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Intercomparison of Mid-latitude Storm diagnostics

First results

Interlaken Workshop 30/3 - 1/4

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Sponsored by Swiss Re

Contents

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- Differences between methods
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- Conclusions

Project members

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Executive committee:

U. Neu, ProClim, Bern/SUI (project coordination; sponsored by Swiss Re)
X.L. Wang, U. Ulbrich, G. Leckebusch, C. Raible

Background

What is the project about?

- Characteristics of cyclone activity and quantification of trends **depend on the methodologies** used for storm track detection
- We need **knowledge** about**:**
  advantages and restrictions of different analysis schemes and **their influence on results**

  ⇒ better synthesis of results and proper interpretations

Aims of the project

- **Intercomparison** of the results using different analysis methods
- **Assessment of the methodologies**
- point out the **specific information** given by **specific methods**

What did we do?

- Evaluated different methods

  ⇒ differences in schemes

- Defined a standard **intercomparison experiment**, calculating storm tracks with all individual methods, using

  - ERA-interim 1.5° reanalysis 1989 - 2009 (ongoing)
  - ERA-interim 0.75° reanalysis for individual storms (future)

  ⇒ differences and similarities in results

Differences in schemes

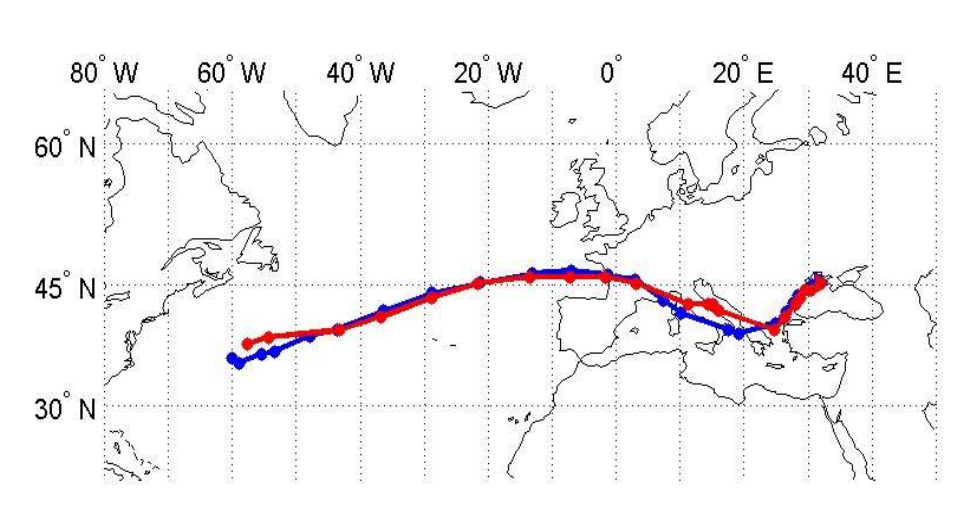
- Pre-processing:
  - grid transformation (⇒ different resolution)
  - data filtering
- Identification method:
  - different metrics (SLP minima; vorticity; pressure contours; 850 hPa minima)
  - different elimination criteria (for vorticity, core pressure, pressure gradient, amplitude, terrain height, lifetime)
  - different treatment of special cases (splitting of cyclones; inclusion/exclusion of open systems; cyclone distance)
- Tracking
- Intensity measures (vorticity, SLP minima, gradient)
- Post-processing
  - presentation (intervals, etc.)

Differences - Examples

Use of different metrics

Example of storm "KLAUS"

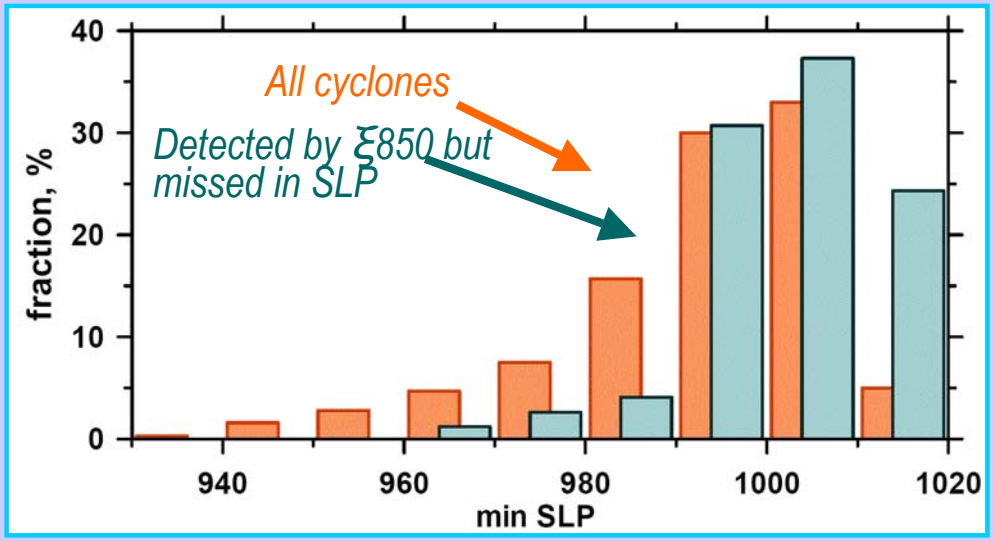
M08 (based on SLP minima)
vs.
M02 (based on vorticity)



Liberato et al.

