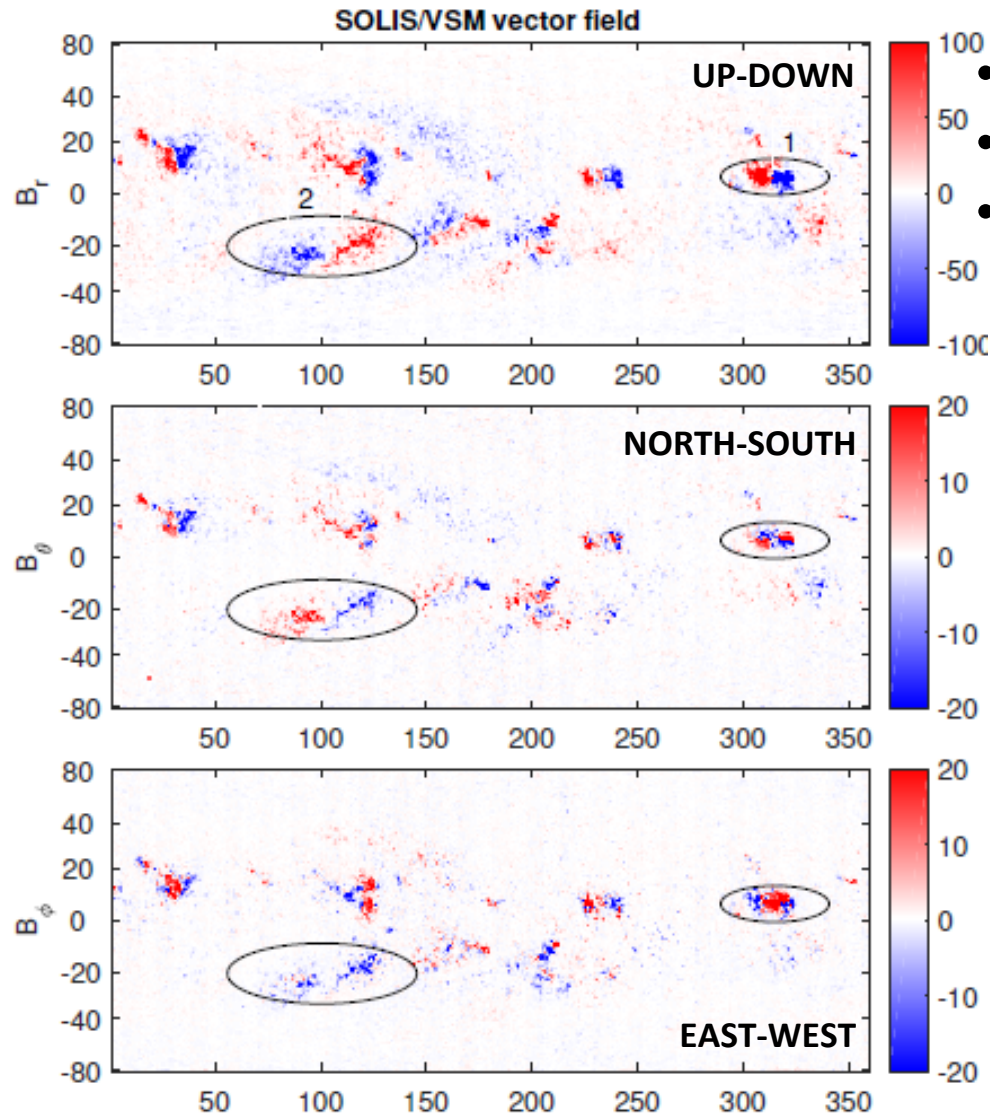
CR2137: Evolution of parameters at EARTH



