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Forum for Climate and Global Change
Forum of the Swiss Academy of Sciences

IMILAST

Intercomparison of Mid-latitude Storm diagnostics

A project overview

Urs Neu
ProClim- (Swiss Academy of Sciences)
and the IMILAST team

Sponsored by Swiss Re

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Project members

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Project team:

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G. Leckebusch, F-Univ. Berlin/GER
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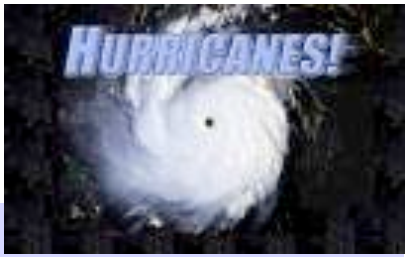
Executive committee:

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

Background



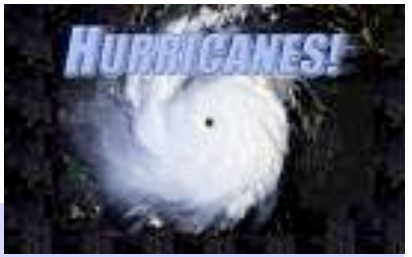
Why is it important?

- Diagnostics of observed and projection of future changes of extratropical storms are a key issue e.g. for insurance companies, risk management and adaptation planning
- Storm-associated damages are amongst the highest losses due to natural disasters in the mid-latitudes

⇒

- knowledge of future **changes in** extratropical cyclone **frequency, intensity, life time, and track locations** is crucial for strategic planning and minimization of disaster impacts

Background



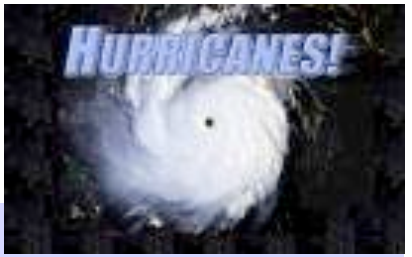
What is the problem?

- Characteristics of cyclone activity and quantification of trends may strongly **depend on the methodologies** used for storm track detection in observational and model data (Trigo 2006, Raible et al. 2008, Ulbrich et al. 2008)
- Different methods might lead to contradictory results based on the same datasets

$\Rightarrow$

- Users of the results (politicians, (re)assurance companies, etc.) are **puzzled** and do not know how to interprete the outcome of single studies

Background



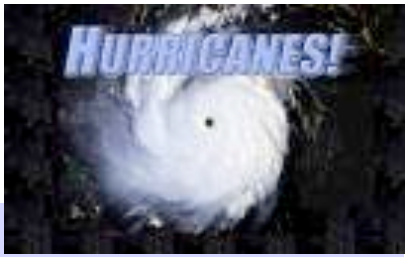
Why is this problem?

- mid-latidude cyclones are **complex systems**, and the temporal development, spatial structures and impacts are highly variable
- The quantification of storm strength is based on meteorological parameters describing **different aspects of the dynamic state** and development of the systems

$\Rightarrow$

- knowledge about advantages and restrictions of different schemes must be obtained to be able to provide a synthesis of results and proper interpretations

Aims of the project

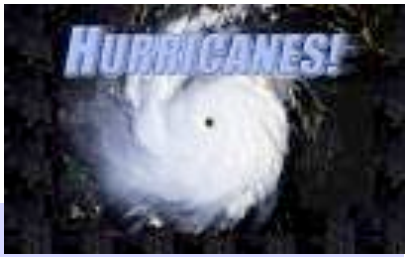


- to provide an assessment of all types of uncertainties inherent in the mid-latitudinal storm tracking by comparing different methodologies, for both cyclone identification and cyclone tracking respectively.

- to intercompare the metrics of mid latitudinal cyclone activity (identification/tracking) used for different purposes

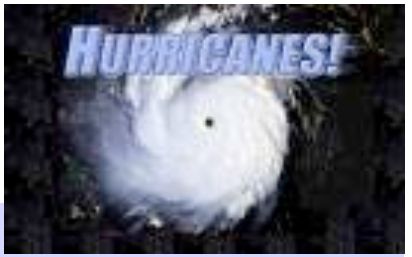
- to provide definitions of storms or cyclones and point out the informations that can be drawn from specific methods, depending on data availability (time/space resolution)

Activities



- **inventory of the existing methods** for cyclone identification and tracking (catalogue)
- to **compare** the existing identification and tracking methods using data of different space-time resolutions (climatologies and single storms)
- to compare the algorithms' **sensitivity to spatial and temporal resolution** of the underlying data
- to provide information of the **relative uncertainties** arising from different methods (including results for limited areas).
- to estimate and intercompare the **information content** provided by the methods
- to provide a systematic **intercomparison of different quantities used** for describing cyclone activity and strength from a dynamical viewpoint
- to provide a **'users guide'** explaining the information that can be taken and the restrictions related to the individual standard
- discuss the **possibility of recommending specific methods** for different purposes and settings

