



COST733

Harmonisation and Applications of Weather Types Classifications for European Regions

Background and objectives

Ole Einar Tveito
Chair COST733 MC
Norwegian Meteorological Institute

Start date: 13/09/2005
End date: 12/09/2010

Motivation

There is, for a wide range of environmental applications a need for information that, in an easy way, describes the current weather (situation).

The need for such information is increasing due to the climate change/global change issue, which has led to a demand for better understanding on the relations between climate/weather and response in various environmental variables/processes.

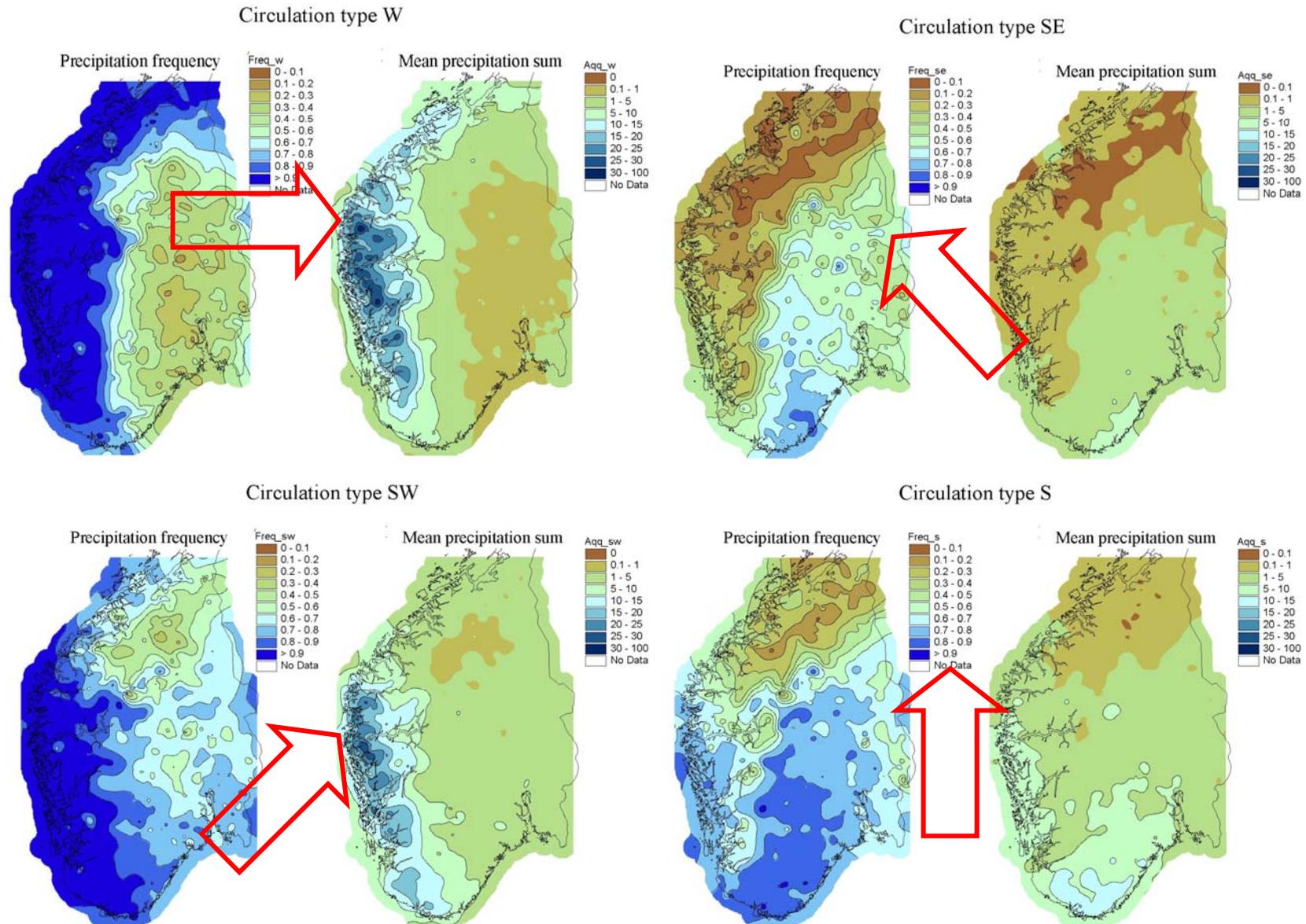
We want to know

Frequencies of certain weather and climatic conditions

- their changes in space and time
- relations between atmospheric circulation and weather
- reasons of occurrence and changes of circulation patterns
- forecasts of weather conditions / circulation patterns

For a statistical description of characteristic weather situations, we need a classification of circulation types

Atmospheric circulation and spatial distribution of precipitation



Why?

