LSO/KSO Hα prominence catalogue: status report – 2023/08/24

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LSO/KSO prom catalogue

- The LSO part: coronagraphic H alpha prominence observations once per day, 05/1967-08/2009
- The KSO part: „quasi-coronagraphic“ observations of the H alpha prominences once per day, 09/2009 – 12/2022 (and still in progress)

Data handling

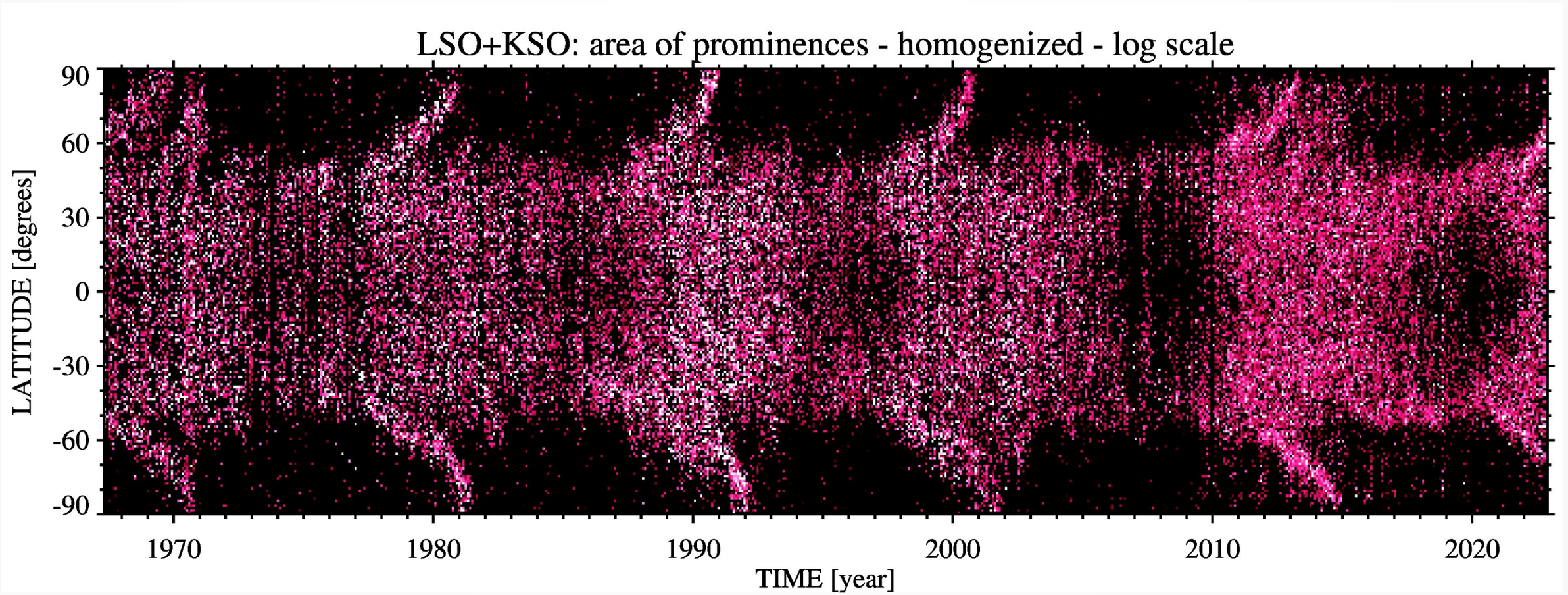
- KSO data: an automatic identification of the prominences and determination of their parameters according to the LSO older catalogue

- LSO+KSO data: homogenization for the filling factor of the observing days in a month

Time-latitude prom distributions

- Time: 05/1967 – 12/2022, time step: 1 month
- Latitude: [-90°,+90°], latitude step: 10°
- Parameter: prominence area
- Time-latidude distribution: prominence area in the time intervals of a month * latitude 10° bin
- Optimum dynamic range: area > 20 degrees * arcsecs, logaritmic scale