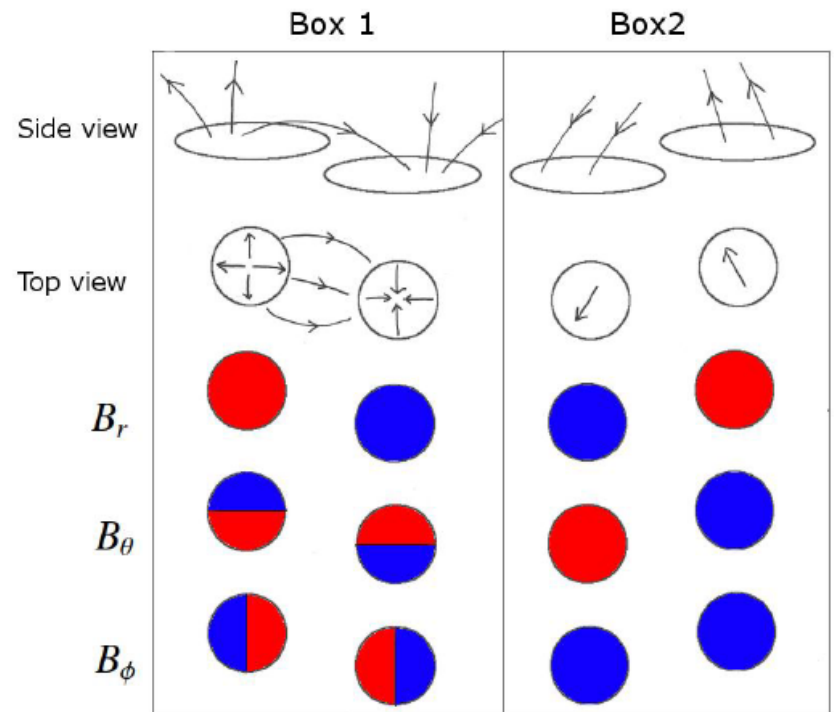
Pevtsov, A.A., Bertello, L., MacNeice, P. (2015)

DOI: [10.1016/j.asr.2015.05.043](https://doi.org/10.1016/j.asr.2015.05.043)

II. Vector Field Synoptic Maps

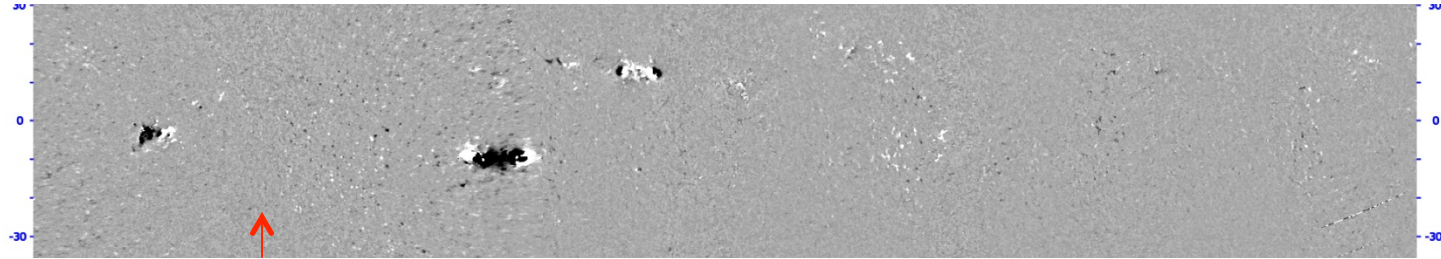


- SOLIS/VSM “daily” magnetograms
- 1 arcsec pixel, full disk
- Fe I 6301-02A, full Stokes inversion.