Difference between cyclones detected by 850hPa vorticity and SLP **(M12)**

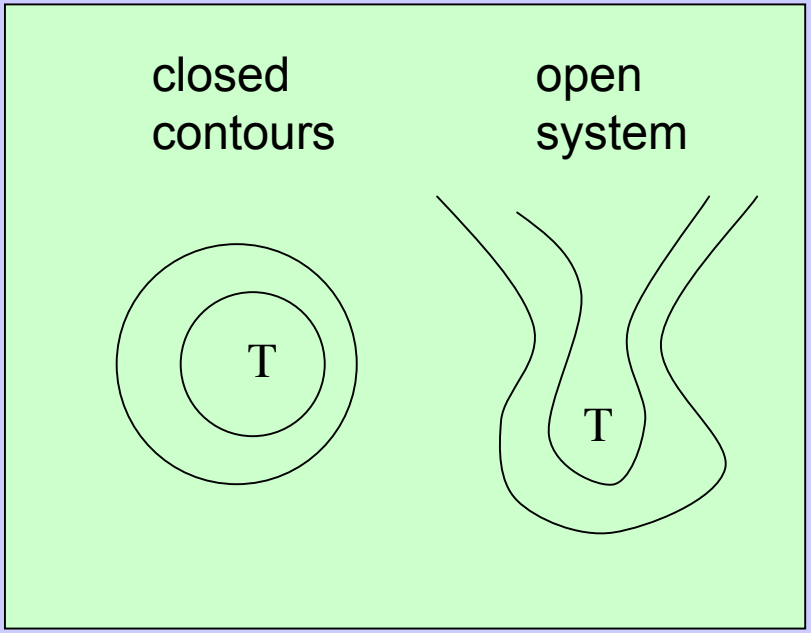
Vorticity detects cyclones earlier and weaker ones



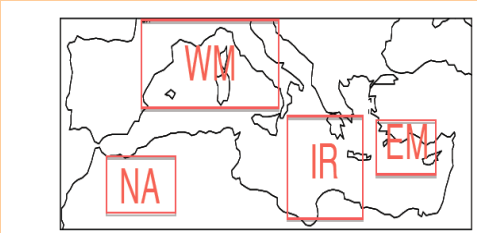
Rudeva and Gulev

Differences - Examples

Inclusion/exclusion of open structures



Cyclogenesis in the Mediterranean:



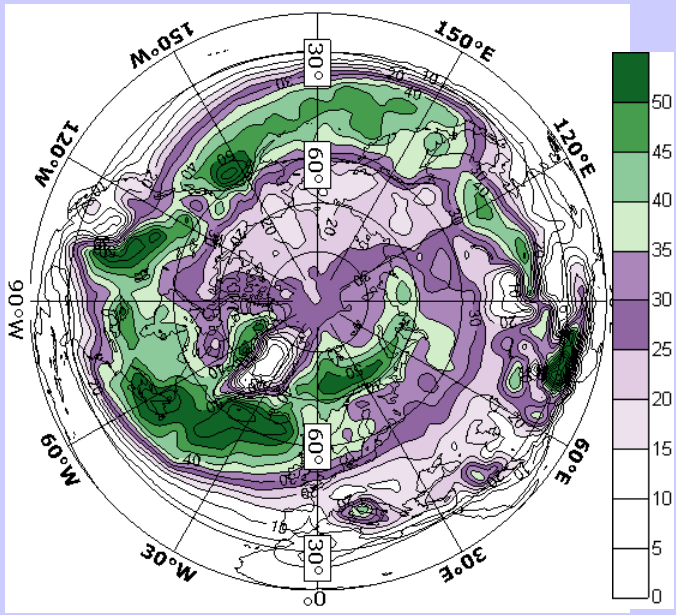
All	M11: 1181 closed / 986 open depr. M16: 1630
WM	M11: 429 closed / 301 open depr. M16: 470
EM	M11: 124 closed / 62 open depr. M16: 117

Reale, Lionello et al.