A lot of circulation/weather type classifications exists, but in many cases they are not comparable to each other due to

- different applications
- different scales
- different methods / criteria
- different data bases
- different number of weather types

No general pan-European, objective and consistent system for circulation type classifications for all Europe exists → **COST Action 733**

The start.....

- Sept 2003 - ECAM Rome WTC Paper
- Nov 2003 - TCM 27 Exeter Action Idea
- April 2004 - TCM 28 Langen Presentation on WTC
- Sept 2004 - TCM 29 Nice, Draft MoU
- Nov 2004 - 6 experts Langen → Final MoU
- Mar 2005 - CSO Brussels, Approval of the action
- April 2005 - ca.25 experts Brussels, Kick-off
- Sept 2005 - MCM1 Utrecht, MC + WG1 meeting

Langen (Germany), november 2004



Final MoU drafted

The start.....

- Sept 2003 - ECAM Rome WTC Paper
- Nov 2003 - TCM 27 Exeter Action Idea
- April 2004 - TCM 28 Langen Presentation on WTC
- Sept 2004 - TCM 29 Nice, Draft MoU
- Nov 2004 - 6 experts Langen → Final MoU
- Mar 2005 - CSO Brussels, Approval of the action
- April 2005 - ca.25 experts Brussels, Kick-off
- Sept 2005 - MCM1 Utrecht, MC + WG1 meeting

Objectives & definitions

Main Objective:

"To achieve a general numerical method for assessing, comparing and classifying weather situations in Europe"

Objectives & definitions

(or what this action is about)

Main Objective:

.....scalable to any European (sub)region with time scales between 12 h and 3 days and spatial scales of ca. 200 to 2000 km, and applicable for:

A NUMBER OF APPLICATIONS:

- frequency analysis of extreme weather events,
- local climate assessment (e.g. fog/snow cover/sunshine duration),
- human biometeorology and impacts on ecosystems,
- climate monitoring,
- assessment of impaired air quality episodes,
- medium range weather forecast and climate characteristics of the forecast period (e.g. by
- mapping of climate parameters related to historic weather types and application to the forecast meteorological situations),
- verification of numerical weather forecast models (by checking the forecast weather types),
- etc., etc.....

Objectives & definitions (or what this action is about)

Secondary Objectives/DELIVERABLES:

- to enhance our knowledge on linkages between the atmospheric circulation, weather, climate and environmental variables,
- to have an up-to-date overview of existing weather types classification methods,
- to identify suitable criteria/indicators to weather types
- to identify a set of useful applications of weather types classifications,
- to analyse the strengths and weaknesses of the methods for different applications,
- to establish a (new) scientific cooperation forum in synoptic climatology in Europe,
- to provide tools for comparison and evaluation of different weather types classifications,
- to assess different methodologies for the comparison of weather types classifications.

How did we do?