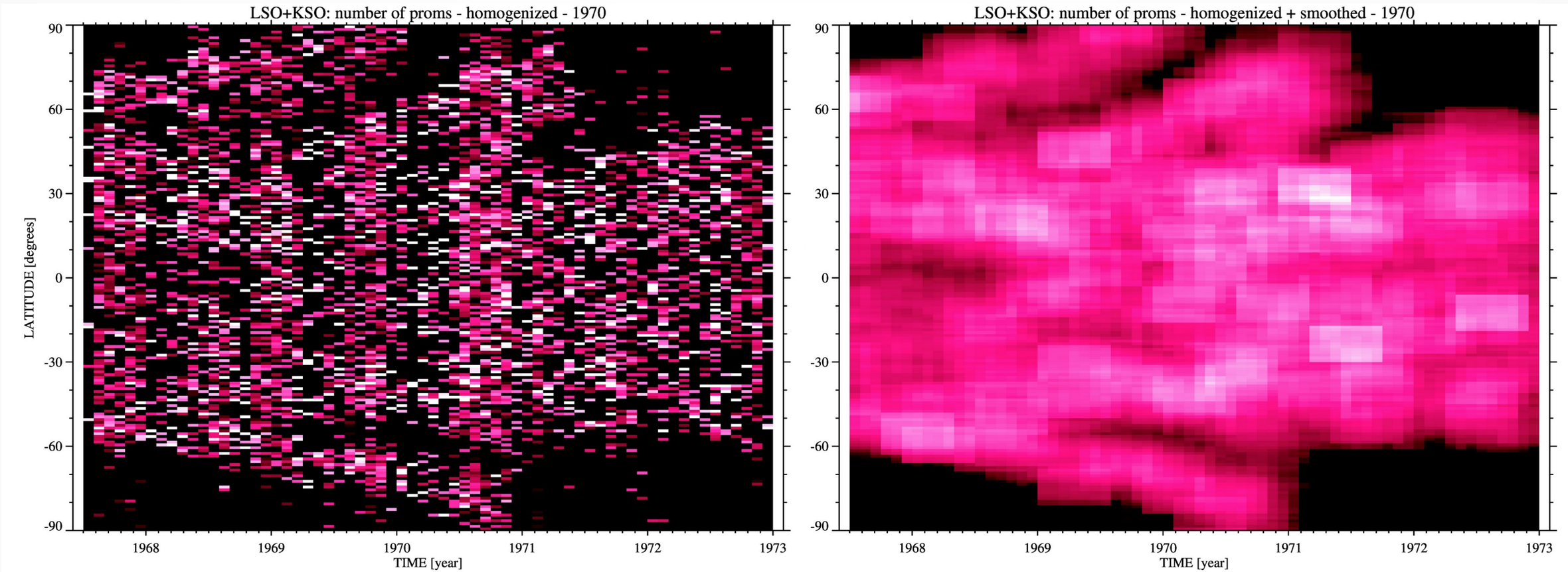
Time-latitude prom distributions



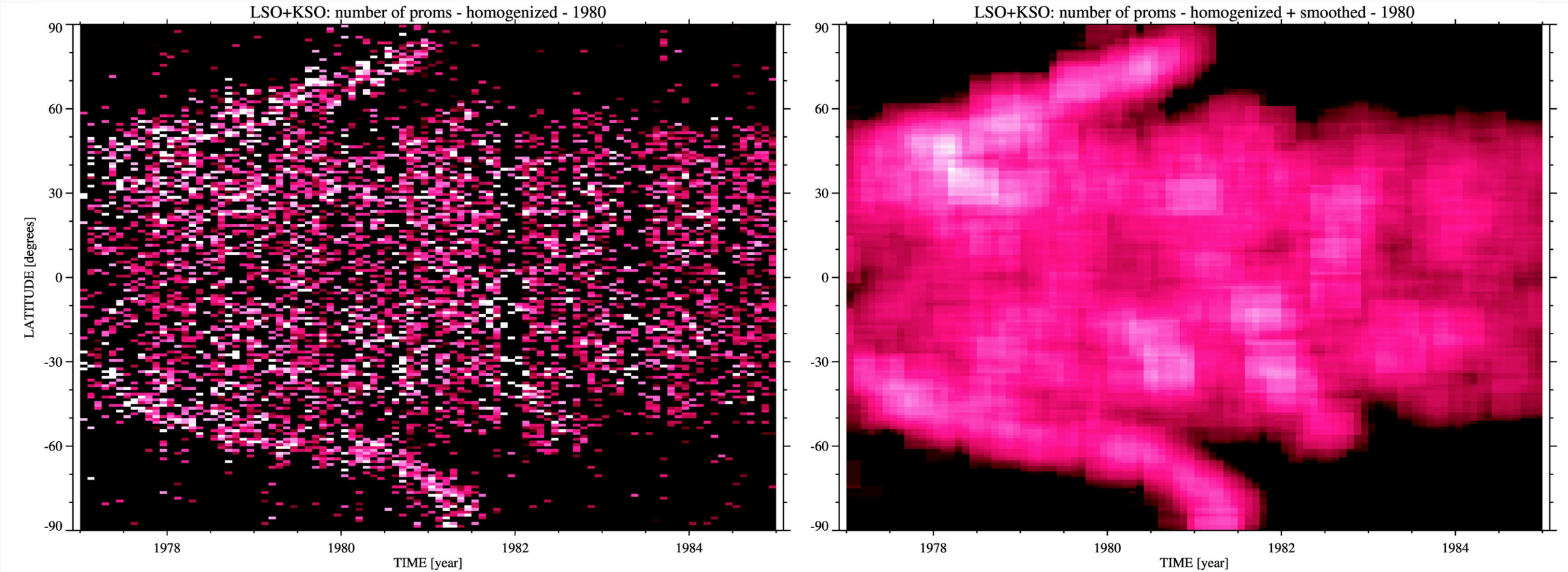
Polar prom branches

- Arrival time differences between cycles & hemispheres
- The primary and the secondary polar branches
- Variable speeds of the poleward motion
- The poleward motion speed changes