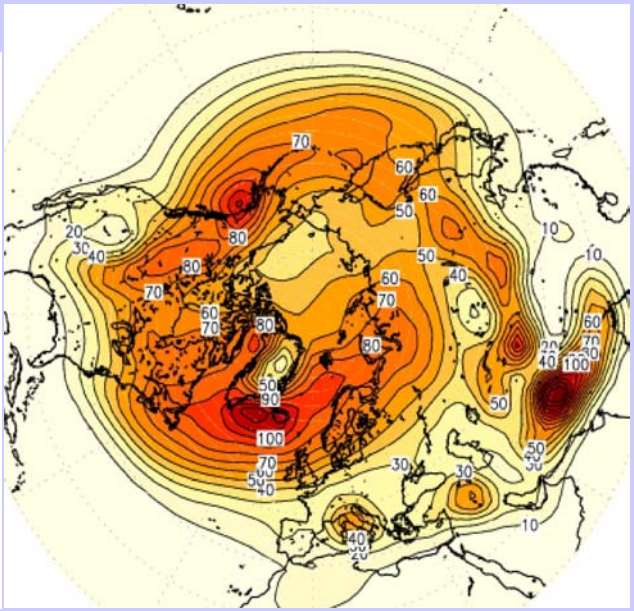
Main differences

Presentation

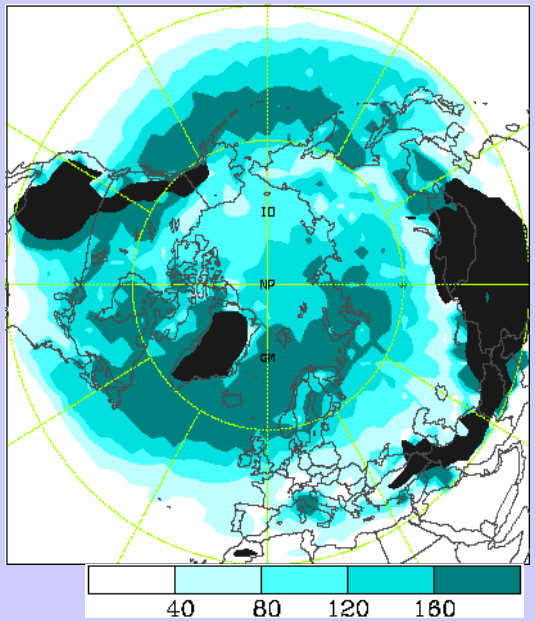
Track density (M02): same tracks, different presentation



I. Rudeva et al.



S. Ulbrich et al.



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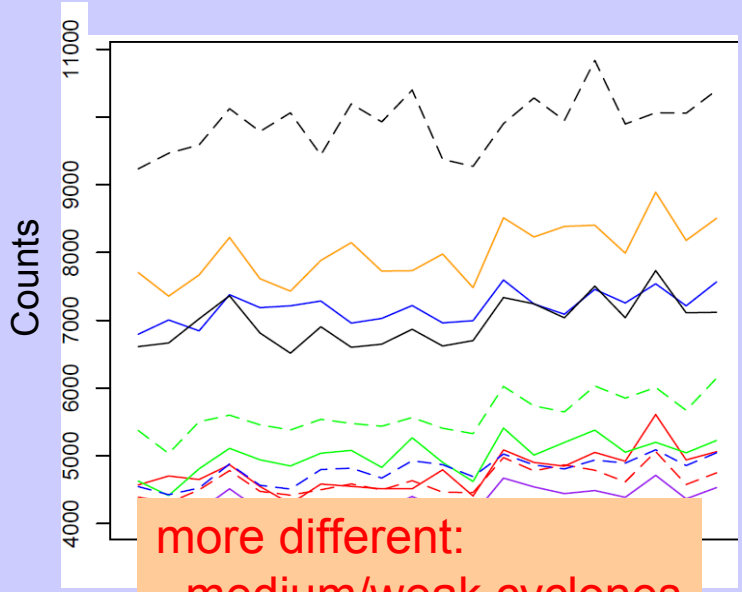
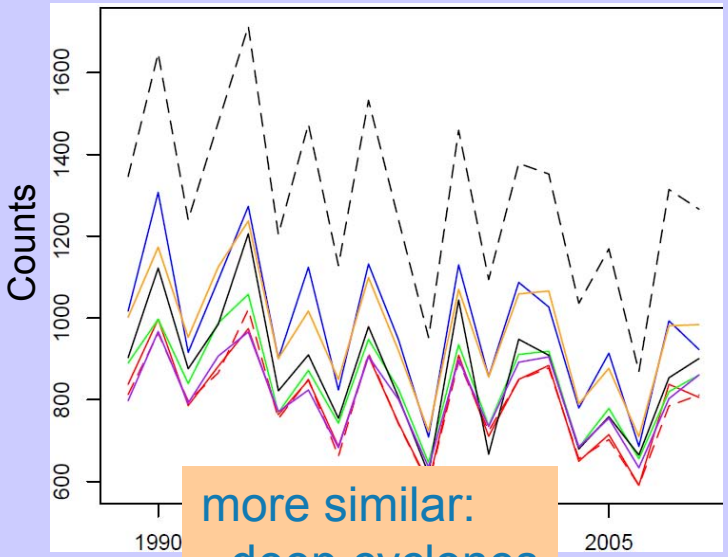
winter (JFM) counts and mean intensity NH