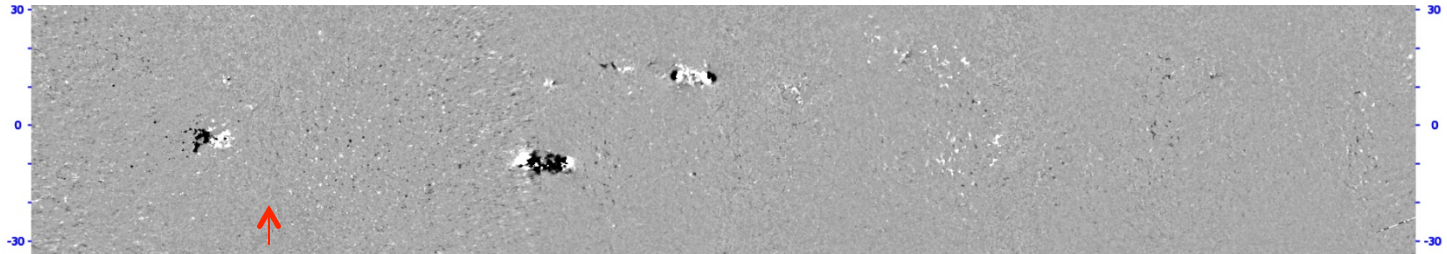


Effect of noise in weak fields

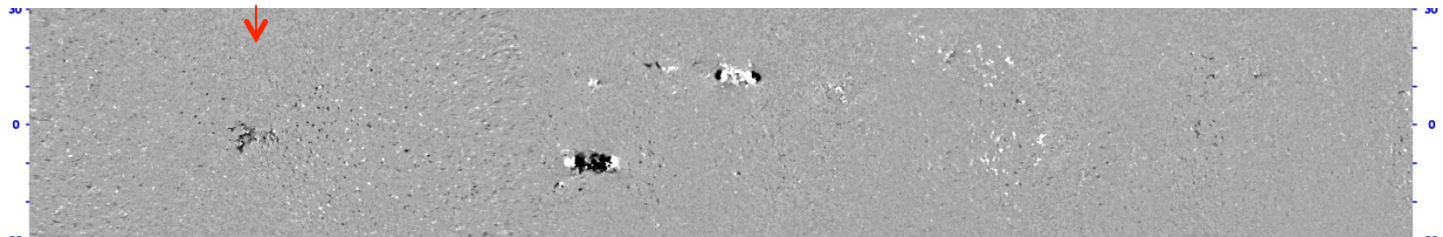
04/05/2017



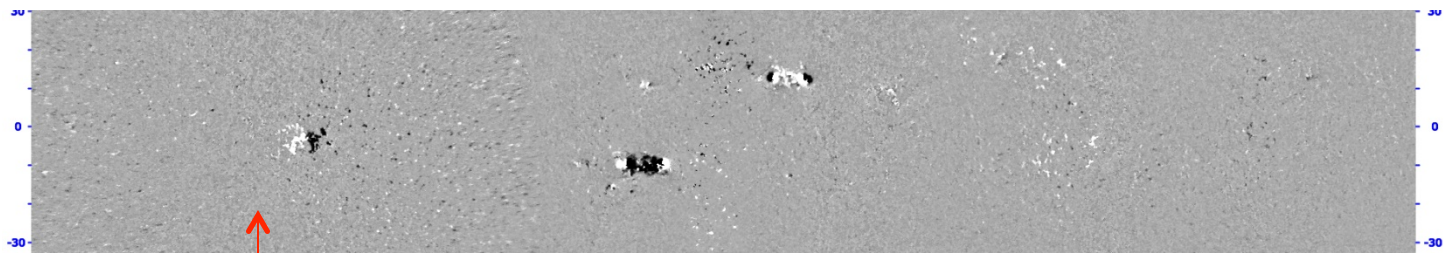
04/06/2017



