

SEVENTH WORKSHOP

ON

METEOROLOGICAL OPERATIONAL SYSTEMS

ECMWF; SHINFIELD PARK; READING/BERKS.; UNITED KINGDOM

15-19 NOVEMBER 1999

Session 1: Use and interpretation of medium-range forecast guidance

MEDIUM RANGE FORECASTS AT GMGO

BY **Karl-Heinz Sawatzky**
German Military Geophysical Office (GMGO)
Forecast Center
Mont Royal

56841 Traben-Trarbach **phone: 0049-6541-18-468**
GERMANY **FAX: 0049-6541-18-515**

1. Introduction and abstract: Operational products are presented. This includes a very brief discussion of the GPV Germany, a medium range forecast for Germany. The main part of this paper deals with our sequence of medium range forecasts for the Balkans /Mediterranean, supporting SFOR / KFOR units.

The term „medium-range forecast“ is used for forecasts from „day + 1“ until „day + 7“ in our service.

Remarks are given to Numerical Guidance including several grid point forecasts and ensemble forecasts. Finally some results of verifications of some of the products are presented.

2. GPV: Geophysical Planning Forecast (German: Vorhersage)

For each of Day +1, +2, +3, +4 this forecast is a combined product of 2 fixed time charts (sunrise + 2 h and sunset + 2 h) showing areas of similar weather (see Fig 1). The weather for those areas, here A to F, can be seen in the table next to the charts. The forecast also includes a brief description of the synoptic situation, remarks to the table and hazards, soilstate and minimum / maximum temperatures.

The „final Report“ of the GPV gives a brief outlook for “day +5” til “day +7”, finally followed by „remarks to Numerics“. The latter describes, which model was used (ECMWF or DWD or a mixture of both). The alternative solution is presented. So is the reasoning for using a particular model. Hints for this reasoning will probably come from Ensemble Forecasts.

3. Medium-range products for the Balkans / Mediterranean supporting SFOR/KFOR units
Each of those forecasts is issued once per day 365 days per year.

3.1 Medium-Range Forecast for South Croatia, Bosnia-Herzegowina, Kosovo, Former Yugoslavian Republic of Macedonia and Albania



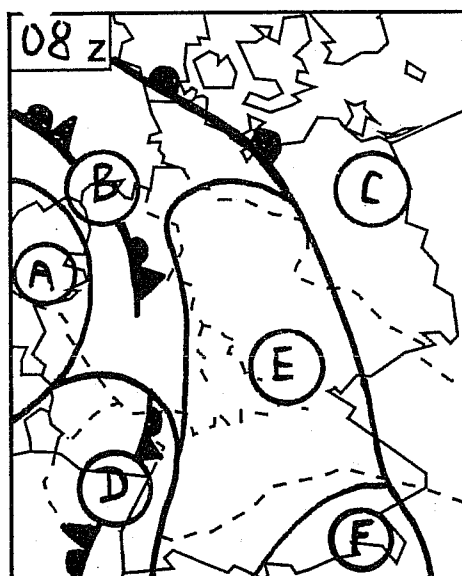
Geophysikalische Planungsvorhersage Deutschland

9 Z X 2 6

herausgegeben am: 21.10.99 gültig für Fr, 22.10. (1. Folgetag)

Synoptische Lage:

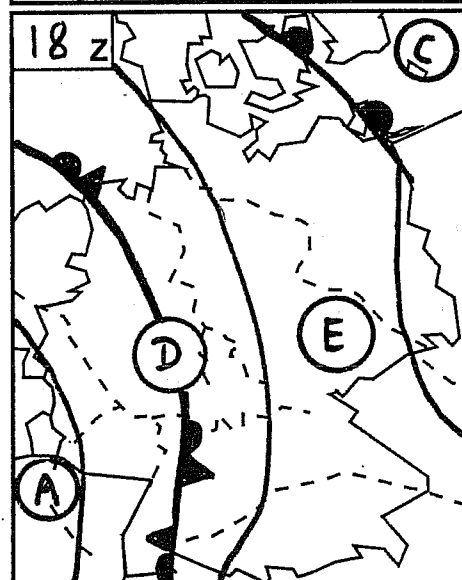
Eine Warmfront sorgt anfangs im Norden bzw. Nordosten für Regen. Die wellende Warmfrontokklusion von Ex-Hurrikan Irene führt im Westen zu verbreitetem meist leichtem Regen. Dazwischen ist es wolkelig bis stark bewölkt aber überwiegend trocken. Im östlichen Alpenvorland herrscht Föhn. Es wird recht mild. Der kräftige Wind aus südlichen Richtungen erreicht in Böen Sturmstärke.