M02
M09
M9a
M10
M12
M13
M20
M22

all cyclones

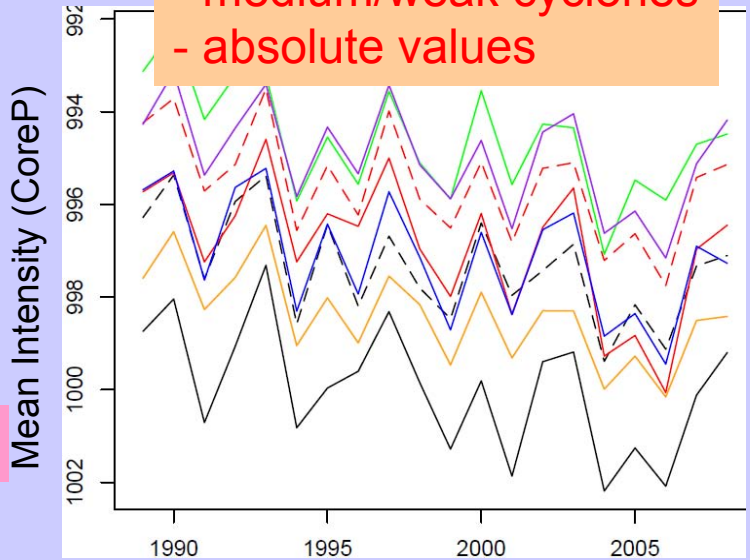
deep cyclones (core P ≤ 980 hPa)

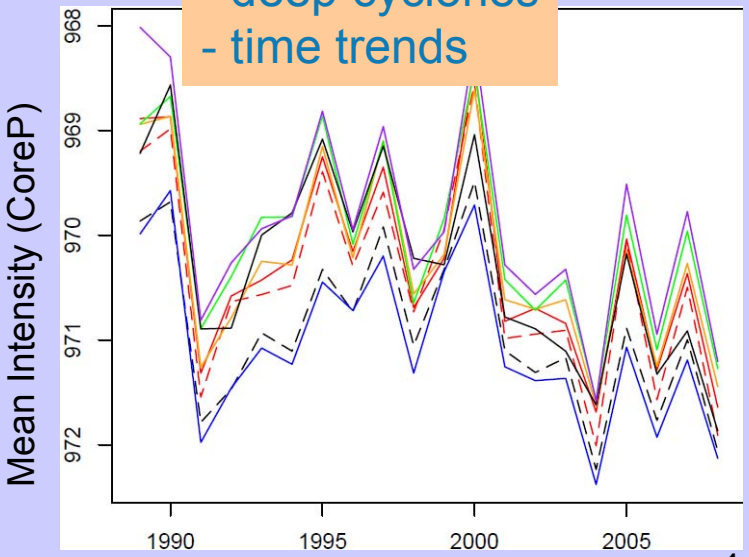




more different:
- medium/weak cyclones
- absolute values

more similar:
- deep cyclones
- time trends





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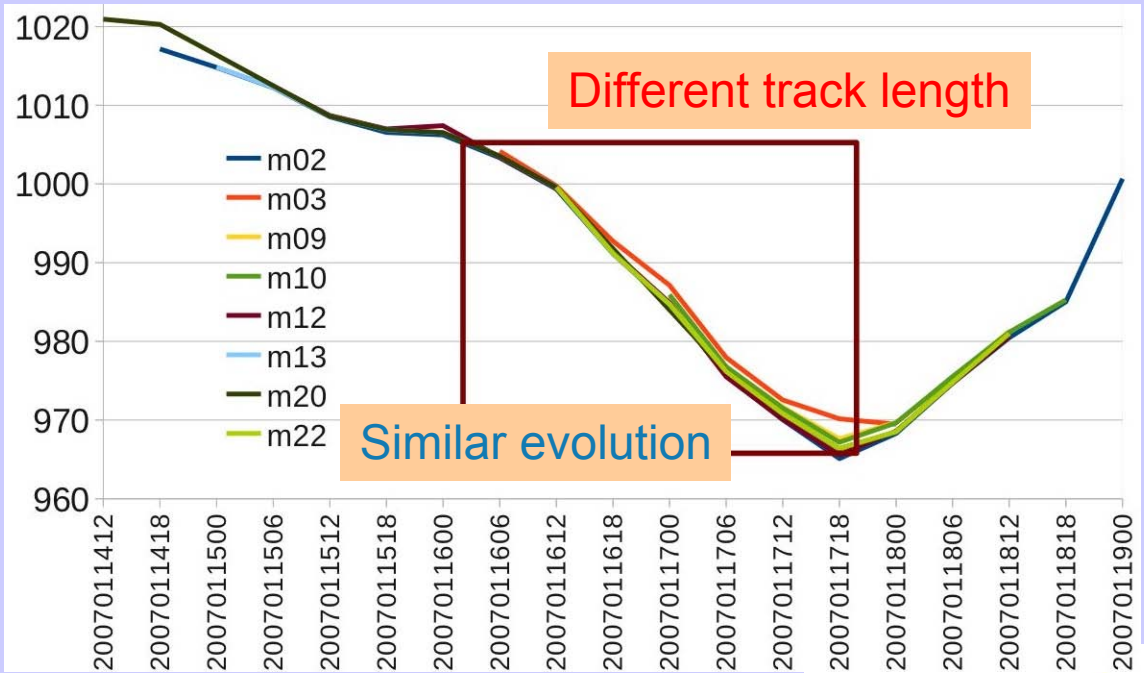
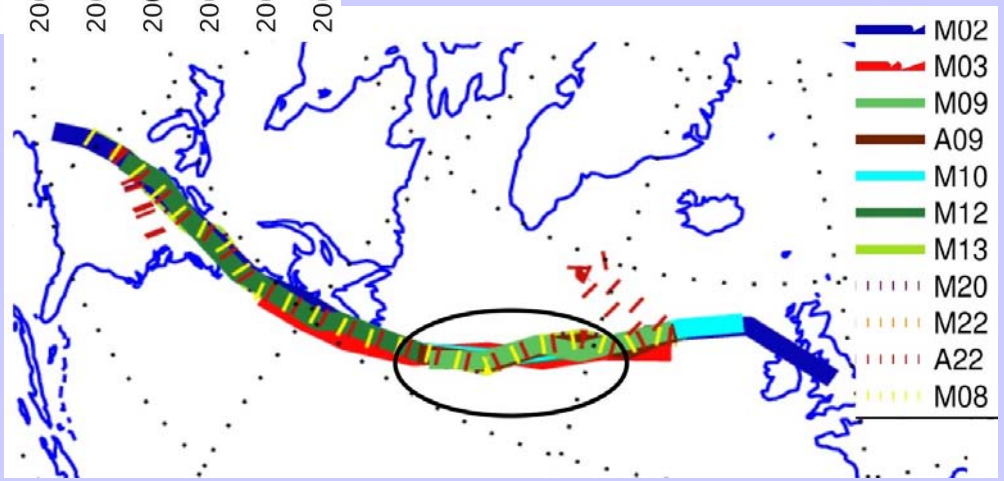
special event: storm "Kyrill" (Jan. 2007)