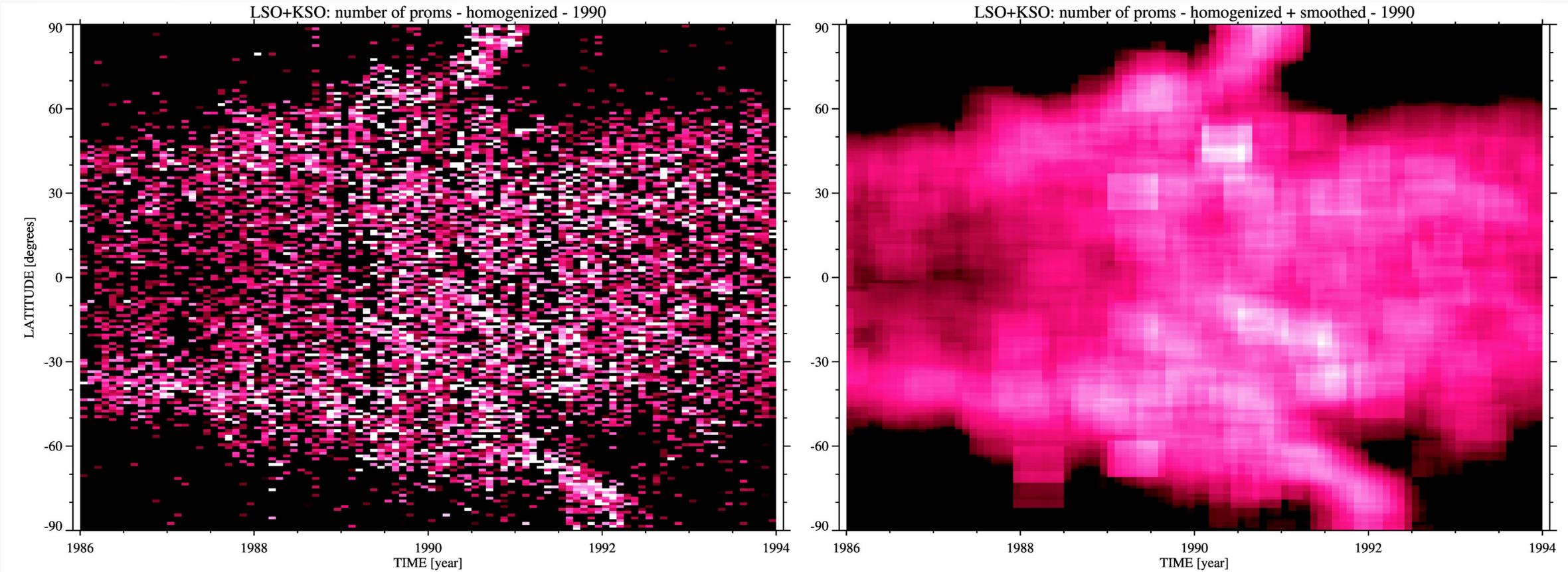
Polar prom branches: cycle 20



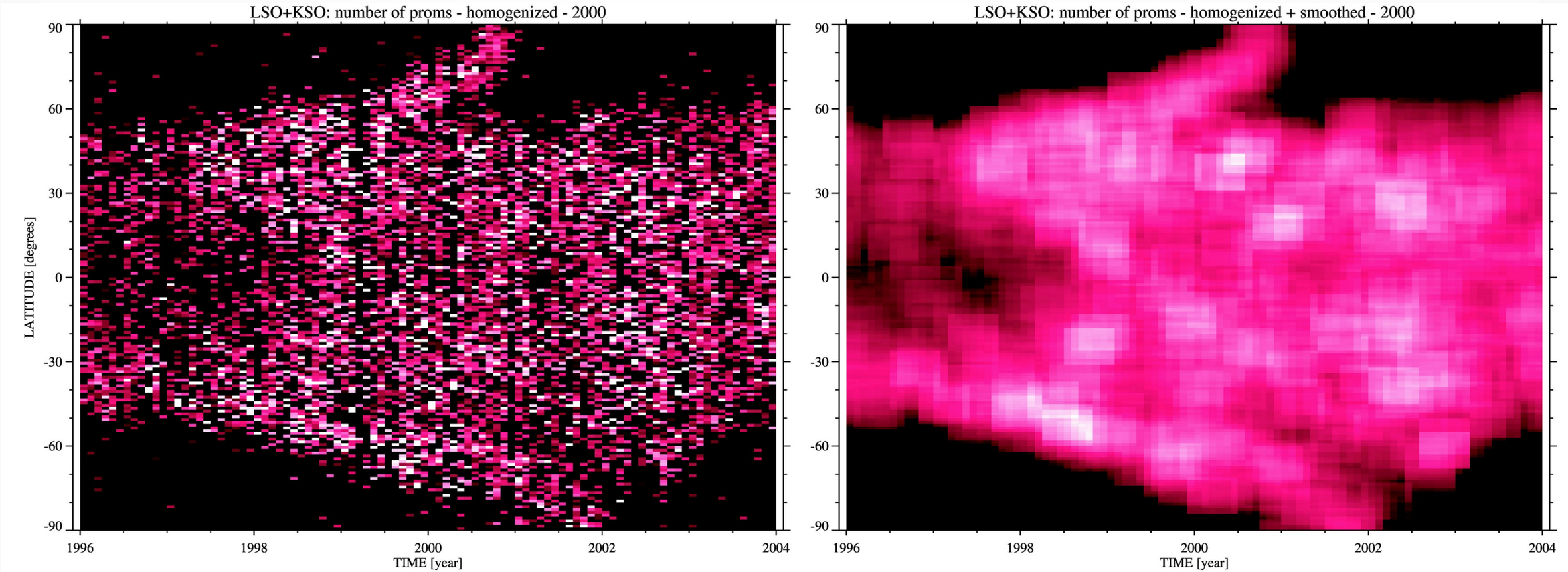
Polar prom branches: cycle 21



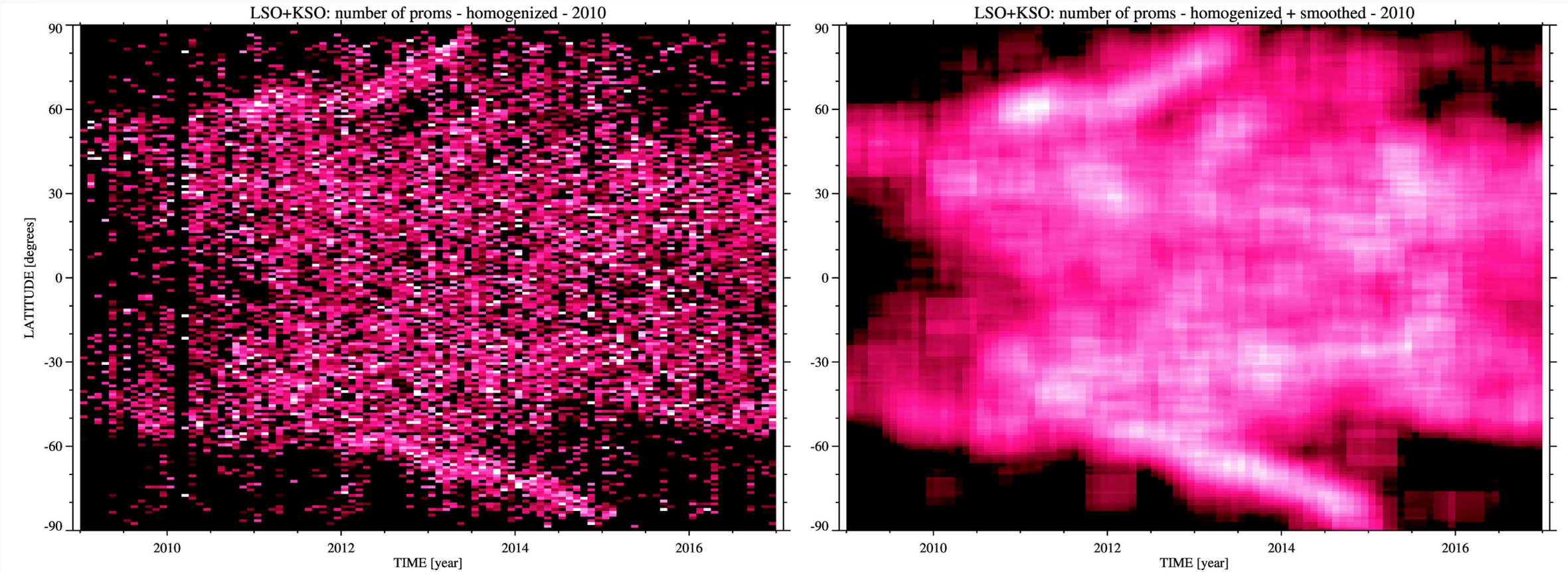
Polar prom branches: cycle 22



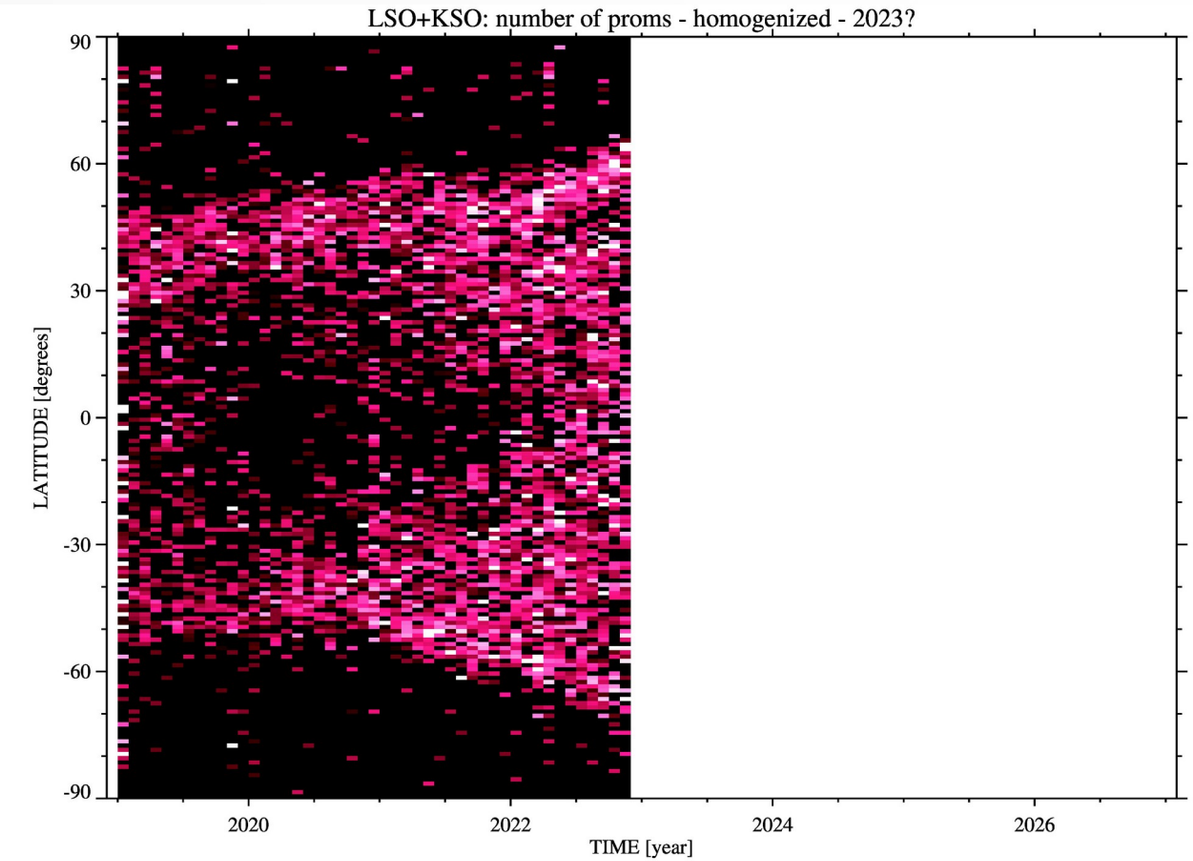
Polar prom branches: cycle 23

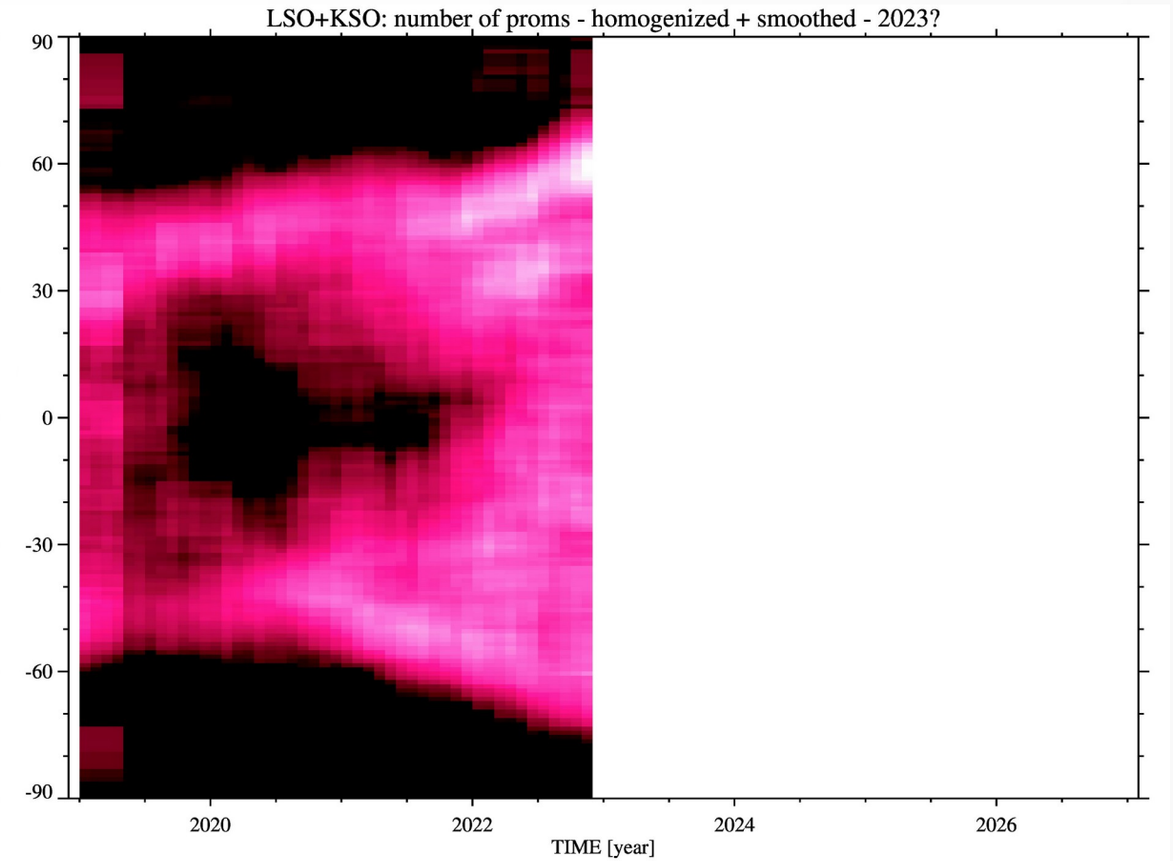


Polar prom branches: cycle 24