G e b	Boden- wind	Boden- sicht	Wetter	Ceiling	0°- Grenze
A	20012				
	G25	10+/5	-/-SHRA	-/15	80
B	18010	8/4	-/-RA.-SHRA	25/12	75
C	15015	8/3	-/RA	35/10	65
D	18008	7/2	-RA/RA	25/07	85
E	16010	10+	-	70/25	85
F	15010	10+	-	-/70	95

Bemerkungen/Phänomene/Gefahren:

- E: vereinzelt leichter Regen oder Schauer.
- im Bergland, an der Küste und im norddeutschen Tiefland böen um 30kt, in exponierten Lagen um 40kt



Erdbodenzustand:

überwiegend feucht, im Flachland örtlich noch trocken.

T_{min}:

sw	:	7 bis 9
sonst	:	6 bis 7
	:	
	:	

T_{max}:

NW	:	13 bis 16
sonst	:	16 bis 19
	:	
	:	

Fig 1

An example for this forecast is shown in **Fig 2a –2c**. It starts with a brief description of the synoptic situation for day+1 until day+4. Remarks to numerics can be included. A table for 4 subareas of South Croatia / Bosnia-Herzegowina follows. It contains the important weather parameters. The same scheme is used for the table concerning Kosovo, Macedonia and Albania. As most of the figures are supposed to be mean values, each subarea gets a reference height representing that area. „Remarks“ are used to add more information to the tables like hills in clouds or fog, not to be mixed up with „remarkable phenomena / hazards. An outlook for day+5 until day+7 follows. This can include remarks to numerics. A soilstate forecast, astronomical data and water temperatures conclude the product.

Guidance used for this bulletin are GME (DWD) and ECMWF. Gridpoint forecasts are available for GME (not filtered and Kalman-filtered versions of Direct Model Output). Ensemble Forecasts of ECMWF are used to bias the forecast towards one of those two models or towards some figures in between both models.

This forecast is a well established product, as it is submitted since 1995.

3.2 Unified Weather Forecast Stabilization FORces / Kosovo FORces (UWF SFOR/KFOR)

This is a chain of products consisting of three parts. Each of them covering the forecast time from day+2 until day+5. Numerical basis are GME (DWD) including DMO (see above) and ECMWF. These are planning charts and bulletins for the forces mentioned above and valid for day+2, 3, 4 and 5.

3.2.1 UWF SFOR – Large scale forecast charts

These are 4 fixed time charts (12z) showing an area forecast in terms of prevailing conditions concerning present weather (SYNOP code symbol), visibility (in km), cloud cover (scattered = 1-4 octas, broken = 5-7 octas, overcast = 8 octas, obscured) and cloud base (in hft). Thresholds for visibility are 1.5, 5 and 8 km, for ceiling 300, 1000 and 2000 ft. Minimum conditions are presented in their frequency and the weather causing them. Frontal boundaries, pressure centers and 850 hpa winds complete the charts. **Fig 3** shows an example.

3.2.2 UWF SFOR – Local forecast („tabular forecast boh and kosovo“) Bulletin Bosnia-Herzegowina and Kosovo

An example is presented in **Fig 4a and 4b**. The Bulletin starts with a very brief description of the synoptic situation for each day. The table following is for 4 forecast regions. These are the three multinational division (mnd) regions of Bosnia-Herzegowina and Kosovo.