Temporal evolution

S. Ulbrich

Individual tracks



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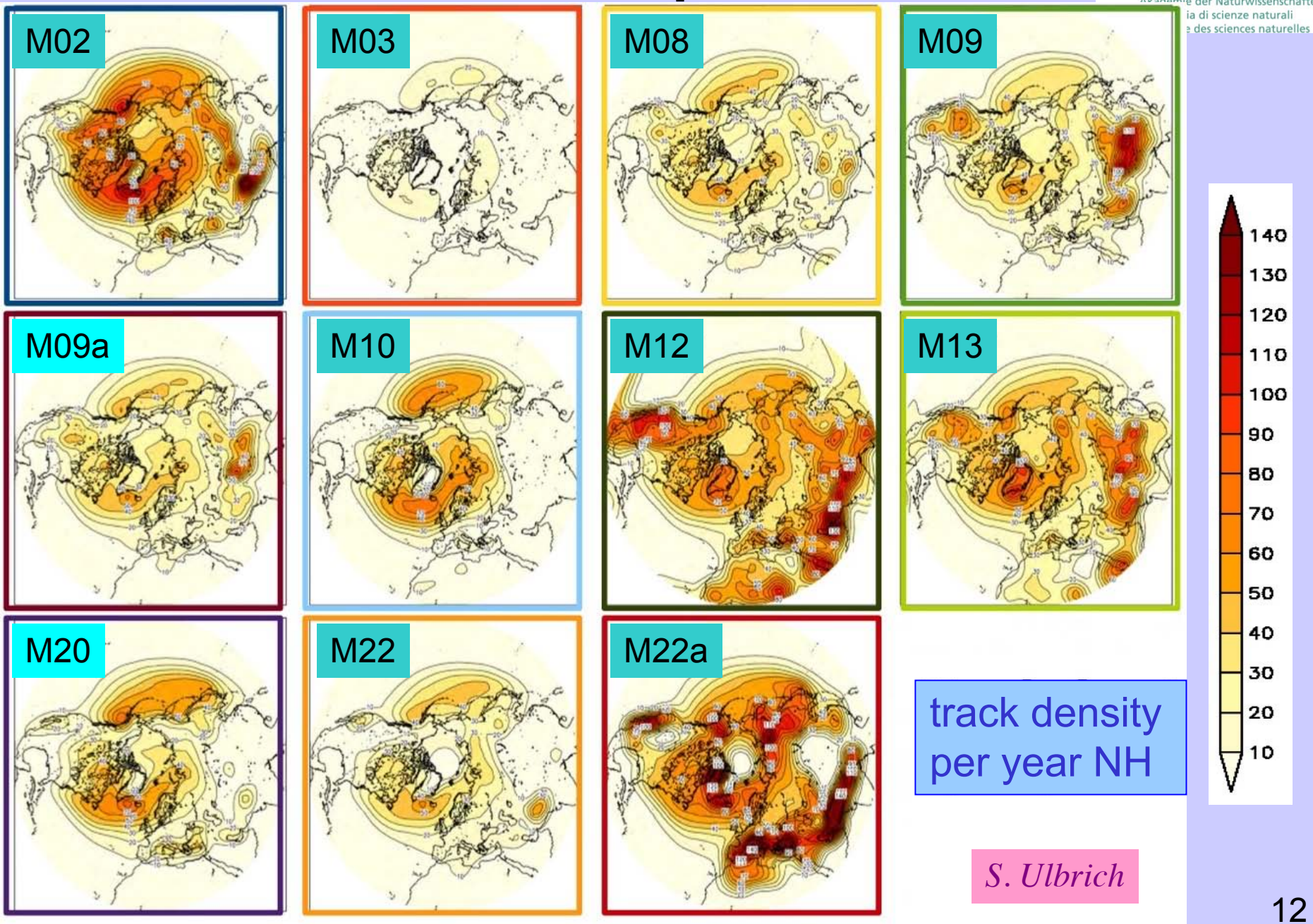

