

Summarizing ensemble forecast scenarios using an objective classification of European synoptic patterns

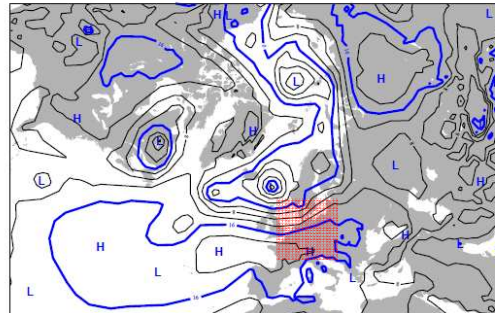
**Paul James, Deutscher Wetterdienst
EMS Meeting, Berlin, 13.09.2011**

Medium-range ensemble forecasting

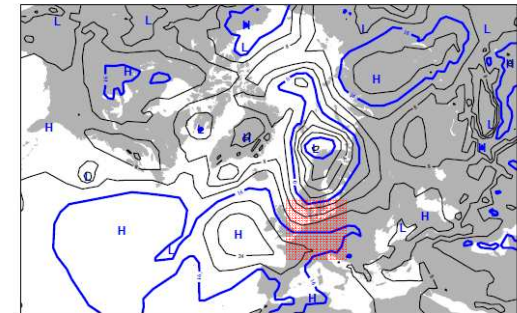
- Forecasters need to assimilate ensemble outputs efficiently and quickly
 - Most likely and primary alternative synoptic developments
 - Impacts of these developments on regional weather
 - Highlight times of potential major changes in synoptic regime
- Automatic prefiltering of large, complex ensemble datasets essential
- Clustering techniques important but are currently inadequate
 - Standard clusters typically fail to separate contrasting synoptic types over Europe (often most members in just one or two clusters)
 - ECMWF new-clusters are a major improvement
 - But clustering determined by large-scale Atlantic-dominated patterns
 - Synoptic patterns over European land mass still poorly separated

- ➔ Variations between clusters more noticeable over nearby N. Atlantic
- ➔ Relatively little variation over central European landmass (westerly flow, cyclonic over Scandinavia)
- ➔ Clusters do not reveal potential variations in synoptic types over central or western Europe adequately
- ➔ e.g. some individual members:

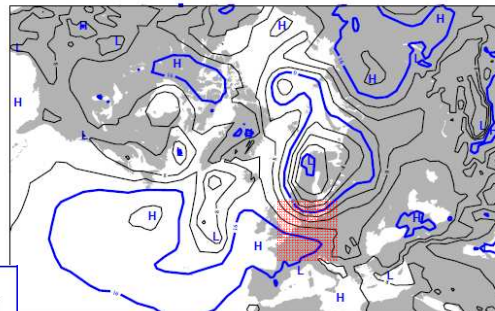
forecast t+168 VT:Thursday 15 September 2011 00UTC
Cluster: 1(of 5), population: 13, repres. member: 36



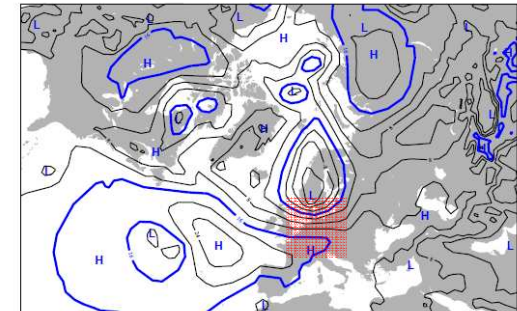
forecast t+168 VT:Thursday 15 September 2011 00UTC
Cluster: 3(of 5), population: 12, repres. member: 26



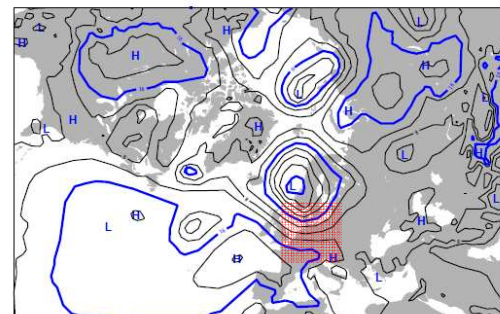
forecast t+168 VT:Thursday 15 September 2011 00UTC
Cluster: 2(of 5), population: 12, repres. member: 38



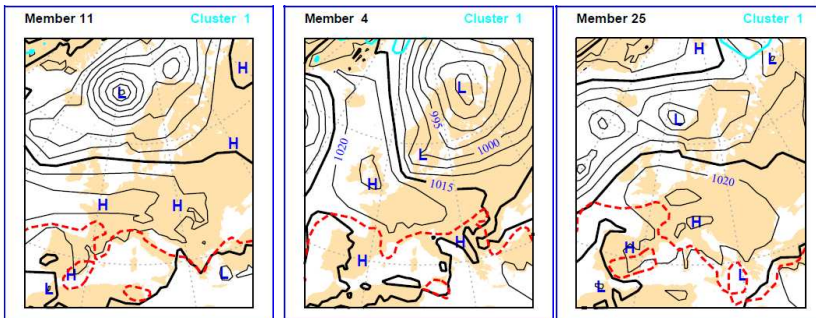
forecast t+168 VT:Thursday 15 September 2011 00UTC
Cluster: 4(of 5), population: 8, repres. member: 9



forecast t+168 VT:Thursday 15 September 2011 00UTC
Cluster: 5(of 5), population: 6, repres. member: 3