04/07/2017



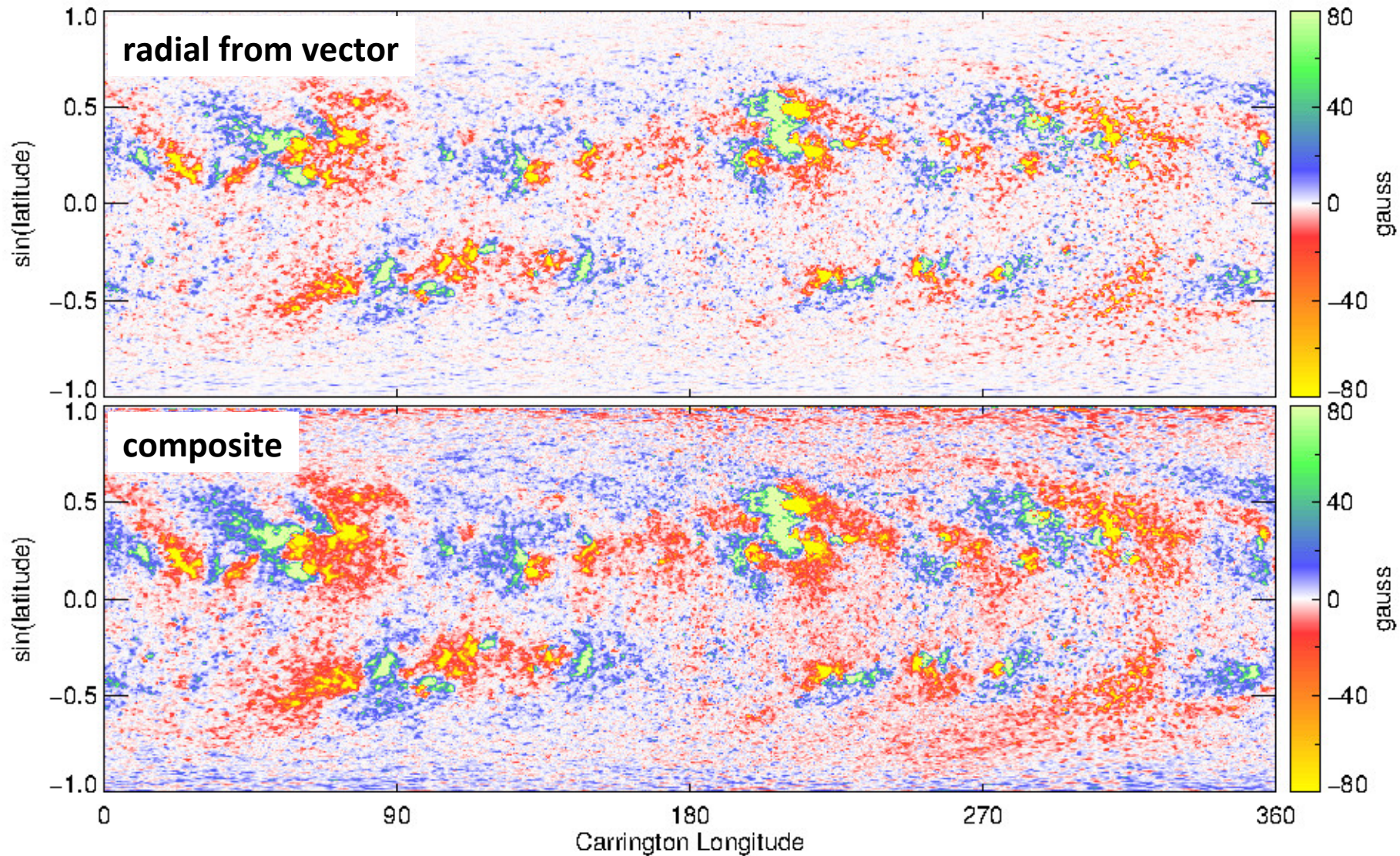
04/08/2017



Central meridian

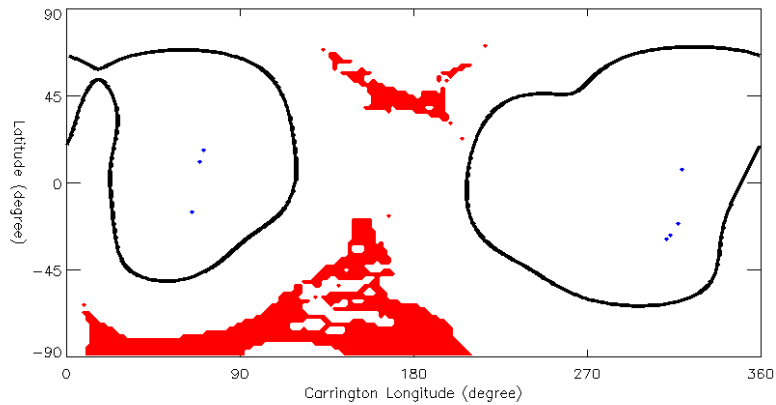
Zonal (East-West) component of vector field