track density per year NH

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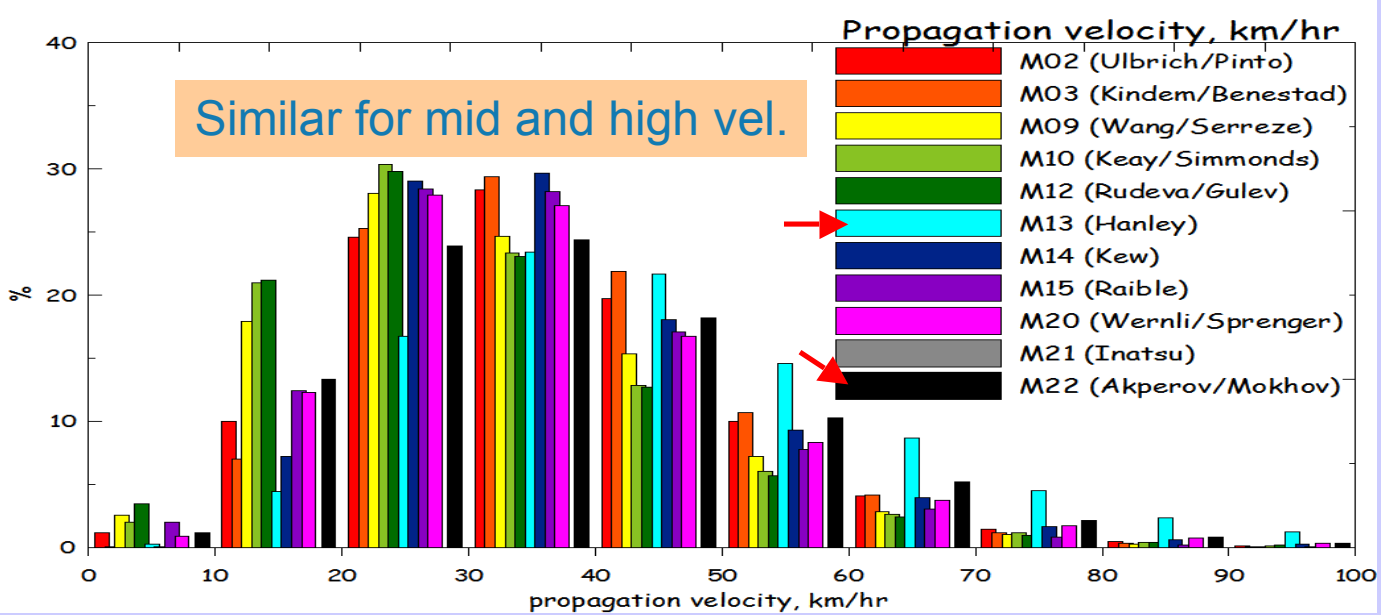
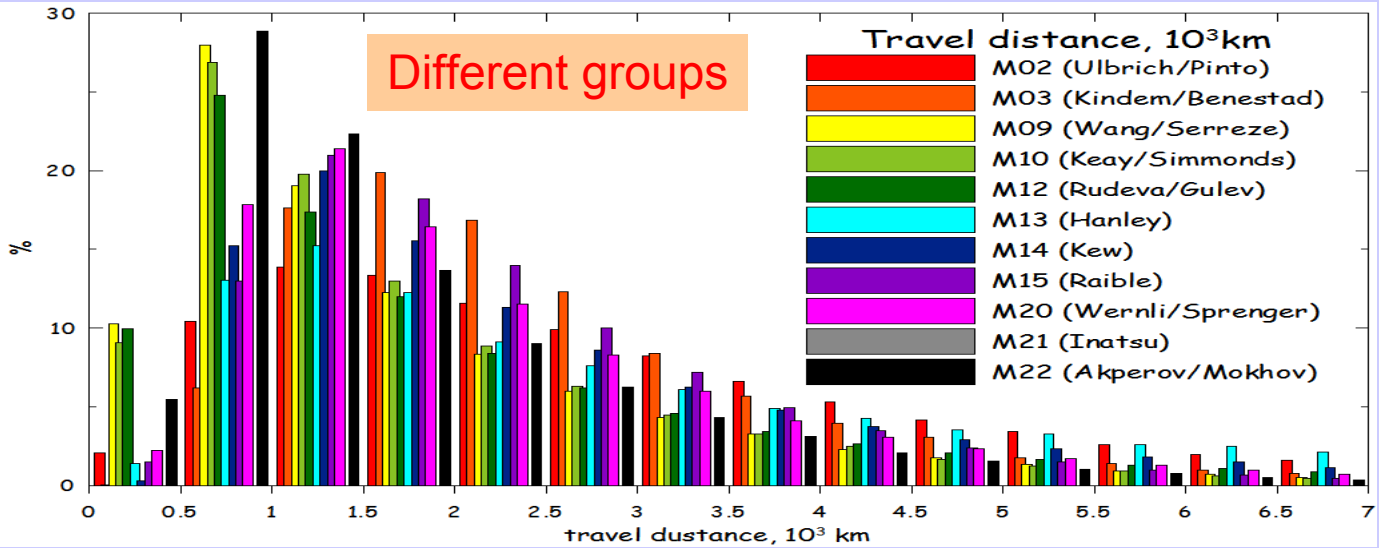
Life cycle NH