**ECMWF new clusters
example
(08.09.2011,
T+168h for 15.09.2011,
5 clusters)**

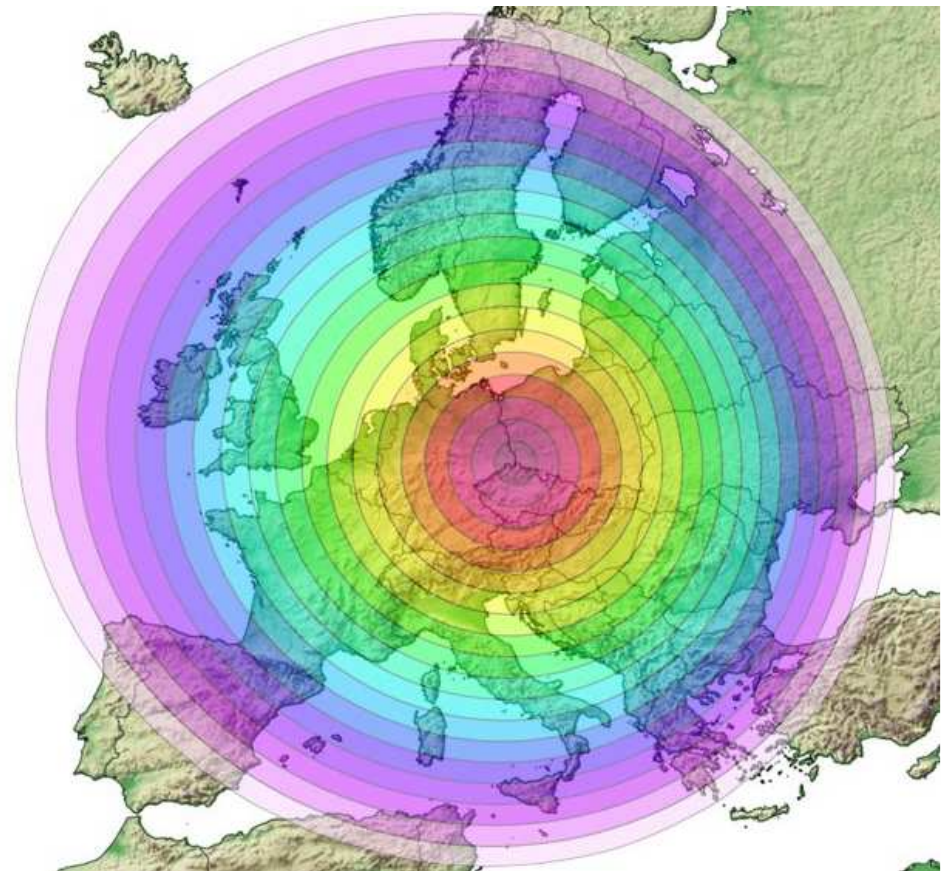


The Grosswetterlagen Approach

- Grosswetterlagen (GWL) are a well-known set of European synoptic types
 - Developed originally by Baur, Hess and Brezowsky in the 1940s
 - Maintained at DWD and PIK-Potsdam up to present day
 - 29 diverse synoptic types, very useful and meaningful for describing large-scale flow and subsequent effect on regional weather (downscaling)
- GWL classification is undertaken manually (DWD, Potsdam)
 - Danger of inhomogeneity
 - Hard to apply routinely to forecast model output
- Objective GWL classification method developed to address this

SynopVis Grosswetterlagen: A new GWL system

- Classification of daily 12 UTC fields based on pattern correlations
 - Use MSLP, 500 hPa-Geopotential and 500-1000 hPa-Thickness
 - 29 GWL base patterns (Winter and Summer composites with sinusoidal weightings centred on 15th January and 15th July)
 - Correlation region relatively tightly weighted around central Europe
 - Subsequent temporal filter so that each GWL sequence lasts at least 2 or 3 days (latter as in Hess-Brezowsky)



SynopVis Grosswetterlagen (SVG) Products

- Standard SVG classification output based on „20th-Century Reanalysis, v.2“
 - Complete daily catalogue from 1871-2008
 - Extended to present day using NCEP-Reanalyses
 - Very useful for synoptic climatological applications
- Statistical analyses (frequencies, record sequence lengths, transition matrix etc.) have been created
- Climatological composite maps of each type at different times of the year
- Detailed type descriptions

SVG Climate Composite Example

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



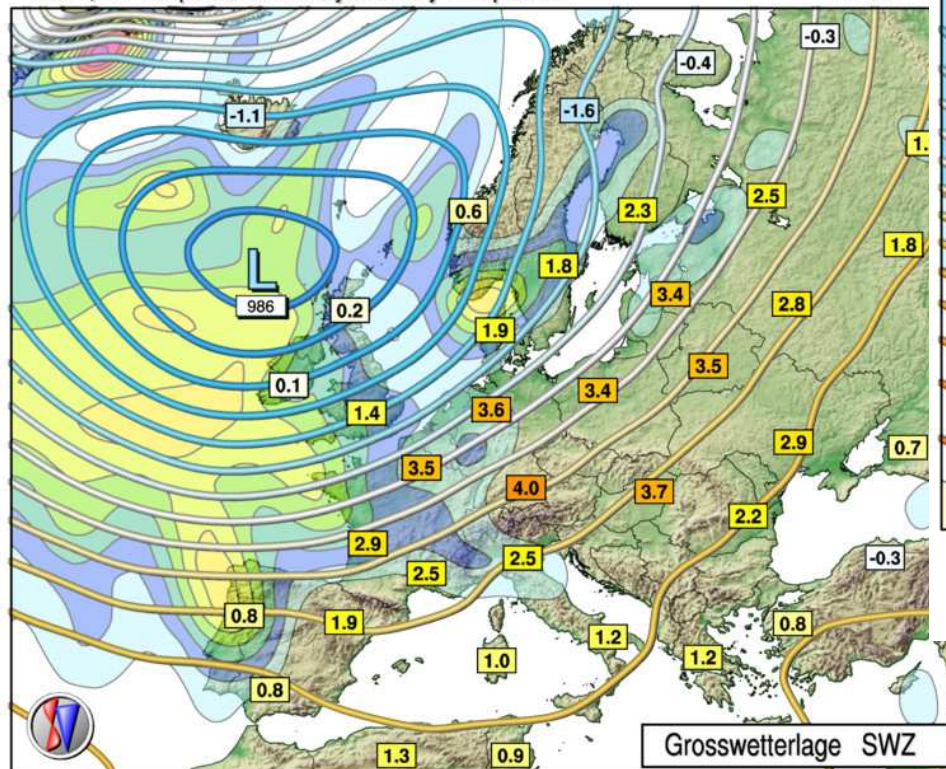
South-Westerly, cyclonic, SWZ

500-hPa Geopotential Height and 850-hPa Temperature

Winter

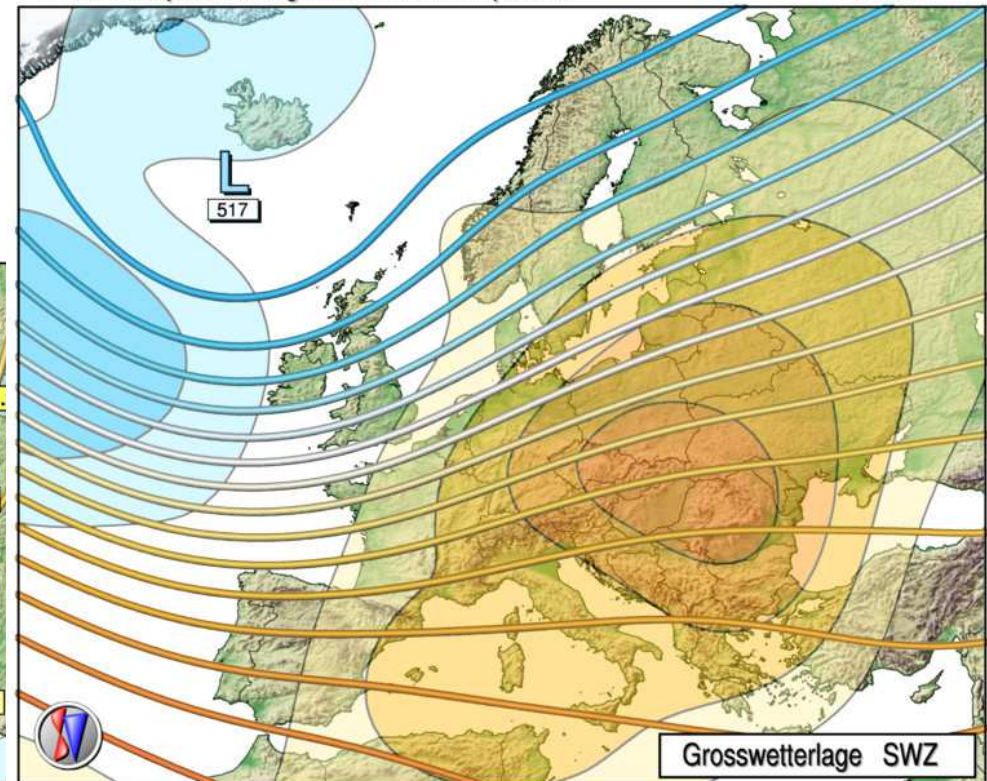
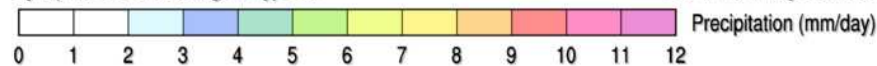
MSLP, 2m-Temperature Anomaly and Daily Precipitation