Outcome



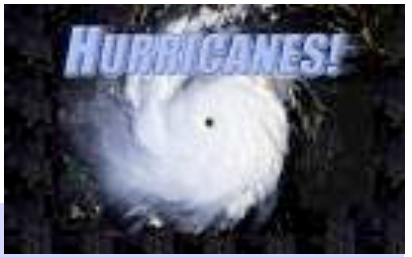
Final Report (or 'white paper') containing

- an overview of existing methods, including a description of the information contained in the results and the limitations of each individual standard method

- an overview of standard parameters for the quantification of cyclone activity and intensity characteristics, including their limitations

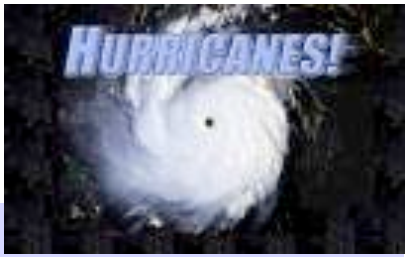
- comments on further work to be done

Working plan



- Collect the existing identification and tracking methods (March 2009) Prepare the methodologies catalogue with the standardized description of the methodologies (April/May 2009)
- Session at EGU meeting with presentations of suggestions concerning the intercomparison experiment, ev. credibility tests
- Define a standard intercomparison experiments (list of simulations, specified data sets, list of characteristics to be delivered) (Workshop after EGU meeting 25 April 2009)
- Set up a project data server and allocate data sets for the intercomparison experiments and output of te experiments (June 2009)
- Small intercomparison project (Starting summer 2009)
- Collection of results / preparation of draft report (autumn/winter 2009)
- Collect propositions concerning standard definitions (autumn 2009)
- Review of draft report (winter 2009)
- Follow-up workshop if necessary (autumn/winter 2009)
- Preparation of Final Report (spring 2010)

First results



15 Methods included

Storm identification

Parameters used:

- SLP: 13 (Minimum SLP:11, minimum 1000hPa:3, max. Laplacian SLP:3)
  Min. 850hPa: 1
- Wind speed: 4 (max. WS around SLP Minimum, estimated from SLP grad.)
- Vorticity: 3
- Combination: 4 (SLP/Vor:2, SLP/WS, SLP/Lap SLP, Vort/fronts)

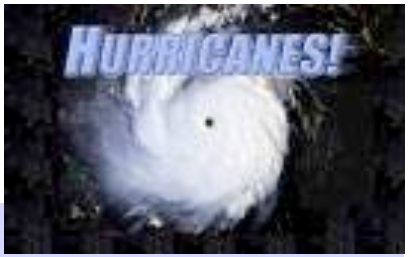
Elimination criteria:

- Life time (18-24h):7, min. Vorticity (0.1-0.6hPa(°lat)$^{-2}$):3,
  track distance (600/1000km):2, min. SLP (995/1010hPa):2,
  others; often optional

Height restrictions:

- 8 (<1500m asl:4, <1000 asl, no high mountains:2, only maritime)

First results



Unwanted structures captured:

- Heat lows: 7, tropical lows:2, local lows:2, large low pressure systems:2, systems near steep large slopes:2

Wanted structures not captured:

- A few (small c. back of mature systems, closely propagating c., very fast moving c., polar lows with northward track, mesocyclones)

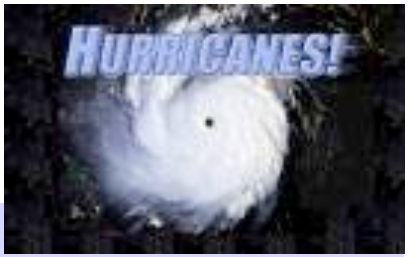
Storm intensity methods used:

- minimum SLP (core pressure): 10
- local laplacian (vorticity): 7
- radial pressure gradient: 6
- Others (radius, depth, amplitude, max. wind speed)

Storm intensity methods used:

- Number of occurrence: 9
- Cyclone frequency: 4
- intensity: 5

Next steps



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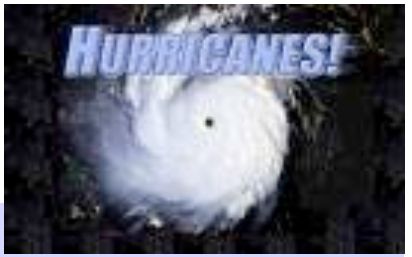
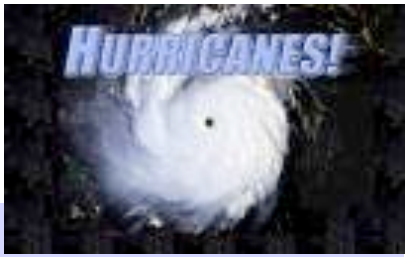
Title



Announcement



Annual Meeting of European Meteorological Society

28 September – 02 October 2009

Toulouse
Centre International de Conférence de Météo France

SESSION AW2: Cyclone Tracking Algorithms

CONVENERS: Richard Blender, Christoph Raible, and Heini Wernli

ABSTRACT DEADLINE: 8 May 2009.