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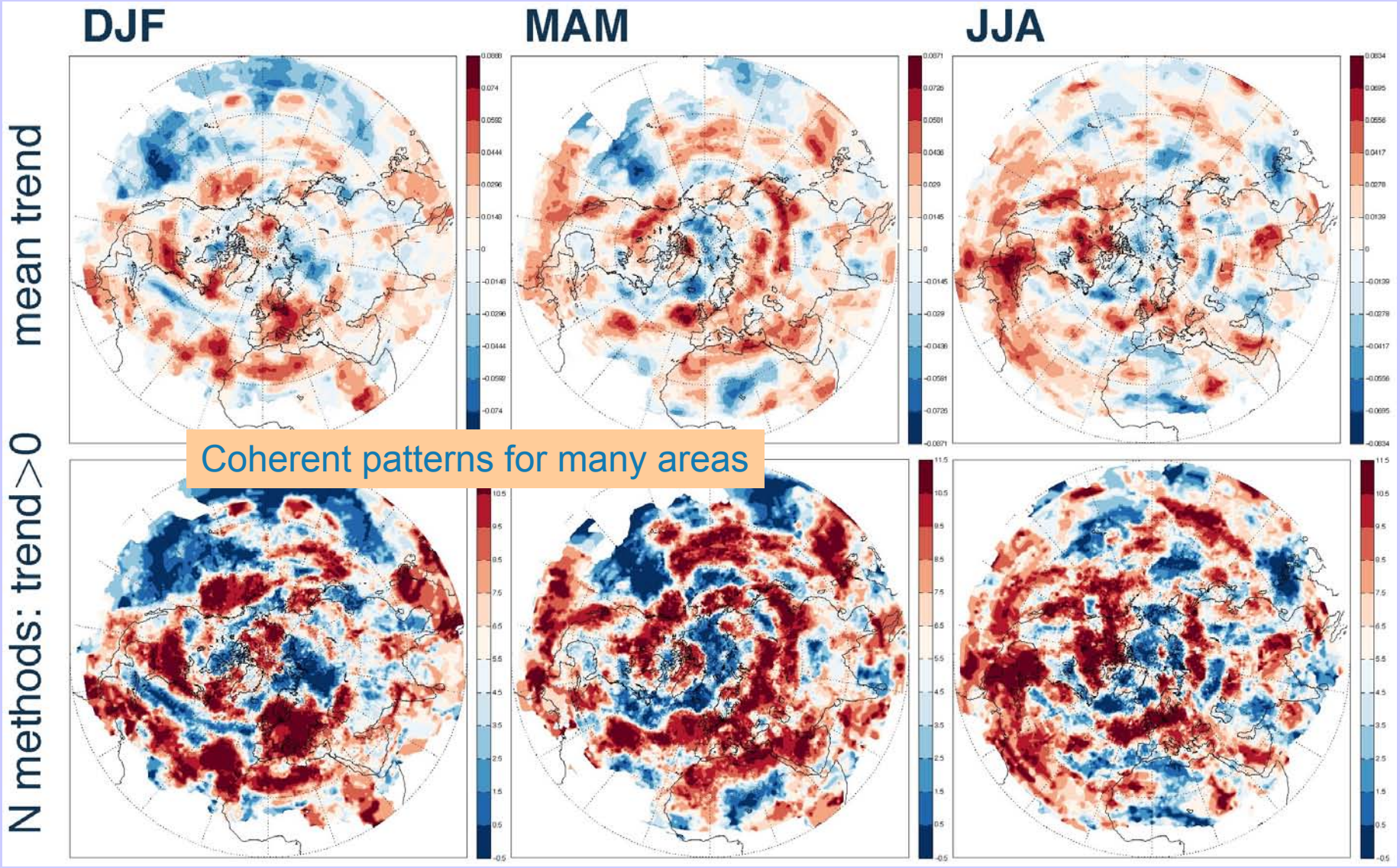
Trends of track density NH