Winter



SynopVis Grosswetterlagen, Type 06

NCEP Re-Analyses, 1960-2009



SynopVis Grosswetterlagen, Type 06

NCEP Re-Analyses, 1960-2009



SVG Climate Composite Example

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



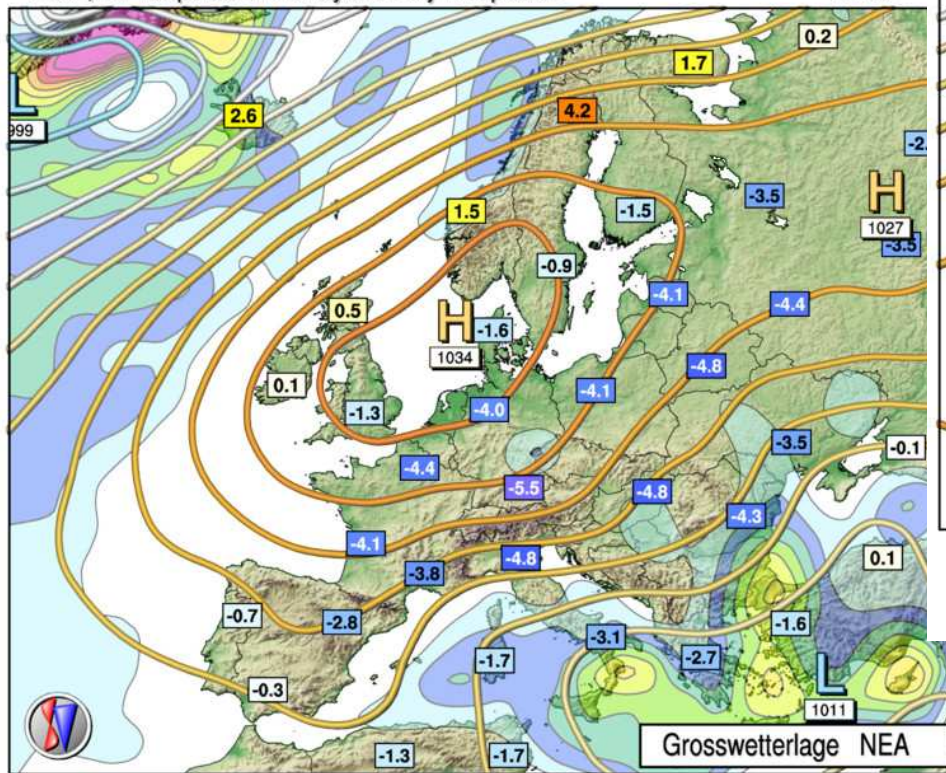
North-Easterly, anticyclonic, NEA

500-hPa Geopotential Height and 850-hPa Temperature

Winter

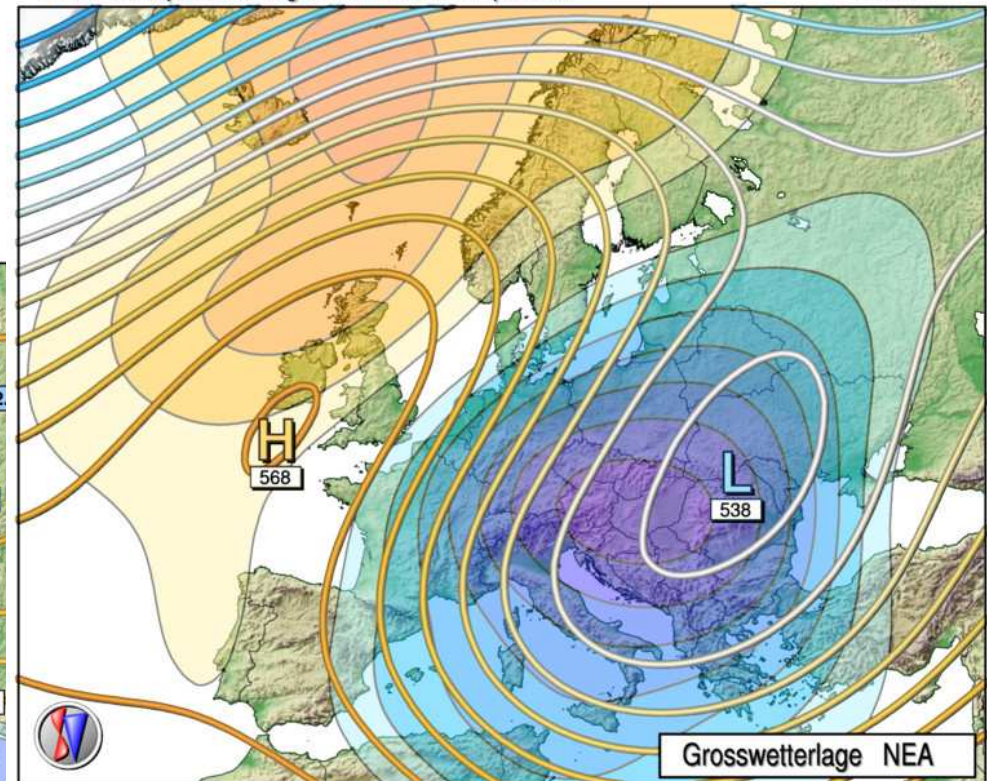
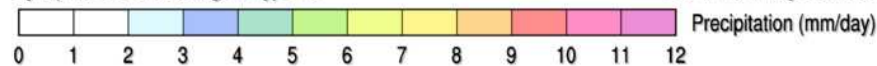
MSLP, 2m-Temperature Anomaly and Daily Precipitation