III. Composite (B_r + pseudo- B_r) maps

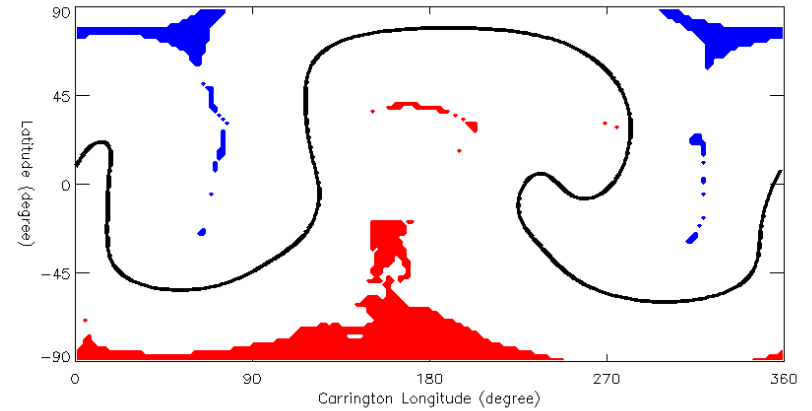


PFSS composite maps

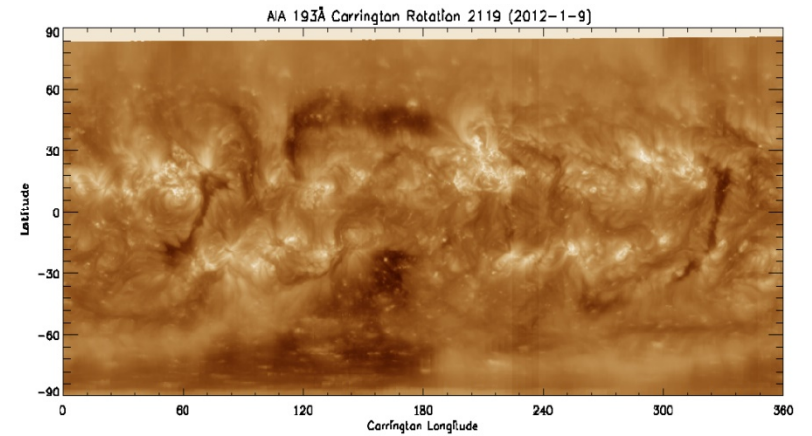
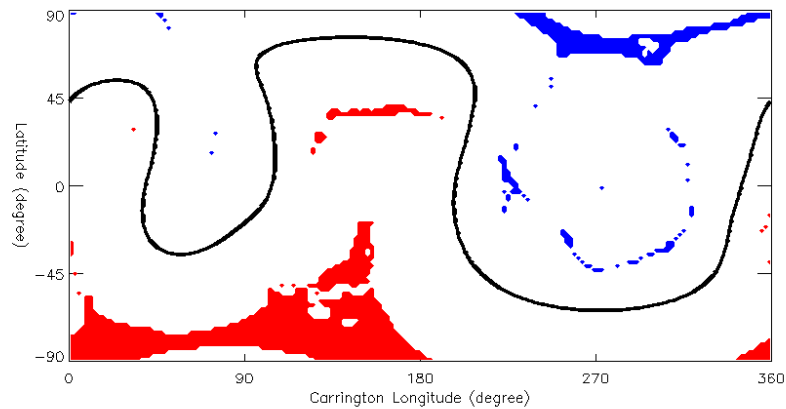
True radial (vector)