The „forecast days“ are divided into 3 parts. This is to enhance the diurnal variation of meteorological variables. So a „forecast day“ starts with „forenoon“ (sunrise – 1h - 12 local time). „Afternoon“ lasts from 12 local time til sunset +1h, „evening / night“ from sunset + 1h til sunrise – 1h (next morning).

For each of those periods in time surface wind, weather (METAR code), visibility and ceiling are forecasted in the table (see **Fig 4a and 4b**). The last three show prevailing and minimum conditions (p/m). The other parameters are just forecasted once per day.

Soilstate, some water temperatures and characteristic wave heights for Adriatic Sea complete the forecast.

3.2.3 UWF SFOR – „impact matrix boh and kosovo“

feyg20 etgx 231100

medium range forecast

for south croatia, bosnia-hercegowina, kosovo,
former yugoslavian republic of macedonia and albania.
valid from Thursday, 24.06.1999 till Wednesday, 30.06.1999

- issued by gmgo -

1. synoptic development

till Sunday, 27.06.1999

an upper low with its related surface low will leave east. at its rear a flat upper ridge with associated subsidence will become dominant from west. near surface a flat pressure gradient situation will establish and the actual cool northerly flow will slow down from west. fair weather will prevail. however, some cloud will be likely over hilly regions with a small risk of isol rain, showers or thunderstorms. from saturday(26th) a warm front-like pattern will cross north italy east with medium and upper cloud. however, it will probably stay north of the aor, only causing small amounts of pcpn at slovenia.

2. table

forecast for south croatia, bosnia-hercegovina

parameter/	areas	: thu	: fri	: sat	: sun
		: 24.06	: 25.06	: 26.06	: 27.06
surface-	adc	: 33007	: vrb05	: vrb05	: vrb05
wind	east	: 32010	: 32005	: vrb05	: vrb05
(deg kn)	hills	: 33010	: 33008	: vrb05	: vrb05
	mon	: 35012	: 35010	: vrb05	: vrb05
visibility	adc	: 10+	: 10+	: 10+	: 10+
(km)	east	: 10+	: 10+	: 10+	: 10+
	hills	: 10+	: 10+	: 10+	: 10+
	mon	: 10+	: 10+	: 10+	: 10+
ceiling	adc	: -	: -	: -	: -
(hft gnd)	east	: frq30	: loc 30	: -	: -
	hills	: frq20	: loc 20	: loc 20	: loc 30
	mon	: frq 10	: frq 10	: loc 15	: loc 20
t min/t max	adc	: 11/23	: 13/25	: 15/26	: 16/27
(deg c)	east	: 09/20	: 09/21	: 10/23	: 12/25
	hills	: 07/16	: 08/18	: 10/21	: 12/22
	mon	: 04/12	: 06/14	: 08/17	: 10/18
freezing-	entire	: 80	: 85	: 95	: 105
level					
(hft msl)					
precipitation	entire	: 0-2	: 0-1	: 0	: 0
(mm/24h)					

h i n t s :

adc = adriatic coast (ref. heigh 300 m nn)
east = area Sarajevo - Tuzla - Banja Luka (ref. heigh 500 m nn)
hills = hilly area (ref. heigh 1000 m nn)
mon = central mountains (ref. heigh 1600 m nn)

Fig 2a

3. t a b l e :