Winter



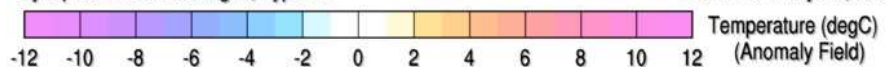
SynopVis Grosswetterlagen, Type 18

NCEP Re-Analyses, 1960-2009



SynopVis Grosswetterlagen, Type 18

NCEP Re-Analyses, 1960-2009

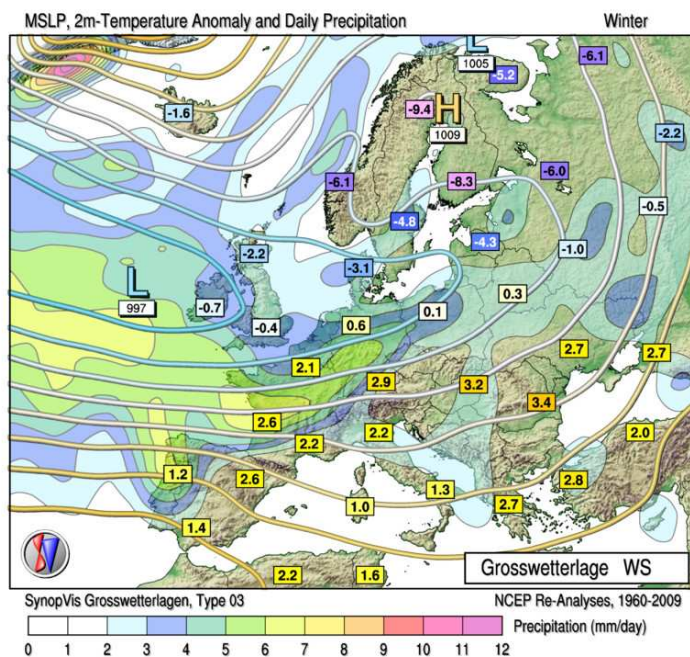


Temperature (degC)
(Anomaly Field)

HD-Composites using Ensembles E-OBS Data

South-Shifted Westerly, WS

- Note fine local detail embedded within large-scale type (e.g. orographic rainfall)

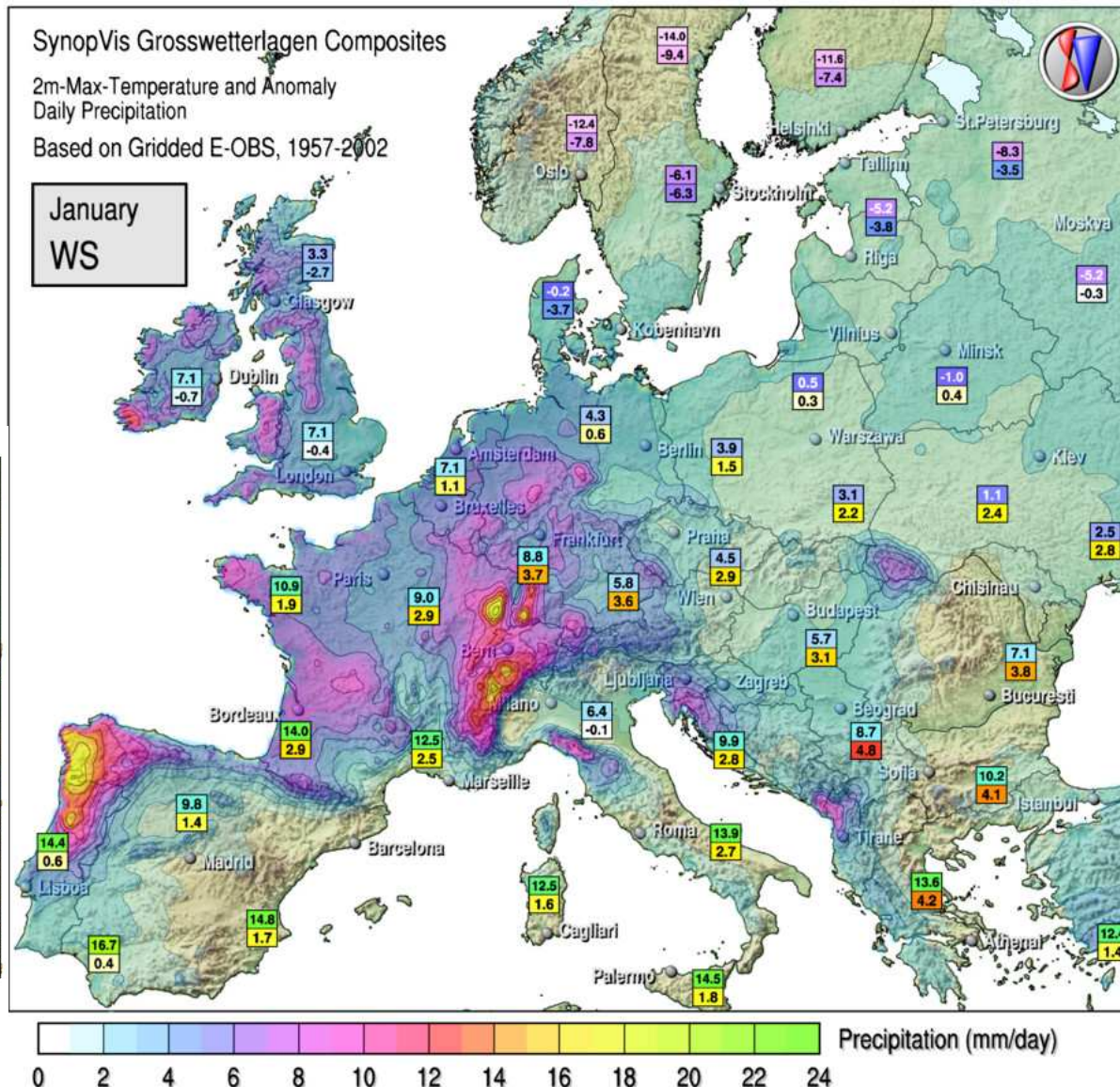


SynopVis Grosswetterlagen Composites

2m-Max-Temperature and Anomaly
Daily Precipitation

Based on Gridded E-OBS, 1957-2002

January
WS



SVG Catalogue Example, 2010

SynopVis Grosswetterlagen 2010

**** Hess-Brezowsky Format ****

Based on pattern correlations with MSLP, 500-1000 hPa Thickness and Z500 [NCEP Reanalyses]

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Feb	TRM	WS	HFZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Mar	NWZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr	TRW	WW	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM	BM
May	WZ	TM	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Jun	NEZ	HNA	TB	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Jul	WW	BM	SWA	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ	SZ
Aug	WZ	TRM	WZ	TM	WS	SWZ	WZ	NZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sep	NA	HNA	SEA	WW	WZ	NWZ	SWZ	TM	HFZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Oct	SZ	SA	Ü	HNA	NZ	TRM	NWZ	TRM	SWA	TRW	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Nov	TRW	WZ	NWZ	TB	WZ	HFZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Dec	HNZ	WZ	HNZ	NA	NZ	TB	TM	Ü	SEA	NWA	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ	HNZ
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

