Intercomparison of mid latitude storm diagnostics (IMILAST)

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Extratropical cyclone over Iceland (Source: Wikimedia commons)

Motivation and background

Storm-associated damages are amongst the highest losses due to natural disasters in the mid-latitudes. **Diagnostics** of the observed and knowledge of future **changes in extratropical storm frequency, intensity, and tracks** are crucial for insurance companies, risk management and adaptation planning.

The challenge

Mid-latidude storms are complex systems with highly variable properties. **Characteristics** of storm activity and trends **strongly depend on the methods used** for cyclone track detection in observational and model data. The magnitude and even the sign of linear trends of cyclone frequency or intensity might depend on the detection and tracking methods used (Ulbrich et al. 2009, Raible et al. 2008).

Aims of the project

- To provide an assessment of uncertainties inherent in the mid-latitudinal cyclone tracking by comparing different methodologies.
- To intercompare the metrics of mid latitudinal cyclone activity used for different purposes.
- To point out what information can be drawn from each method.
- To discuss the possibility of an identification of a limited set of methods which can provide the most important information.

Working plan

- Establish an inventory of the existing cyclone identification and tracking methods (2010)
- Intercomparison project (climatological studies using different meteorological datasets on which the schemes are applied: reanalyis data set, GCM data, set of individual storms); (ongoing)
- Workshops and discussion of results
- Preparation of papers containing the results (see Refs.; special issue in **Tellus**: http://www.tellusa.net/index.php/tellusa/pages/view/thematic)
- Preparation of intercomparison final report (2015)

Example of results I: Comparison of automated with manual tracking

The comparison of automated tracking schemes is accompanied by the question of what would be the 'true' cyclone track. However, the 'truth' is not known, all the more there is even no common definition of a 'cyclone' itself.

Nevertheless manual tracks are often thought to be at least closer to the 'truth' than automatically derived tracks, althouth manual tracks also differ from each other.

The example below shows the comparison of cyclones derived by automated tracking schemes with those identified by manual analysis from synoptic charts.

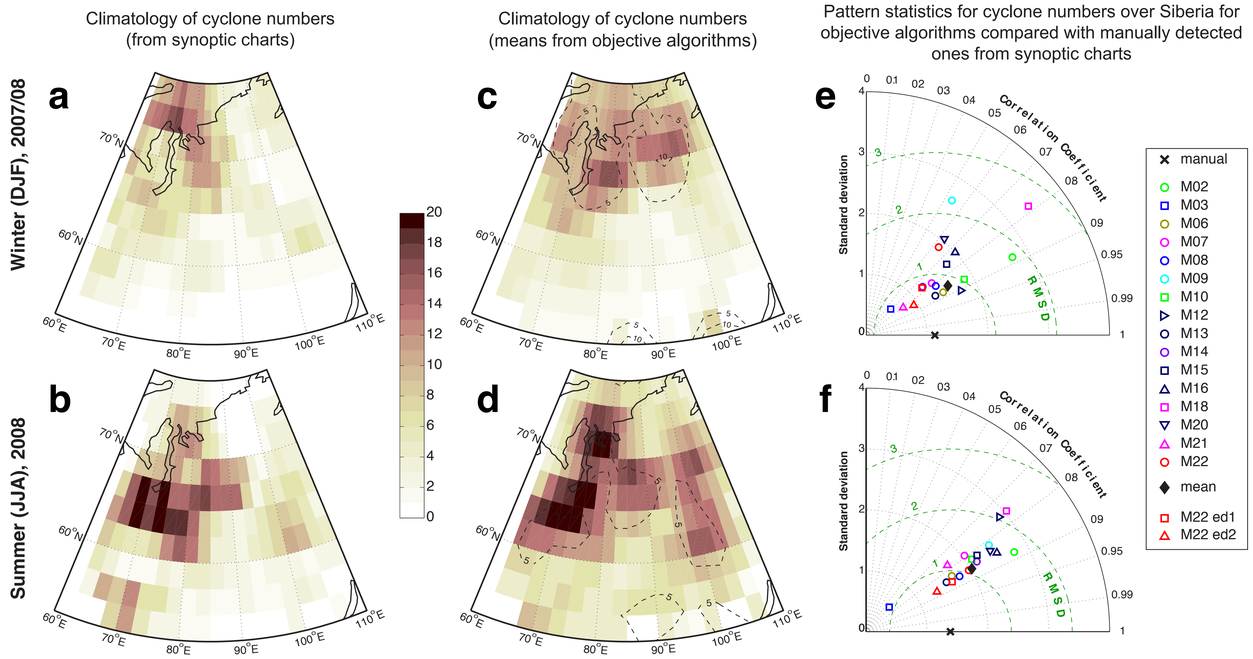

Figure 1: Results of the comparison of objectively identified mid-latitude storms from reanalysis with those detected manually from synoptic charts for the Siberian region (50–80N, 60–110E): climatology of cyclone number by manual detection from synoptic charts for (a) winter 2007/08 and (b) summer (2008); climatology of cyclone number from the mean of 16 objective algorithms for (c) winter 2007/08 and (d) summer (2008); pattern statistics for (e) winter and (f) summer for cyclone number, where manual tracking is taken as reference dataset. (M22 ed1: cyclones are taken into account only if the closed isobar is divisible by 5 hPa; M22 ed2: the difference between the cyclone minima and the last closed isobar ≥ 5 hPa).

Project participation
Any research group that is interested in participation in the project is highly welcome to do so.

Project homepage
www.proclim.ch/IMILAST/index.html

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Example of results II: Sensitivity of results to parameter choice

Rudeva et al. (2014) have analysed the sensitivity of cyclone characteristics to the choice of different parameters in automated tracking algorithms. The analysis has shown that cyclone tracking methods that produce a large number of cyclones are the most sensitive to different thresholds and parameter settings.

Figure 2 shows the number of cyclones identified by different methods depending on cyclone intensity. In DJF all the methods except for M02 agree well in the range of central pressure below 980 hPa. In JJA, this range increases to about 990 hPa. Generally, for the 200 most intense cyclones per season, all schemes agree relatively well in both winter and summer.

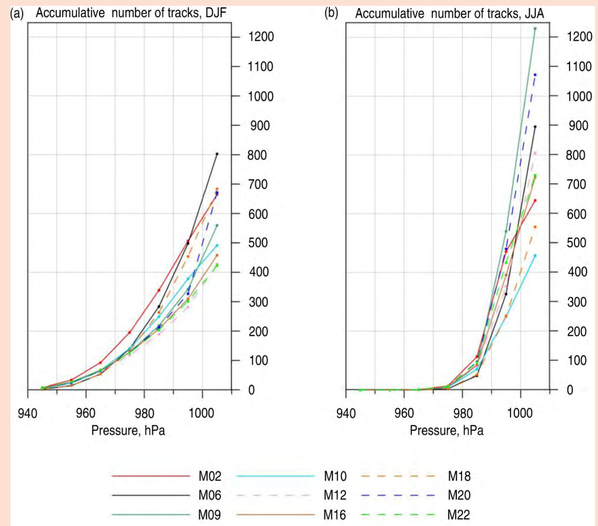

Figure 2: (a) DJF and (b) JJA cumulative distribution for the number of tracks per season as a function of cyclone intensity (minimal central pressure). The plots are built using 10-hPa wide bins (dots placed in the centre of the bins). Source: Rudeva et. al. 2014.

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