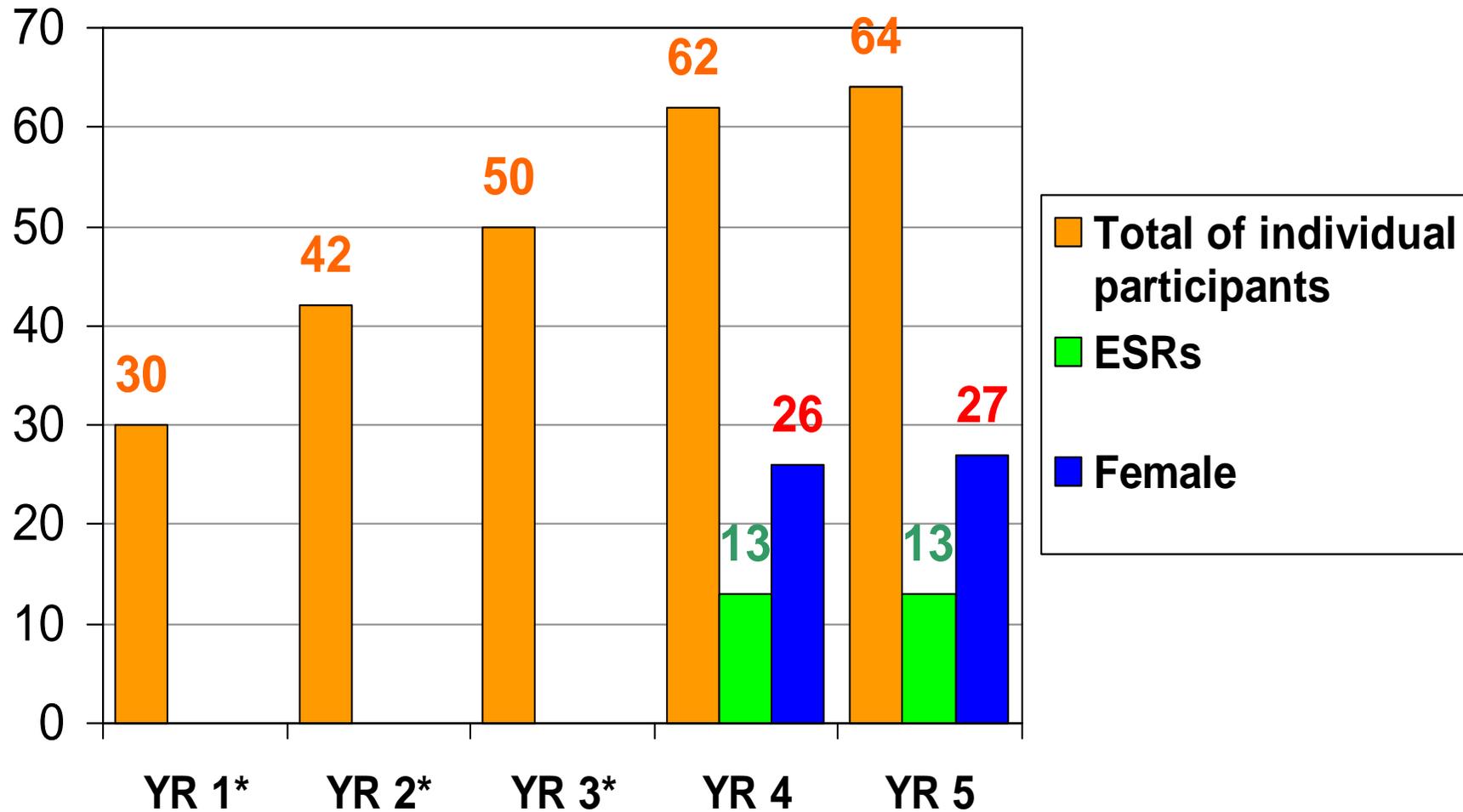
Activity level

- 18 STSMs
- 1 Training school
- 10 Management Committee meetings
- 10 WG 2 Meetings
- 10 Wg 3 Meetings
- 10 WG4 Meetings
- ? Wg1 Meetings
- 5 Core group meetings



- > 65 scientists → extraordinary network.
- High publication rate:
 - 2 special issues (Mid-term, ECAC 2006)
 - 1 proceedings (EMS 2005)
 - More than 50 peer-reviewed papers associated with the Action.