SVG-Frequency Table 1871-2011

SynopVis Grosswetterlagen

Monthly Frequencies (%), 1871-2011

GWL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Description
WA	8.4	8.2	7.2	3.9	2.9	5.6	5.3	6.9	8.5	7.4	6.3	7.3	6.5	Anticyclonic Westerly
WZ	6.6	4.4	4.4	4.4	2.8	6.3	9.7	10.2	8.1	6.2	6.7	7.0	6.4	Cyclonic Westerly
WS	1.4	2.2	2.1	1.2	0.9	1.7	4.4	2.7	1.2	1.5	1.1	2.1	1.9	South-Shifted Cyclonic Westerly
WW	6.1	5.2	4.7	3.9	3.3	4.7	6.4	6.3	3.5	2.4	4.6	6.0	4.8	Maritime Westerly (Block E. Europe)
SWA	6.1	4.1	3.8	2.6	3.2	5.0	4.2	4.9	7.0	6.3	5.2	5.4	4.8	Anticyclonic South-Westerly
SWZ	6.6	5.3	4.5	2.9	4.3	4.5	5.3	6.2	4.4	5.8	5.1	5.3	5.0	Cyclonic South-Westerly
NWA	5.5	5.0	4.1	2.5	1.8	2.6	3.1	3.7	5.4	4.6	5.1	5.5	4.1	Anticyclonic North-Westerly
NWZ	6.4	5.2	5.0	3.0	1.7	4.6	7.6	5.9	4.2	4.8	5.7	5.6	5.0	Cyclonic North-Westerly
HM	4.4	3.8	2.8	2.1	1.4	2.3	2.2	2.8	3.5	2.6	2.2	4.1	2.9	High over Central Europe
BM	3.8	2.8	3.7	3.7	3.4	3.5	3.6	4.4	4.3	4.2	3.8	4.5	3.8	Zonal Ridge across Central Europe
TM	1.2	1.8	2.1	3.5	5.2	3.5	1.5	1.4	1.7	1.9	2.8	1.7	2.4	Low over Central Europe
NA	1.8	2.9	2.4	1.5	2.1	4.3	4.9	3.1	2.4	1.6	1.7	1.8	2.6	Anticyclonic Northerly
NZ	2.1	2.9	2.5	3.1	2.8	3.6	2.6	3.0	2.5	1.7	3.5	2.8	2.8	Cyclonic Northerly
HNA	2.2	2.2	2.4	3.1	3.7	2.6	2.3	2.1	2.9	2.6	1.9	2.6	2.6	Icelandic High, Ridge C. Europe
HNZ	1.0	1.6	1.8	1.6	3.2	3.0	1.2	2.0	1.6	1.9	1.5	1.5	1.8	Icelandic High, Trough C. Europe
HB	2.8	2.9	2.9	2.9	1.8	2.6	2.6	2.0	3.6	2.5	3.3	2.8	2.7	High over the British Isles
TRM	1.6	1.5	2.2	4.3	2.1	4.3	6.3	5.3	2.9	2.7	3.1	2.6	3.2	Trough over Central Europe
NEA	2.0	2.7	1.9	1.6	2.6	1.9	1.5	2.4	1.9	1.1	0.9	2.1	1.9	Anticyclonic North-Easterly
NEZ	2.2	3.1	2.4	4.8	3.8	5.0	4.5	2.6	2.9	1.5	1.9	2.1	3.1	Cyclonic North-Easterly
HFA	3.9	4.0	3.6	1.6	2.7	2.2	3.2	3.2	2.1	2.9	2.6	1.6	2.8	Scandinavian High, Ridge C. Europe
HFZ	3.5	3.6	4.0	5.1	5.3	4.7	4.0	2.7	2.6	2.6	2.6	3.2	3.7	Scandinavian High, Trough C. Europe
HNFA	1.7	1.2	1.7	1.9	2.8	2.0	0.4	0.9	1.0	1.4	1.0	1.5	1.5	High Norway-Iceland, Ridge C. Eur.
HNFA	1.5	2.3	3.5	6.7	6.1	2.5	1.6	1.6	1.5	2.1	2.3	1.1	2.7	High Norway-Iceland, Trough C. Eur.
SEA	3.3	5.0	4.7	4.7	4.2	2.5	1.3	1.5	3.6	4.2	3.6	2.9	3.5	Anticyclonic South-Easterly
SEZ	1.6	2.8	3.9	5.9	5.3	1.7	1.0	1.5	2.7	3.4	2.6	2.7	2.9	Cyclonic South-Easterly
SA	3.2	3.0	3.4	2.1	3.2	2.5	1.6	2.8	4.9	4.7	2.8	3.0	3.1	Anticyclonic Southerly
SZ	3.4	3.6	3.6	5.1	6.5	2.8	2.8	2.6	2.8	5.3	4.5	3.5	3.9	Cyclonic Southerly
TB	2.2	3.8	4.8	4.9	4.4	2.5	1.4	1.3	1.5	4.0	4.6	3.0	3.2	Low over the British Isles
TRW	2.3	1.5	3.1	4.4	5.5	3.8	3.3	4.0	4.5	5.5	5.8	3.5	3.9	Trough over Western Europe
Ü	1.5	1.5	0.9	0.8	1.0	0.9	0.1	0.0	0.1	0.6	1.1	1.2	0.8	Transitional Period

Application of GWLs to 15-day ensembles

- ECMWF EPS15 has 51 ensemble members
 - Runs twice a day, from 00 UTC and 12 UTC analyses
 - Classify daily sequences of each member with SVG method
 - Display GWL statistics in a tree-like structure...

GWL EPS15 Forecast, 9th Sept 2011, 00 UTC

Grosswetterlagen Forecast Tree

15-day ECMWF Ensembles

00 UTC Forecast from 09 Sep 2011

Day	Number of Ensemble Members																									Key / Extreme Members									
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	51	Most Repr.	Cold	Warm	Wet						
9 Sep	WA																									WA >>	WA	WA	WA						
10 Sep	SWZ																									SWZ >>	SWZ	SWZ	SWZ						
11 Sep	SWZ																									SWZ >>	SWZ	SWZ	SWZ						
12 Sep	SWA										SWZ										WZ					SWZ >>	WZ	SWA	WZ						
13 Sep	SWA										-	WZ														WZ >>	WZ	SWA	WZ						
14 Sep	WA					NWZ					-					WZ										WZ >>	NWZ	SWA	WA						
15 Sep	WA										NWZ					NWA			WZ					-			WA >>	NWZ	WA	WA					
16 Sep	WA								NWZ					NWA			-					WZ					WA >>	NWZ	WA	WA					
17 Sep	NA	WA					BM			NWZ					-										WZ					WA >>	NWZ	SWA	BM		
18 Sep	WW	WA					BM			NWZ					HM			SWA			-					WZ			SA	WA >>	NWZ	SWA	BM		
19 Sep	WA					NWZ					HM					SWA			-					WZ			SA	WA >>	NWZ	TRW	TRW				
20 Sep	WA								NWZ			HM			SWA					NA		-					SA			WA >>	NWZ	TRW	TRW		
21 Sep	WA								NWZ					SWA					NWA			HB		-					SA			WA >>	NWZ	SZ	TRW
22 Sep	WZ	WA					NWZ					SWA					NWA			HB		-					WZ >>	NWZ	SZ	HFZ					
23 Sep	WZ	WA					HM			NWZ			BM			SWA			NWA			-					WZ >>	NWZ	SZ	HFZ					
																											>> Full Matrix								
	Surface										Mid-Troposphere										< MPEG Animations (Most Representative Member, No.14)														
	Coldest, No.19					Warmest, No.50					Wettest, No.36					< MPEG Surface Animations (Extreme Members)																			