Polar prom branches: cycle 25





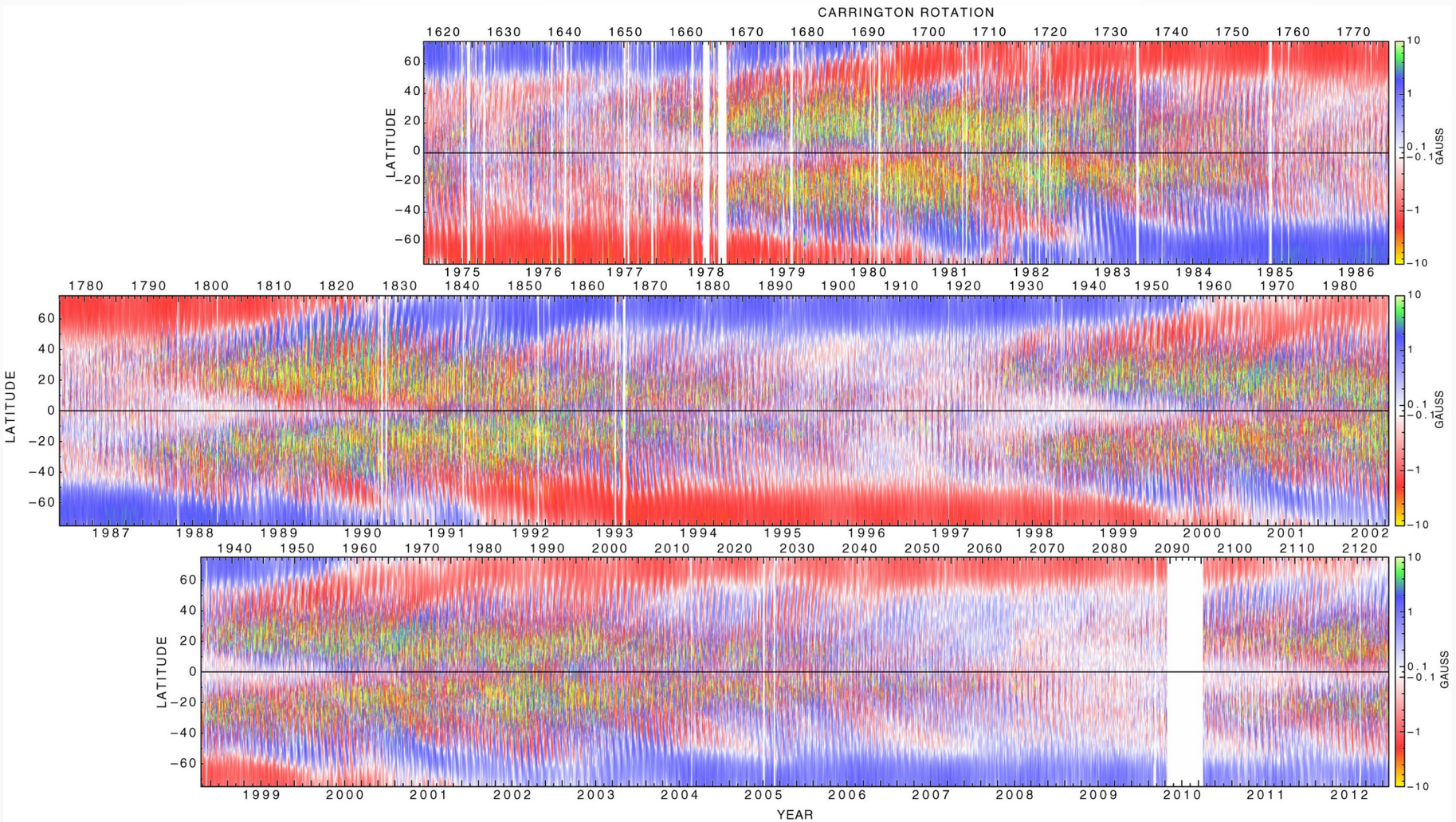
Polar branches ~ pole MF reversals

- An attempt to relate the parameters (arrival time, arrival speed, arrival speed changes) of the poleward motion of the prominences to the photospheric emerging magnetic flux and their disperions
  - qualitative only
  - only for cycles 21 (~1980), 22 (~1991), 23 (~2000), 24 (~2014)
  - The magnetic field BKG data (MFs) - from figures only:
    - Magnetic Supersynoptic Chart for 1974 to 2012, R. Ulrich, http://obs.astro.ucla.edu/images/supersynoptic_18-cr1617_2124.jpg
    - Supersynoptic map for Cycle 24 based on GONG data, A. Pevtsov et al., J. Space Weather Space Clim. 2021, 11, 4