Action participants



Geographical impact

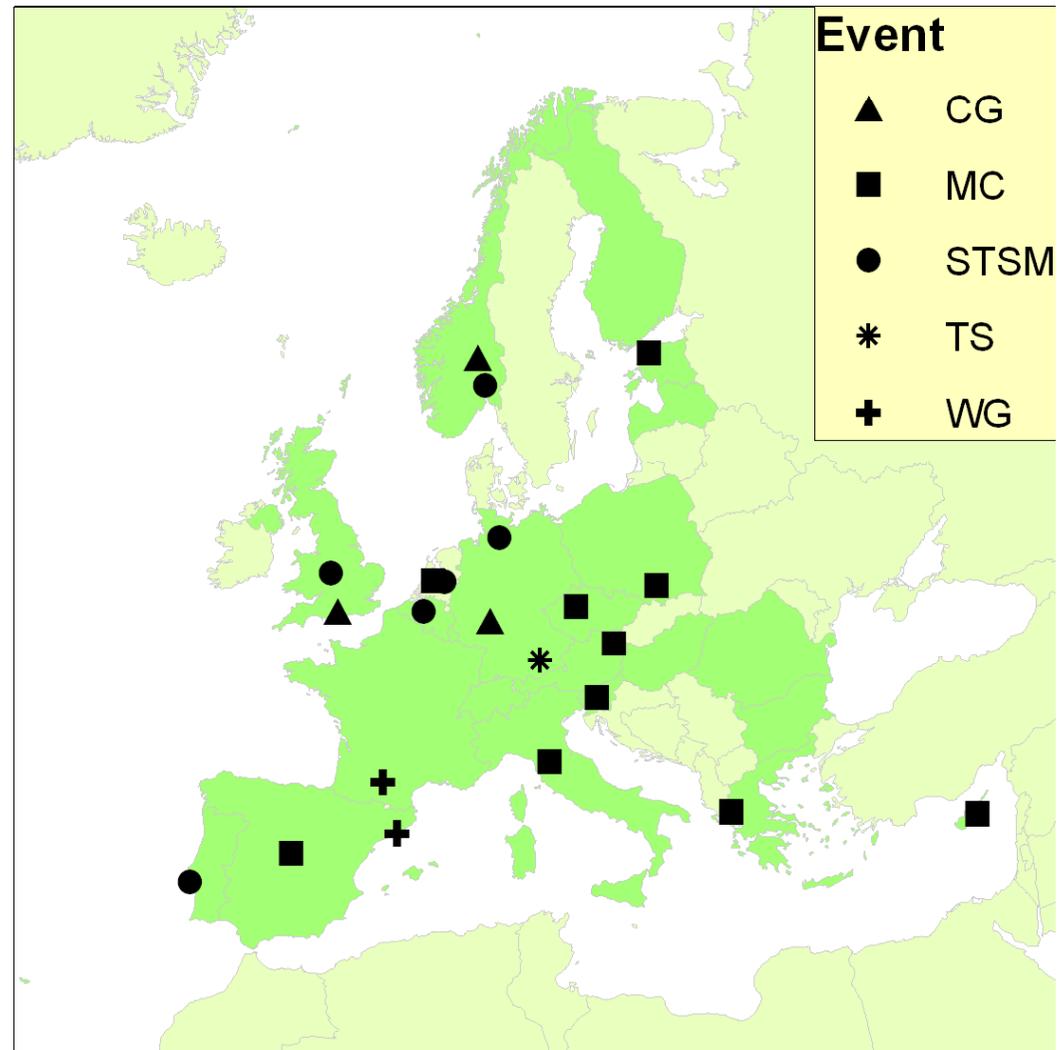
COST Countries : 23

Chair : **NO**

AT, BE, BG, CH, CY,
CZ, DE, EE, ES, FI,
FR, GR, HU, IE, IT,
LU, LV, NO, PL, PT,
RO, SI, UK

Non-COST institutions:

- None



Scientific context and objectives

Research directions:

- Inventory of existing circulation types classifications used in Europe up to today,
- Select methods to be assessed further by the action.
- Establish a dataset consisting of (currently) 35 circulation type classifications (based on 24 methods), most of them covering [12 domains](#) in Europe for the ERA40-period.
- Develop an open-source software package for most of the selected classification methods.
- Conceptualize a general tool for circulation type classification method(s) for Europe.
- Extend methods to apply more and other input variables than MSLP
- Extend methods to impose multi-day sequences in catalogues, or impose a seasonal definition

Scientific context and objectives

Research directions:

- Evaluation and inter-comparison of classifications
 - harmonized number of types in the objective classifications to ~9,18,27.
 - first results indicated that the number of types affect properties (quality) of classifications more than the classification principles (method).
 - Make comparison and evaluation more coherent.
 - Basic comparison and evaluation
 - Subjective (synoptic) evaluation
 - Climatological evaluation
- Testing circulation classifications for various applications

Working groups

1. **Inventory of existing weather type classification methods and applications.**