Clickable GWL-Cluster-Means within tree

Grosswetterlagen Forecast Tree

15-day ECMWF Ensembles

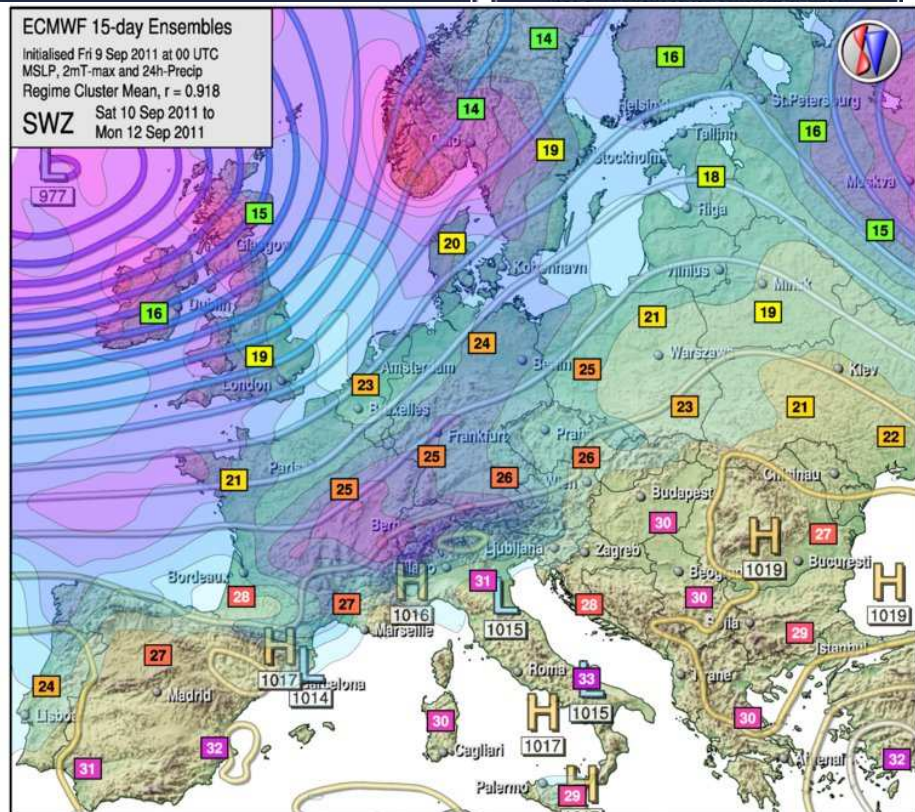
00 UTC Forecast from 09 Sep 2011

Day	Number of Ensemble Members																	
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32		
9 Sep	WA																	
10 Sep	SWZ																	
11 Sep	SWZ																	
12 Sep	SWA											SWZ						
13 Sep	SWA											-						
14 Sep	WA						NWZ					-						
15 Sep	WA									NWZ						N		
16 Sep	WA								NWZ					NWA				
17 Sep	NA	WA						BM		NWZ								
18 Sep	WW	WA						BM		NWZ					HM		SWA	
19 Sep	WA						NWZ				HM				SWA			
20 Sep	WA								NWZ			HM		SWA				
21 Sep	WA								NWZ				SWA					
22 Sep	WZ	WA						NWZ				SWA					N	
23 Sep	WZ	WA					HM		NWZ			BM		SWA		NWA		
	Surface										Mid-Troposphere							
	Coldest, No.19								Warmest, No.50				Wettest, No.					

ECMWF 15-day Ensembles

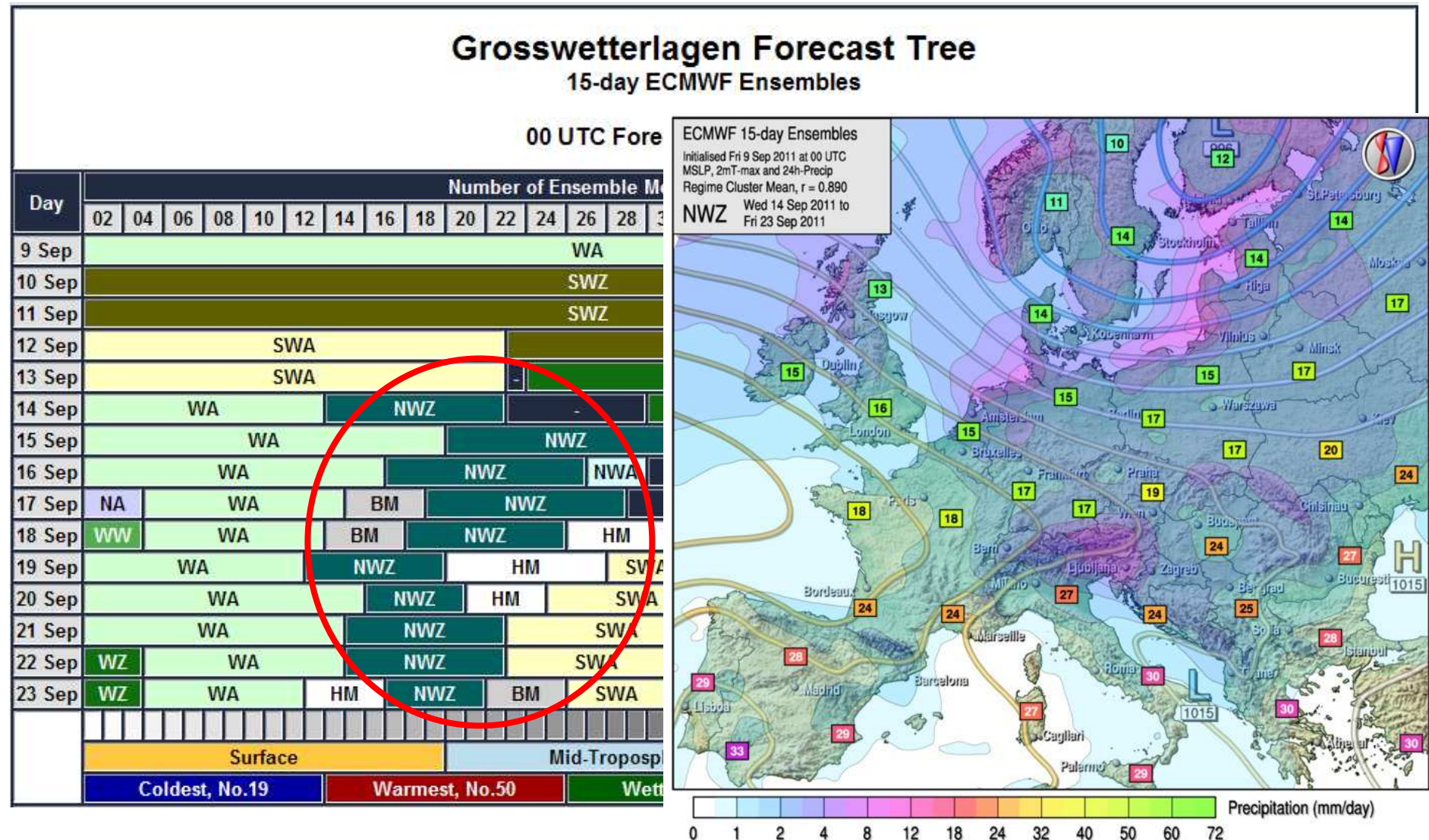
Initialised Fri 9 Sep 2011 at 00 UTC
MSLP, 2mT-max and 24h-Precip
Regime Cluster Mean, $r = 0.918$