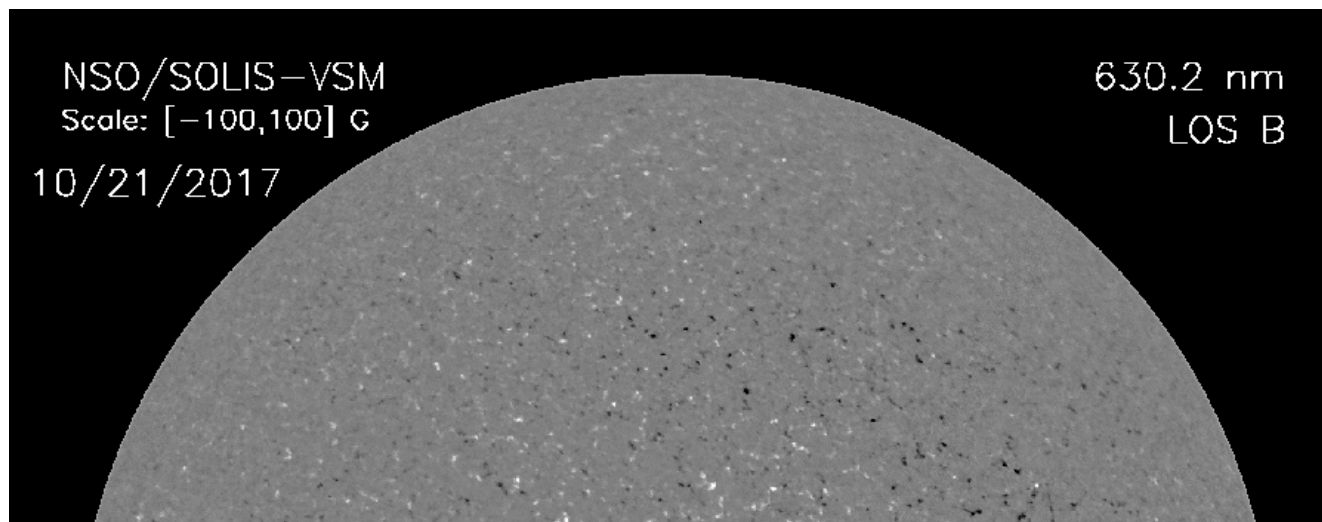
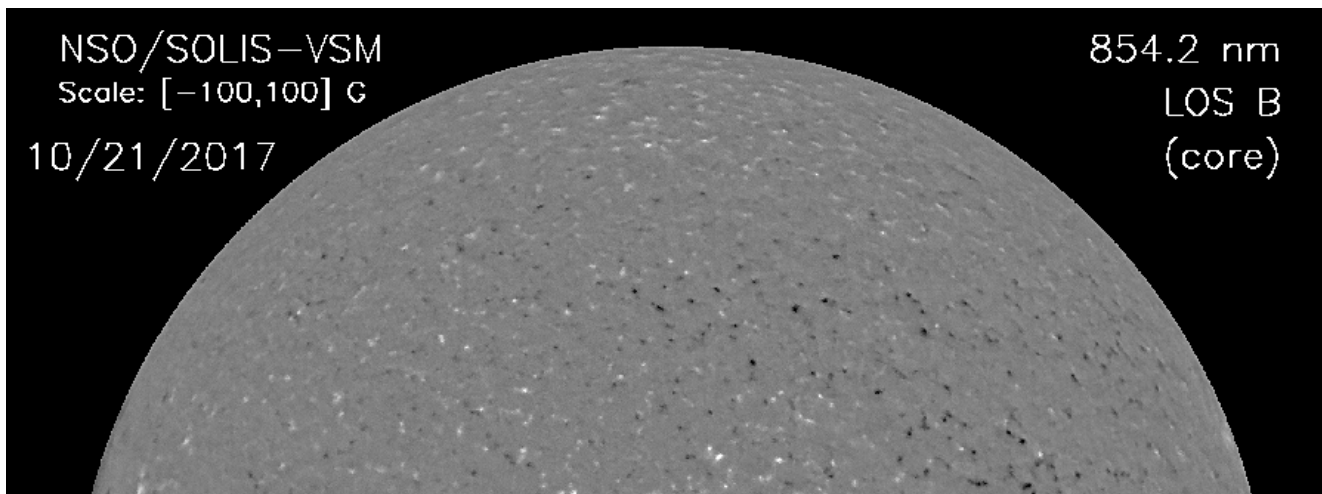
Pseudo-radial