Radan Huth, CZ

2. **Implementation and development of weather type classification methods**

Andreas Philipp, DE (Chair) / Piia Post, EE (V-Chair)

3. **Comparison of selected weather type classifications**

Massimiliano Pasqui, IT (Chair) / [Pere Esteban](#), ES (V-Chair)

4. **Testing methods for various applications**

Matthias Demuzere, BE (Chair) / Christel Prudhomme, UK (V-chair)

program costaction733

catalogs = work(WG1,WG2)

optimized=.false.

do while (.not. optimized)

result = WG3evalu(catalogs)+WG4evalu(catalogs)

if(result=perfect)then

optimized=.true.

else

catalogs = work(WG2)

endif

enddo

end program costaction733

Dataset

cost733cat

Software

cost733class

cost733plot

Visualization

Outcome and achievements

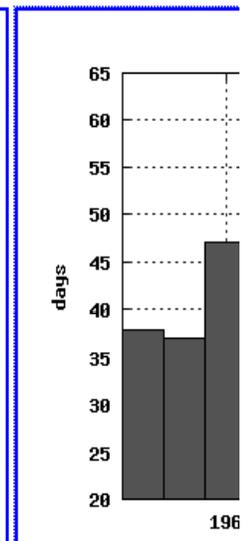
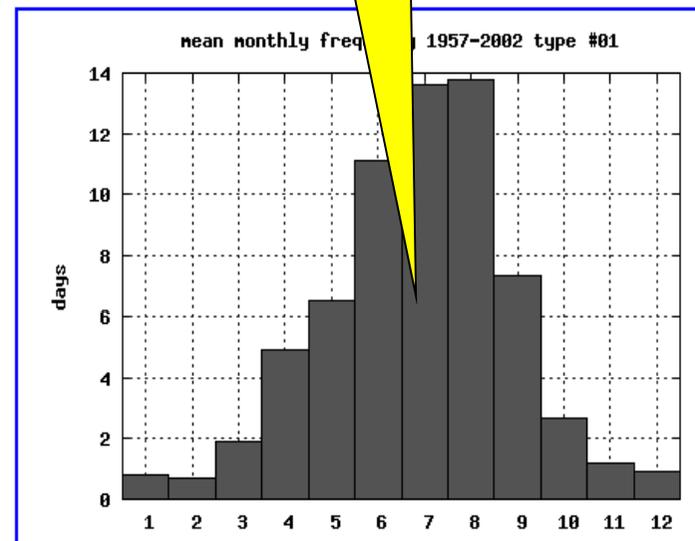
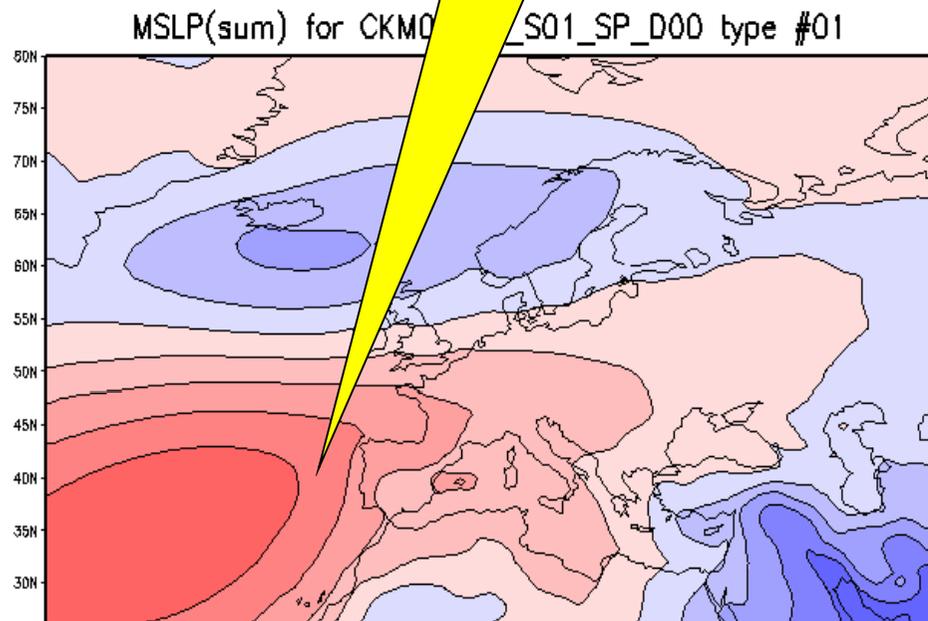
- Version 2.0 of `cost733cat` circulation type catalogue launched including 17 + 1 automatic and 6 subjective classifications for 12 predefined domains.
- Software package `cost733class` (open source, GPL) for a number of (**currently 20**) automatized circulation type classifications developed.
- Open access visualization application (`cost733plot`)
- Principles for evaluation and testing are defined and implemented in the `cost733class`.
- First version of ranking of circulation type classifications based on various statistical and climatological scores and applications tests associated to catalogues v1.2 and v2.0.
- Classifications are evaluated for several applications in meteorological, climatological and environmental disciplines.
- The contours of a new general CTC-**tool** is evolving..