SWZ
Sat 10 Sep 2011 to
Mon 12 Sep 2011



Precipitation (mm/day)
0 1 2 4 8 12 18 24 32 40 50 60 72

Clickable GWL-Cluster-Means within tree



Clickable GWL-Cluster-Means within tree

Grosswetterlagen Forecast Tree

15-day ECMWF Ensembles

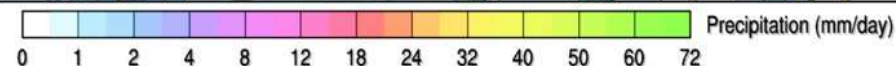
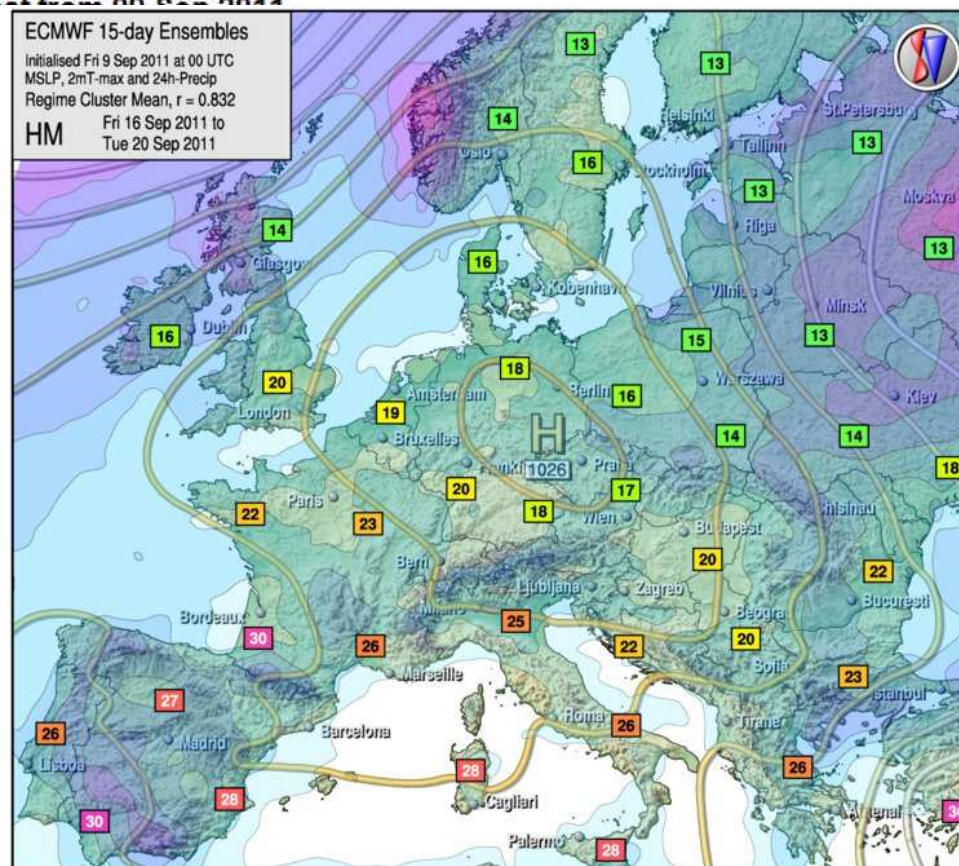
00 UTC Forecast from 00 Sep to 00 Sep 2011

Day	Number of Ensemble Members																																																									
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30																																											
9 Sep																									WA																																	
10 Sep																									SWZ																																	
11 Sep																									SWZ																																	
12 Sep													SWA																																													
13 Sep													SWA																																													
14 Sep							WA												NWZ																																							
15 Sep													WA																												NWZ																	
16 Sep													WA																						NWZ												NWA											
17 Sep	NA								WA										BM														NWZ																									
18 Sep	WW								WA										BM														NWZ												HM													
19 Sep							WA																		NWZ																		HM												SWA			
20 Sep							WA																		NWZ																		HM												SWA			
21 Sep							WA																		NWZ																								SWA									
22 Sep	WZ								WA																		NWZ																								SWA							
23 Sep	WZ								WA												HM								NWZ												BM								SWA									
	Surface															Mid-Troposphere																																										
	Coldest, No.19															Warmest, No.50															Wettest																											