      https://doi.org/10.1051/swsc/2020069

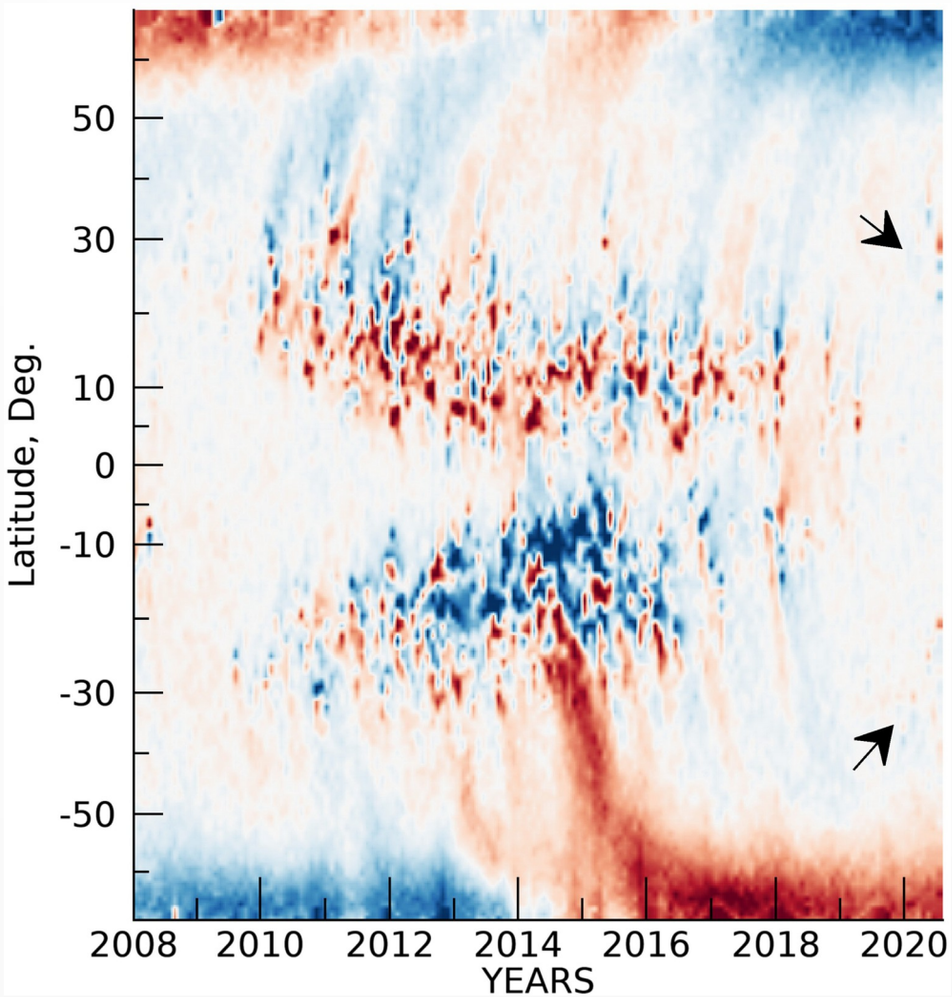
Polar branches ~ pole MF reversals

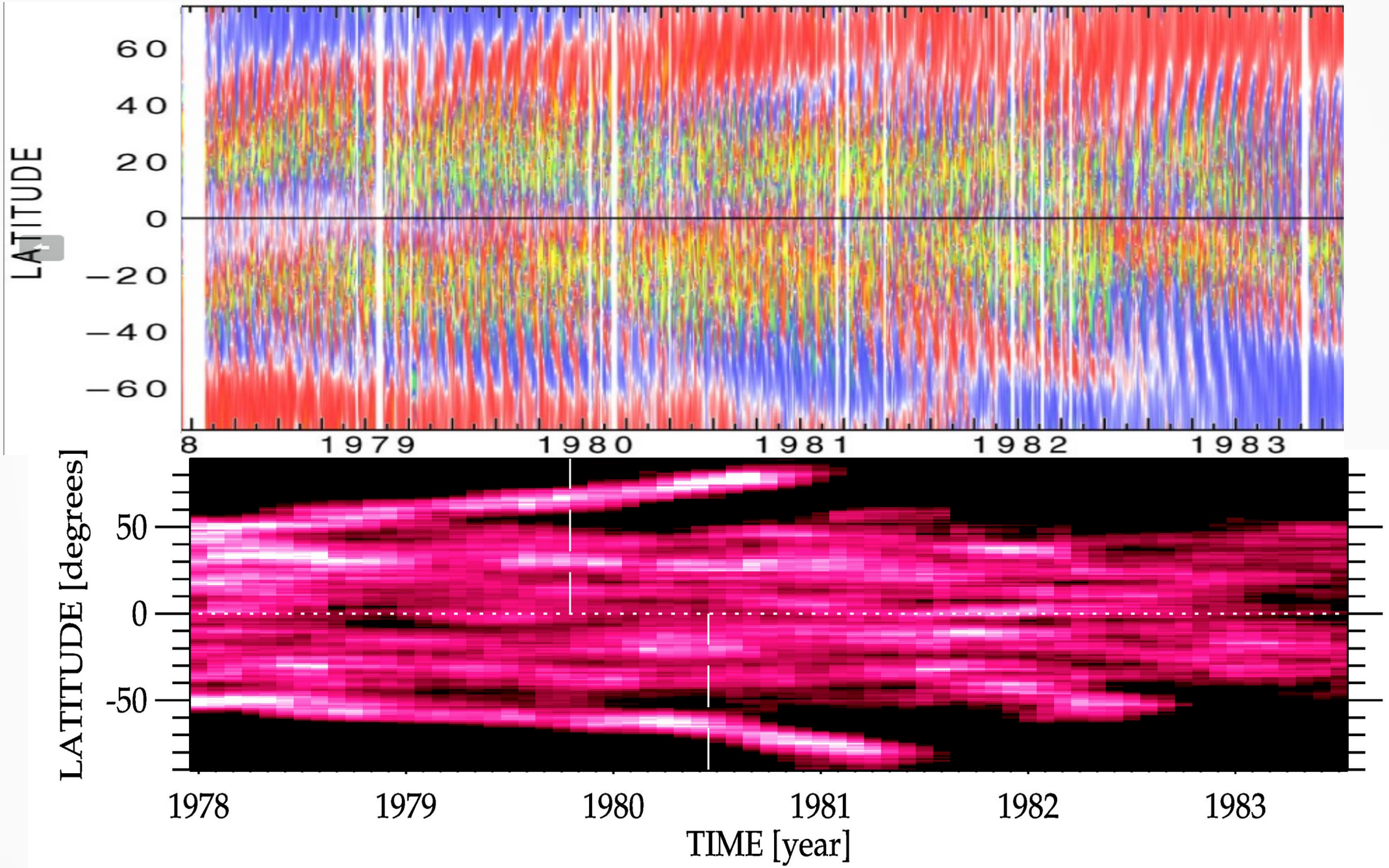
- Magnetic Supersynoptic Chart for 1974 to 2012, R. Ulrich