classification method	number of types	preprocessing mode	classification input data	classification domain	centroid parameter	centroid level (for Z,R,T,VORT only)	centroid season	run
WLK0	00	YR_S01	SP	00	Z	925	year	<input type="checkbox"/> anomalies <input type="checkbox"/> normalized <input type="checkbox"/> map size: lon: -47 : +60 lat: +20 : +80 640x480 <input type="checkbox"/> draw box <input type="checkbox"/> draw labels <input type="checkbox"/> centroid data <input checked="" type="checkbox"/> seasonal cycle <input checked="" type="checkbox"/> interann. freq.
KRZ	09	YR_S04	Z8	01	MSLP	850	win	
KRZ0	18	SE_S01	Z5	02	PRC	700	spr	
PXE	27		Z1-Z5	03	CP	500	sum	
PXE0			SP-Z5	04	LSP	300	aut	
PCT			SP-K5	05	R			
PCT0			SP-Y5	06	TWC			
PTT			SP-Z5-V5-K5	07	2mT			
LND				08	T			
KIR				09	Z500-Z850			
ERP				10	10mU			
ERP0				11	10mV			
PTS0					U700			
CKM					V700			

Centroid maps

Monthly frequencies

searching CKM09_YR_S01_SP/CKM09_YR_S01_SP_D00.txt...
 CKM09_YR_S01_SP_D00: CKM09_YR_S01_SP_D00.txt (actually 9 types)
 See statistics at CKM09_YR_S01_SP/CKM09_YR_S01_SP_D00.stat



<http://geo22.geo.uni-augsburg.de/cgi/cost733plot>

Impact, outreach and EU added value

- Extensive peer-reviewed review paper on recent developments and applications of circulation type classifications (Huth et al. 2008)
- An outstanding 3-day mid-term conference in Krakow 2008 with almost 100 participants and 80 presentations, including presentations from international capacities like [Mike Richman](#), [Ian Jolliffe](#), [Dave Reusch](#) etc.
- 5 day training school in Augsburg in April 2010 (23 trainees, 9 lecturers).
- Active publishing of COST733 results in papers, at conferences and workshops
 - many 'non-joint' papers utilize (and benefit from) joint database
 - regular special session on 'synoptic climatology' at EMS/ECAC conferences
 - special session on classifications and regimes at EGU conference
 - special issue in Theor. Appl. Climatol. from ECAC 2006 with several COST733-based papers
 - A special issue from the mid-term conference is in press. 50 papers originally submitted, 29 are accepted.
- Steps are taken towards a public release of the dataset and the classification software. [cost733plot](#) is public!
- An impressive **final scientific report**
- Final workshop Vienna 22-24.Nov 2010.

Coordination, management and internal functioning

- Great enthusiasm 😊
- Activities are coordinated by strong interactions between WGs. Joint WG-meetings are extensively used.
- Active core group.

- Core group members participate actively in several WGs.
- WG-meetings and MC-meetings are well and actively attended
- Wiki-page for internal documentation

- **Encouragement of younger scientists:**
 - Younger scientist included in core group as WG-chair and vice-chairs.
 - Young scientists play an active role in the WGs, in particular WG4.
 - 70% of STSMs by younger scientist
 - Conference grants
 - Training school



Enjoy the workshop!