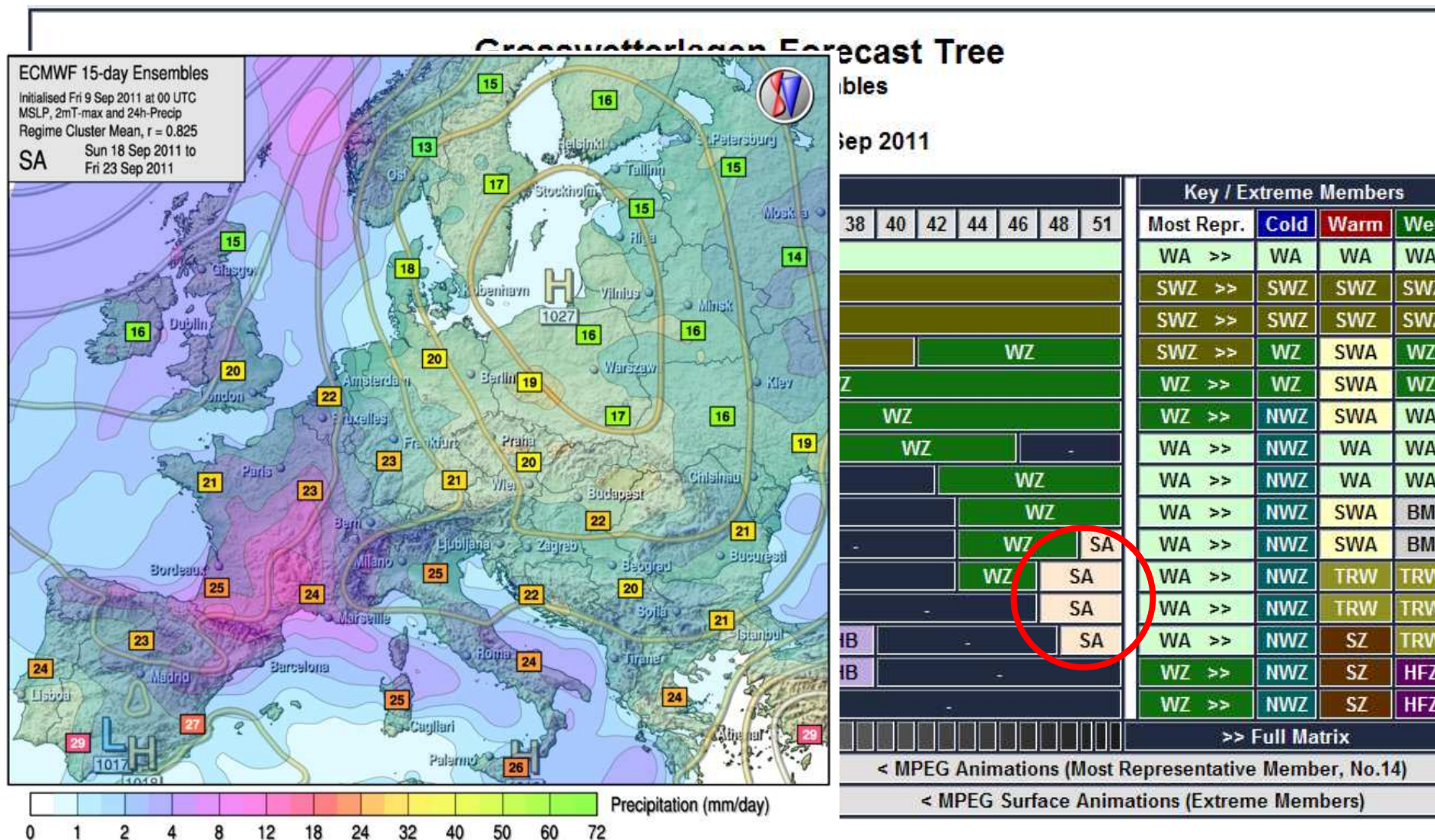
ECMWF 15-day Ensembles

Initialised Fri 9 Sep 2011 at 00 UTC
MSLP, 2mT-max and 24h-Precip
Regime Cluster Mean, $r = 0.832$

HM Fri 16 Sep 2011 to
Tue 20 Sep 2011



Clickable GWL-Cluster-Means within tree



GWL-Statistics provide very useful method of selecting most representative individual member

Grosswetterlagen Forecast Tree																																																										
15-day ECMWF Ensembles																																																										
00 UTC Forecast from 09 Sep 2011																																																										
Day	Number of Ensemble Members																														Key / Extreme Members																											
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	51	Most Repr.	Cold	Warm	Wet																													
9 Sep	WA																														WA >>	WA	WA	WA																								
10 Sep	SWZ																														SWZ >>	SWZ	SWZ	SWZ																								
11 Sep	SWZ																														SWZ >>	SWZ	SWZ	SWZ																								
12 Sep	SWA										SWZ										WZ										SWZ >>	WZ	SWA	WZ																								
13 Sep	SWA										WZ																				WZ >>	WZ	SWA	WZ																								
14 Sep	WA							NWZ															WZ										WZ >>	NWZ	SWA	WA																						
15 Sep	WA										NWZ						NWA					WZ														WA >>	NWZ	WA	WA																			
16 Sep	WA							NWZ					NWA															WZ														WA >>	NWZ	WA	WA													
17 Sep	NA	WA							BM			NWZ															WZ														WA >>	NWZ	SWA	BM														
18 Sep	WW	WA							BM			NWZ					HM			SWA															WZ										SA		WA >>	NWZ	SWA	BM								
19 Sep	WA							NWZ					HM					SWA															WZ										SA		WA >>	NWZ	TRW	TRW										
20 Sep	WA							NWZ					HM			SWA					NA													SA														WA >>	NWZ	TRW	TRW							
21 Sep	WA							NWZ					SWA										NWA					HB													SA														WA >>	NWZ	SZ	TRW
22 Sep	WZ	WA							NWZ					SWA										NWA					HB																							WZ >>	NWZ	SZ	HFZ			
23 Sep	WZ	WA							HM			NWZ					BM			SWA					NWA																									WZ >>	NWZ	SZ	HFZ					
	>> Full Matrix																																																									
	Surface										Mid-Troposphere										< MPEG Animations (Most Representative Member, No.14)																																					
	Coldest, No.19										Warmest, No.50										Wettest, No.36										< MPEG Surface Animations (Extreme Members)																											

Exceptional late summer heatwave over Bavaria, 21-26 August (>35 degC in Munich, 26th Aug, with Föhn, GWL type SZ, rare in summer)

Grosswetterlagen Forecast Tree																																																							
15-day ECMWF Ensembles																																																							
00 UTC Forecast from 15 Aug 2011																																																							
Day	Number of Ensemble Members																																																			Key / Extreme Members			
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	51	Most Repr.	Cold	Warm	Wet																										
15 Aug	WW																																																			WW >>	WW	WW	WW
16 Aug	WW																																														WZ		WW >>	WW	WW	WW			
17 Aug	SWA												SWZ						WA				WZ										SWA >>	WZ	SWA	WZ																			
18 Aug	SWA												SWZ						WA				WZ								SWA >>	WZ	SWA	WZ																					
19 Aug	SWA										SWZ		WA								WZ						SWA >>	WZ	SWA	WZ																									
20 Aug	SWA		HM																		WA						WZ				HM >>	HM	HM	HM																					
21 Aug	SWA		HM																		WA										HM >>	HM	HM	HM																					
22 Aug	SWA						HM						SA						SWZ				SEA		SA >>	SA	SA	SEA																											
23 Aug	SWA						WW				HM				SA				SWZ				SEA		SA >>	SA	SA	SEA																											
24 Aug	SWA				TRM						HM		WZ		SA		SZ		SWZ		HFZ		SEA		TRM >>	TRM	SA	SZ																											
25 Aug	TB		SWA		TRM								WZ		SA		SZ		SWZ		TRW		SEA		TRM >>	TRM	SA	SZ																											
26 Aug	TB		TRM										WZ		SZ		WW		TRW						TRM >>	WZ	SA	SZ																											
27 Aug	TB		SWA		TRM								WZ		SZ		WW		TRW		SEA				TRM >>	WZ	SEA	TM																											
28 Aug	SWA		TRM										WZ		WA				TRW		SEA				TRM >>	WA	SEA	TM																											
29 Aug	NEZ		TRM										WZ		WA				TRW		NWZ				WZ >>	WA	SEA	WW																											
																																																				>> Full Matrix			
	Surface										Mid-Troposphere										< MPEG Animations (Most Representative Member, No.39)																																		
	Coldest, No.42										Warmest, No.19										< MPEG Surface Animations (Extreme Members)																																		

Summary

- A new clustering method for 15-day ensemble forecasts has been developed
 - Based on objectively classified European Grosswetterlagen *
 - Runs twice a day at DWD using ECMWF EPS15
 - GWL probabilities displayed in an easily-readable tree-like structure
 - Very useful for operational medium-range forecasters
 - Rapid visual assimilation of primary synoptic aspects of forecasts
 - Free of artificial constraints in respect to pre-specified forecast periods
 - Alternative synoptic developments in forecast easy to understand
 - Impacts of these developments on regional weather clarified using advanced graphical display of respective GWL-cluster-means

* Other classification methods, other regions of the globe can be envisaged