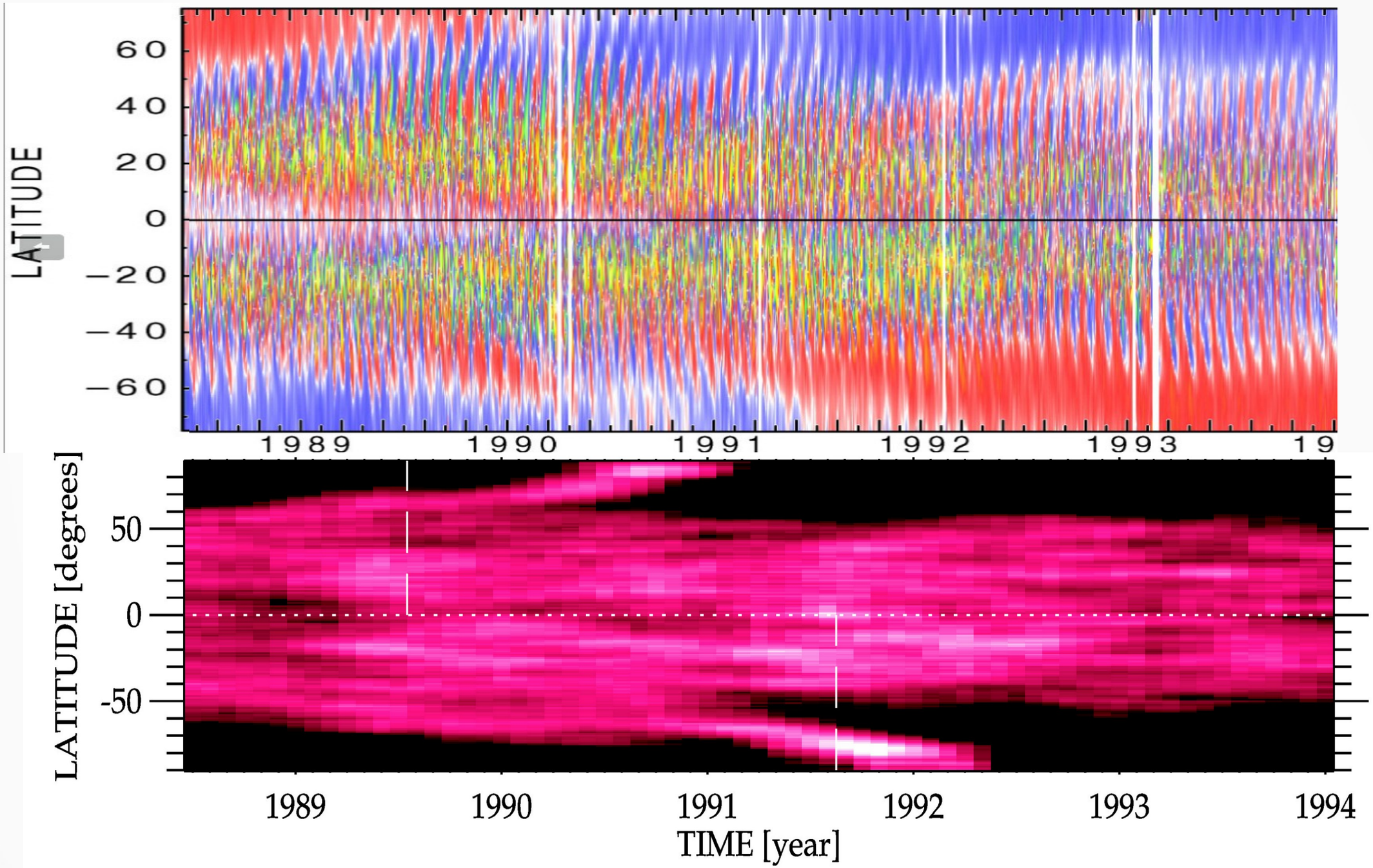


Polar branches ~ pole MF reversals

- Supersynoptic map for Cycle 24 based on GONG data, A. Pevtsov et al.




LATITUDE
60
40
20
0
−20
−40
−60
8
1979
1980
1981
1982
1983
LATITUDE [degrees]
50
0
-50
1978
1979
1980
1981
1982
1983
TIME [year]


LATITUDE
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−20
−40
−60
1989
1990
1991
1992
1993
19
LATITUDE [degrees]
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0
-50
1989
1990
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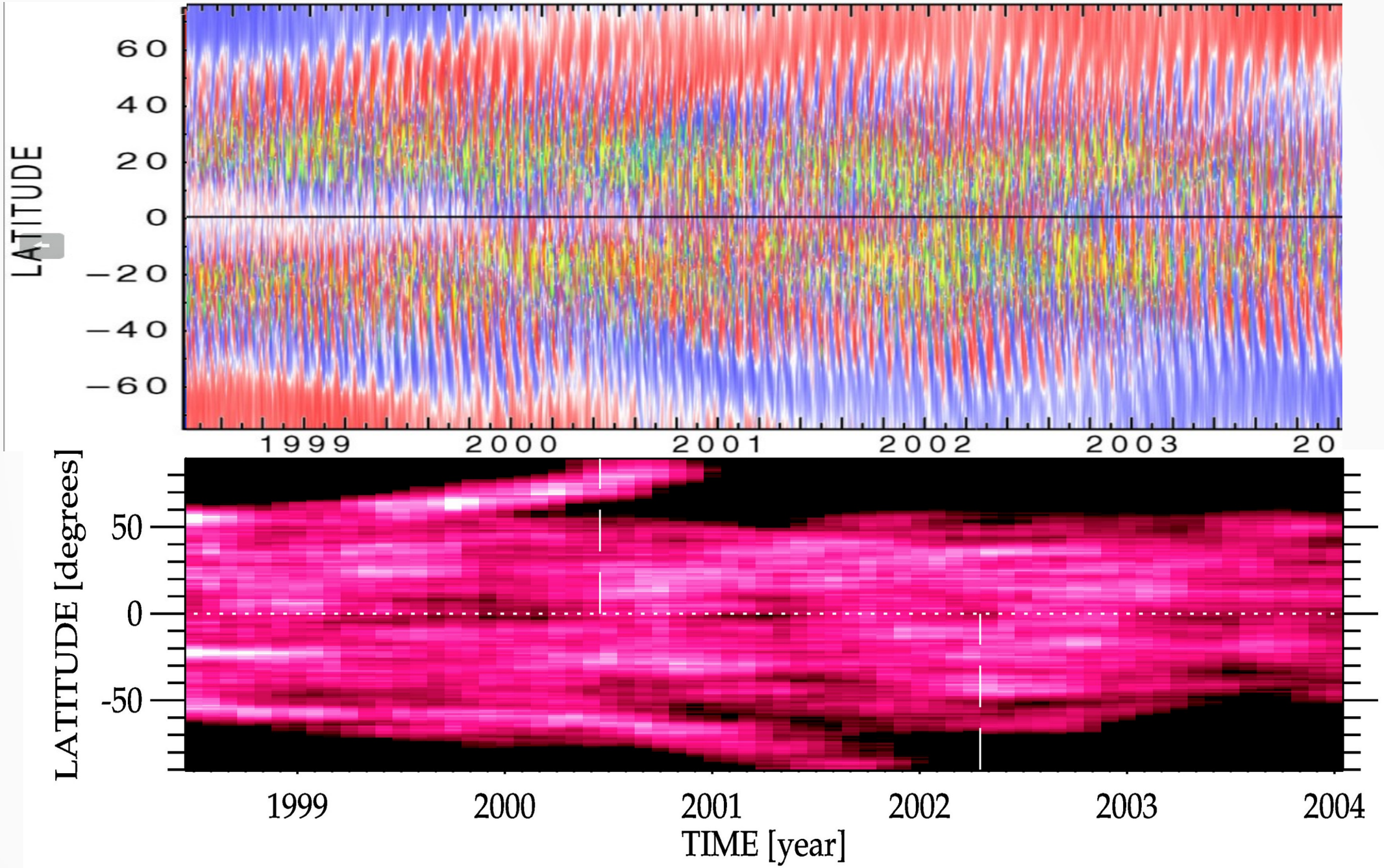
1993
1994
TIME [year]