forecast for former yugoslavian republic of macedonia,
kosovo and albania

parameter/	areas	: thu	: fri	: sat	: sun
sfc-wind (deg kn)	kos	: 24.06	: 25.06	: 26.06	: 27.06
	mac	: 33010	: 34007	: 33007	: vrb05
	alcoa	: 33010	: 34007	: 33008	: vrb05
	alhigh	: 35012	: 35010	: 33007	: vrb05
visibility (km)	kos	: 10+	: 10+	: 10+	: 10+
	mac	: 10+	: 10+	: 10+	: 10+
	alcoa	: 10+	: 10+	: 10+	: 10+
	alhigh	: 10+	: 10+	: 10+	: 10+
ceiling (hft gnd)	kos	: frq 25	: loc 25	: -	: -
	mac	: frq 25	: loc 25	: -	: -
	alcoa	: -	: -	: -	: -
	alhigh	: frq 25	: frq 25	: -	: -
t min/t max (deg c)	kos	: 09/19	: 10/20	: 12/23	: 13/25
	mac	: 10/20	: 11/21	: 13/24	: 13/25
	alcoa	: 14/24	: 15/25	: 16/27	: 18/29
	alhigh	: 10/20	: 12/21	: 13/24	: 14/26
frz-level (hft msl)	entire	: 75	: 80	: 90	: 100
pcp (mm/24h)	entire	: 0-3	: 0-1	: 0	: 0

h i n t s :

kos = kosvo (ref. height 500 m nn)
 mac = the former yugoslavian republic of macedonia
 (ref. height 500 m nn)
 alcoa = albania/coastal area (ref. height 100 m nn)
 alhigh = albania/highlands (ref. height 500 m nn)

4. r e m a r k s :

- on thu(24th) and fri(25th) still isol pcpn, more in the east than in the west.
 - during late night and early morning loc dense mist or even fog.

5. r e m a r k a b l e p h e n o m e n a / h a z a r d s :

- during first part of period still northwesterly strong gale over exposed areas.

6. f u r t h e r o u t l o o k from Monday, 28.06.1999
 till Wednesday 30.06.1999

summerly weather with still rising temperatures and sunny periods.
 but due to a flat upper trough with related flat surface low - both approaching from west - convective cloud with risk of rain showers and thunderstorms will occur.

7. s o i l s t a t e till Wednesday. 30.06.1999

moist, becoming dry. from mon(28th) transient moist to wet in places due to convective pcpn.

Fig 2b

8. astronomical data :

sarajevo	:24.06.	25.06.	26.06.	27.06.
sunrise:	03:05	03:05	03:05	03:05z
sunset :	18:33	18:33	18:33	18:33z
pristina	:24.06.	25.06.	26.06.	27.06.
sunrise:	02:58	02:59	02:59	02:59z
sunset :	18:17	18:17	18:17	18:17z

9. water temperature :

adriatic sea (area zadar-split)	22 deg cen
adriatic sea (west of albania)	23 deg cen
area thessaloniki	23 deg cen

Fig 2c

fxeu52 etgx 020030

issued by gmgo

uwf - sfor/kfor - tabular forecast boh and kosovo

1. synoptic situation:

wed, 03rd:

high pressure influence over entire aor, diurnal variation of weather elements.

thu, 04th:

still high pressure weather type, slack pressure gradient.

fri, 05th:

weak mediterranean depression approaching boh, kosovo still high pressure.

sat, 06th:

remnants of above mentioned low affecting entire aor.

day 2

(wednesday, 03rd, 04z till thursday, 04th, 04z)

m n d - n

sfc wind (deg/kt) : forenoon 03005 afternoon 04008 evening/night vrb05
weather (metar-code) p: - - br
m: br hz fg
visibility (km) p/m: 8/3 8/5 6/0,4
ceiling (hft gnd) p/m: -/- -/- -/zero
.....
t min/t max (deg cel) 04/13
td min/td max (deg cel) 05/05
freezing level (hft msl) 085
precipitation (mm/24h) - reference height: 300m

m n d - s w

sfc wind (deg/kt) : forenoon 04010 afternoon 05012 evening/night vrb05
weather (metar-code) p: - - -
m: br hz br
visibility (km) p/m: 8/3 10+/6 8/3
ceiling (hft gnd) p/m: -/- -/- -/-
.....
t min/t max (deg cel) 05/12
td min/td max (deg cel) 04/04
freezing level (hft msl) 085
precipitation (mm/24h) - reference height: 400m