composite

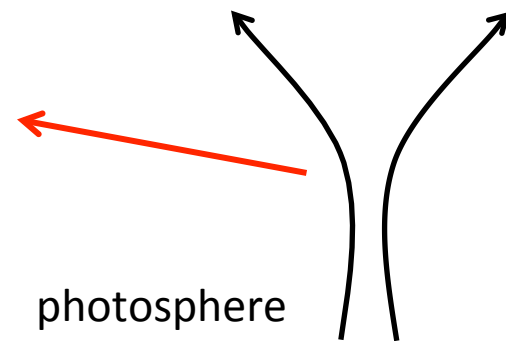


IV. Pseudo-radial from chromospheric observations



$$B_{rc} \sim B_{LOS} f(r/R)$$

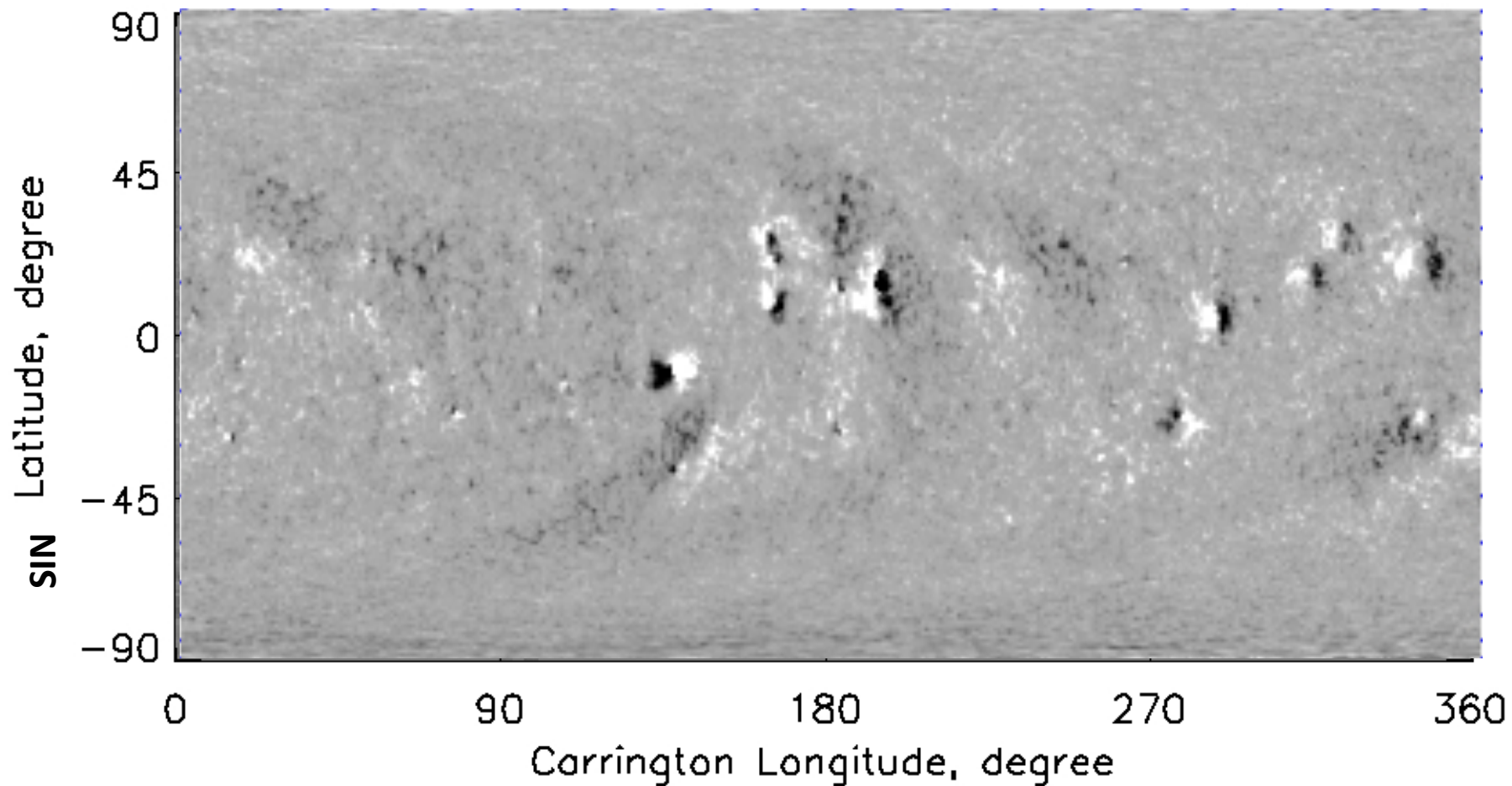
chromosphere



$$B_{rp} \sim B_{LOS} / \cos(r/R)$$

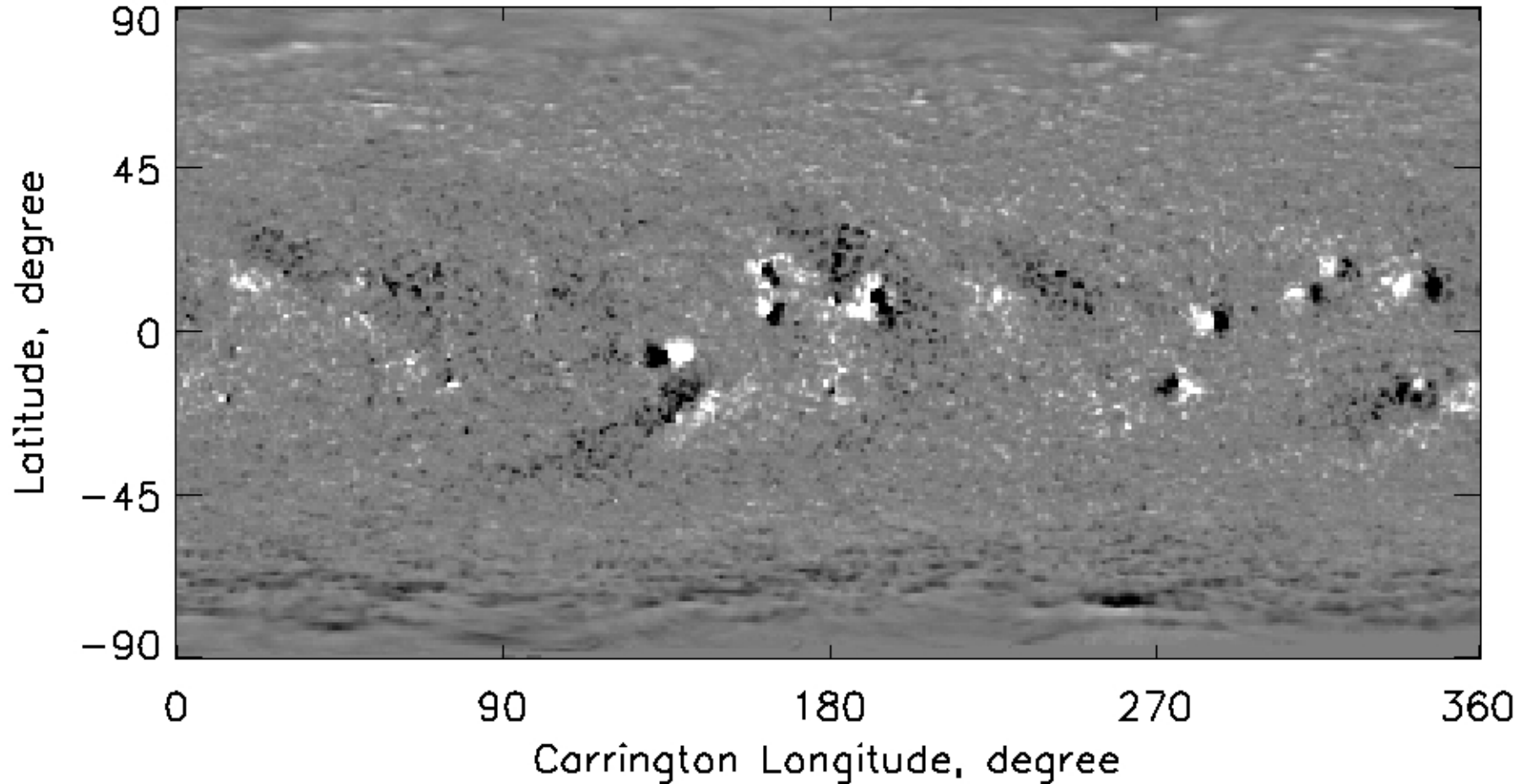
LOS synoptic map

SOLIS-VSM 6302L CR=2184



Pseudo-radial synoptic map

SOLIS-VSM 85421 pseudo-radial CR=2184



Summary

- Four new data products are available to the modeling community: (synoptic maps of) uncertainties, vector field, composite, and pseudo-radial chromospheric field.
- Tests using PFSS and WSA-Enlil models
- Vector data may have some limitations due to difference in noise between B-los and B-trans.
- Would appreciate feed back (useful/useless, suggestions for other data products).