S. Kew



Coherent patterns for many areas

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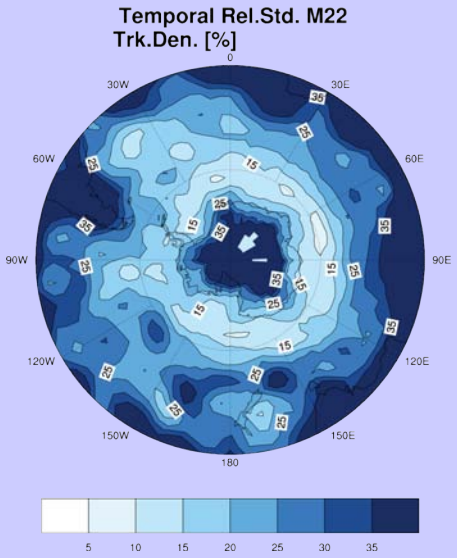
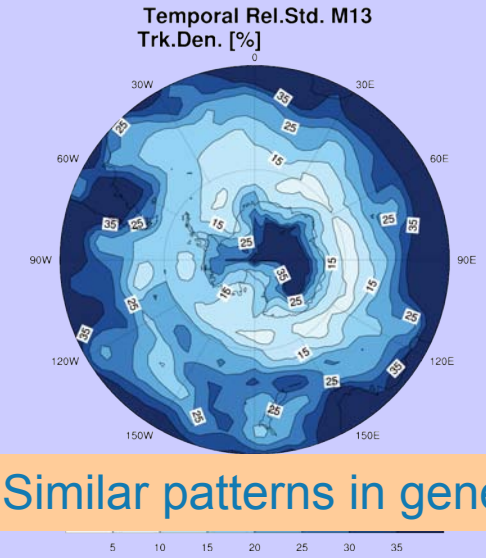
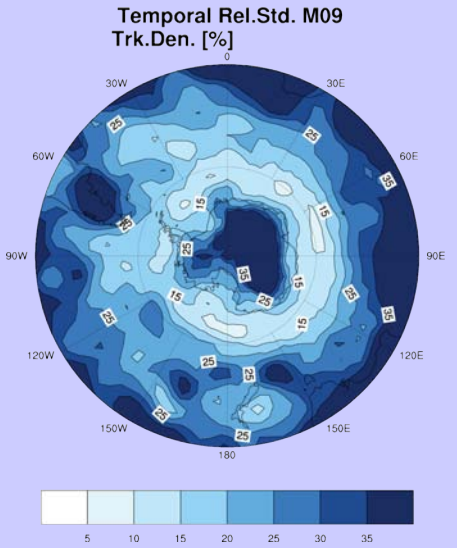
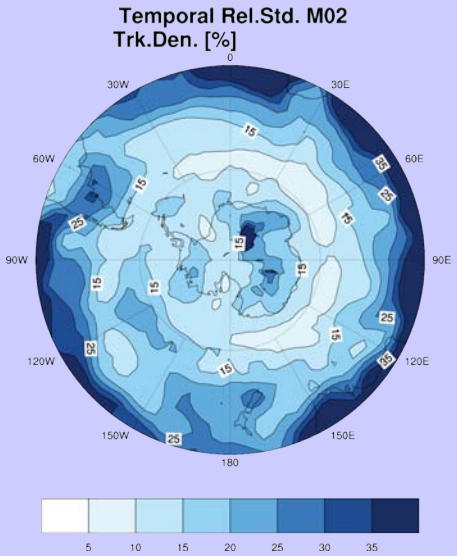
Interannual variability of track density **SH**

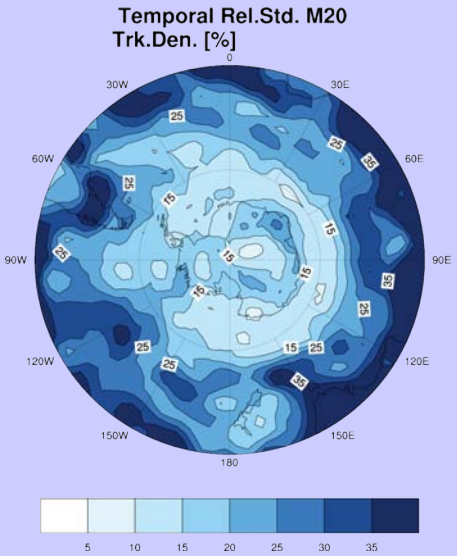


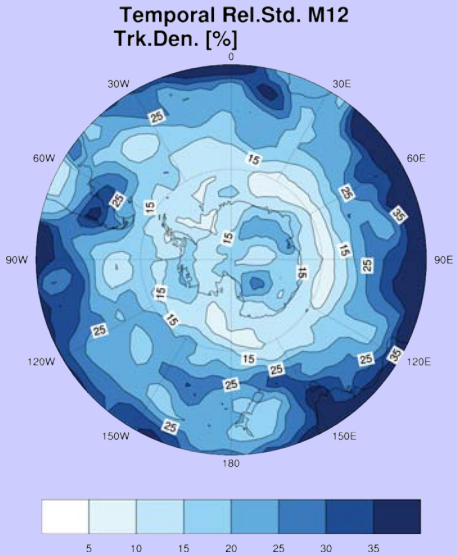




Similar patterns in general







G. Leckebusch

Conclusions

- broad **variety of differences** between methods
- For **some aspects** of cyclones **results differ** considerably
  (e.g. numbers, geographical distribution of tracks)
- For **some aspects** of cyclones results show **noticeable consistencies**
  (e.g. trends, geographical distribution of the trend sign, tracks and intensity of deep cyclones)
- For better attribution of differences to specific methodological aspects **further analysis is needed**
  (e.g. analysis of individual or extreme tracks)