LATITUDE
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40
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−20
−40
−60
1999
2000
2001
2002
2003
20
LATITUDE [degrees]
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1999
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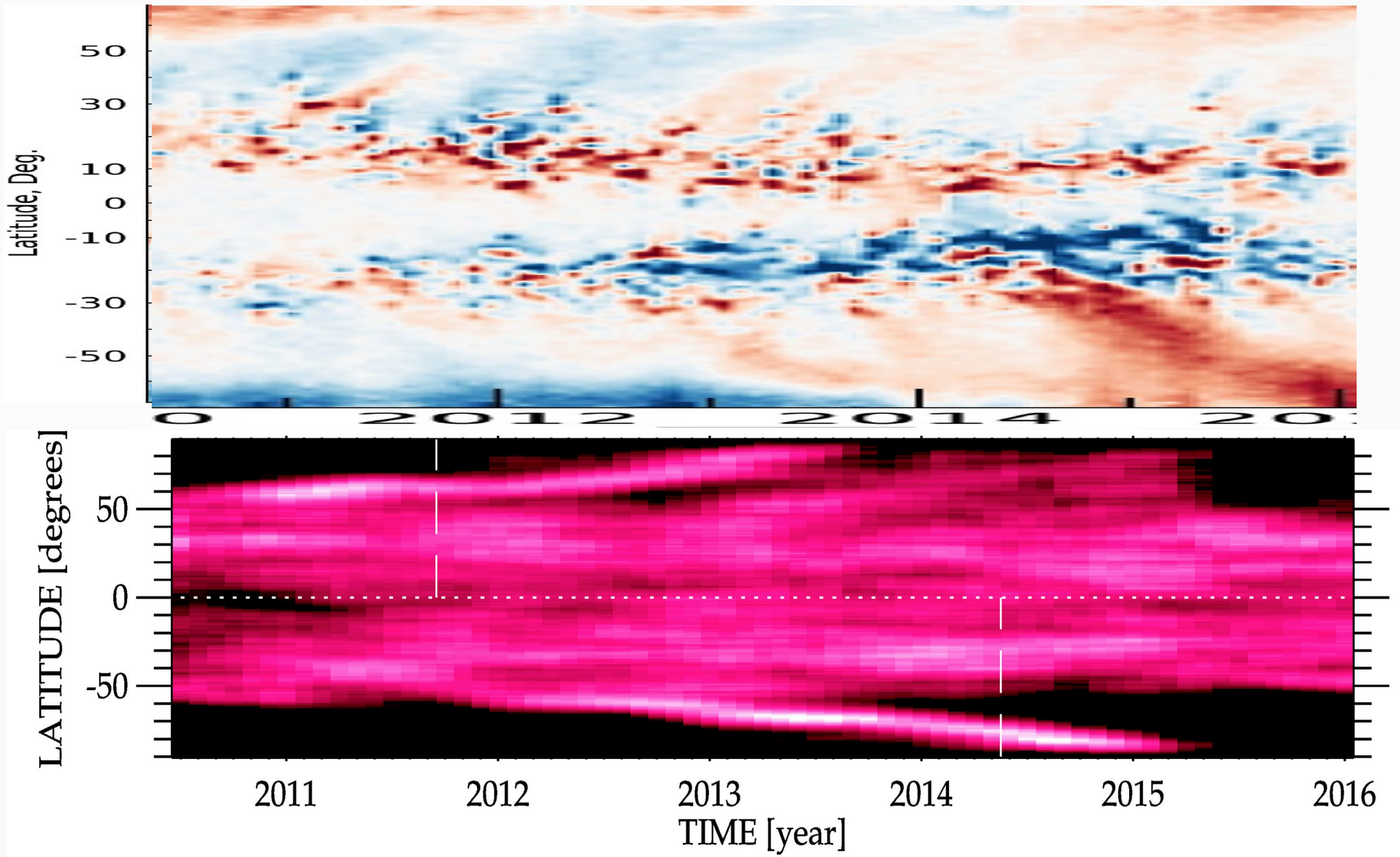
2001
2002
2003
2004
TIME [year]

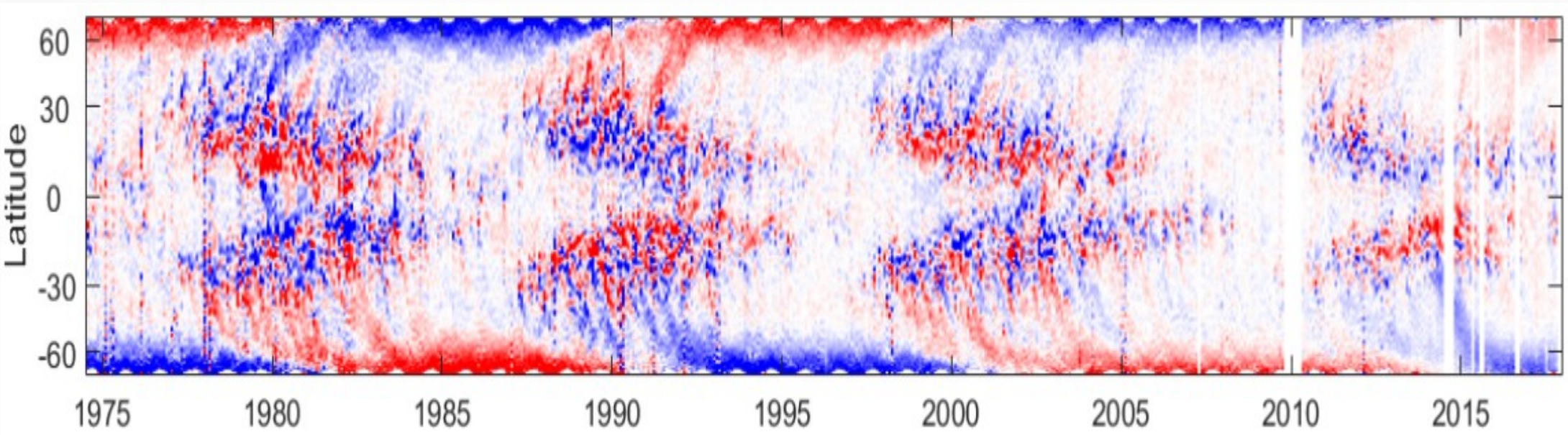

Latitude, Deg.
50
30
10
0
-10
-30
-50
2012
2014
LATITUDE [degrees]
50
0
-50
2011
2012
2013
2014
2015
2016
TIME [year]

Summary

- the prominence primary polar banch pole arrival time and MF pole reversal time in a close relation
- Arrival speed and its possible change seem to be in relation to the surges of the photospheric emerging magnetic flux and their disperions

Next?

- Moving forward from the qualitative to a quantitative analysis of the relation of the promience poleward motion timing and parameters on the photospheric emerging magnetic flux surges and their disperion
- A promising data sets of the homogenized MF data: Virtanen, I. and Mursula, K. A&A 626, A67 (2019). data of WSO, the MWO, Kitt Peak, SOLIS/VSM, SOHO/MDI, and SDO/HMI, extenstion to the actual time would be welcome



Future?

- Analysis for determination of possible qualitative relations derived between the polar prominence branches timing and parameters and the MF emergence
- In case of the solid resulting qualitative relations derived between the polar prominence branches timing and parameters and the MF emergence:
  - An estimation of the MF pole reversals for the cycle 20 using the LSO/KSO prom catalogue (i.e. before start of photospheric patrol magnetographic measurements)
  - A possible extension of information on the MF reversals back to 1880 using the available solar disk H alpha prominence observations and their catalogues