Fig 4a

m n d - s e

sfc wind (deg/kt) : forenoon afternoon evening/night
 : vrb05 03008 vrb03
weather (metar-code) p: - - -
 m: br hz fg
visibility (km) p/m: 8/2 10+/7 8/0,6
ceiling (hft gnd) p/m: -/- -/- -/zero
.....
t min/t max (deg cel) 05/15
td min/td max (deg cel) 05/06
freezing level (hft msl) 090
precipitation (mm/24h) - reference height: 800m

kosovo

sfc wind (deg/kt) : forenoon afternoon evening/night
 : vrb05 02008 vrb03
weather (metar-code) p: - - -
 m: br hz fg
visibility (km) p/m: 8/1,5 8/6 8/0,6
ceiling (hft gnd) p/m: -/- -/- -/zero
.....
t min/t max (deg cel) 07/17
td min/td max (deg cel) 06/08
freezing level (hft msl) 095
precipitation (mm/24h) - reference height: 500m

soilstate:

generally dry, becoming moist on sat, 06th due to widespread rain.

actual water temperature adriatic sea

north: 19 cen deg.

south: 21 cen deg.

forecast of characteristic wave height adriatic sea (m)

	day 2	day 3	day 4	day 5
date	wed, 03rd:	thu, 04th:	fri, 05th:	sat, 06th:
north	0,5	0,5	0,5	0,8
south	1,0	1,0	0,6	0,5

Fig 4b

This is a very specific and customer oriented forecast for the planning of different kind of military missions (see Fig 5a, 5b and 5c). Therefor it needs quite some explanation. We call it a „traffic lights forecast“. It is supposed to help military leaders to plan their missions quickly and still precisely. It has the same time resolution as the „tabular forecast boh and kosovo“. So following that traffic lights terminology weather conditions can have three types of impact on a military mission:

NONE	no weather impact	Mission possible	GREEN lights
MOD	Moderate weather impact	Mission possible with restrictions	YELLOW lights
HIGH	severe weather impact	Mission impossibile	RED lights

A list of sensible weather thresholds for each of the required types of missions was made together with the customer. The thresholds mainly refer to prevailing conditions.

With very few exceptions the impact matrix **has** to be detected right out of the weather conditions given in the „tabular forecast boh and kosovo“. In other words this „tabular forecast boh and Kosovo“ directly implies the „impact matrix boh and kosovo“. This is the crucial point of this impact matrix.

That`s the reason, why for example the unusual parameter dew point, also quite difficult to be forecasted properly, still has to be forecasted.

A computer program helping the operational meteorologist to calculate the impact matrix from his local forecast is in progress.

3.2.4 UWF SFOR – Notes

As to be expected with detailed forecasts up to day+ 5 ahead, that forecast for a particular day can vary significantly from day to day with the variation of the different model runs and the different models. To detect the best forecast possible every day ensemble forecasts are helpful sometimes.

The customer has to be aware of that problem. So GMGO started to add „remarks“ to the „tabular forecast boh and kosovo“ with the beginning of the year 2000. Significant differences to the previous forecast are mentioned their. „Precipation stronger“, „colder, precipitation more snow than rain now“ or „precipitation delayed“ are typical examples for those remarks.

Critics of the product focus more on some of the weather thresholds for the impact matrix than on the forecast itself.

3.2.5 UWF SFOR – Verification

Long term verification of parameter forecasts in the „tabular forecast boh and kosovo“ was done for the mnd-sectors of Bosnia-Hercegowina. This was done for a period of time when only one figure per day had to be put into the forecast. Focus was on systematical errors will say biases.

Main biases were -overestimation of convective processes,

-underestimation of fog/mist in mnd-n, some overestimation in mnd-se,

-ceiling forecast often too pessimistic,

-underestimation of the diurnal cycle of temperature

-overestimation of convective processes.

Most of those biases can be summarized with „to be on the safe side“. This seems to be something meteorologists like to do, especially those who deal with aviation and therefor flight safety.

fxeu53 etgx 020030
 issued by gmgo
 uwf - sfor/kfor - impact matrix boh and kosovo

1. synoptic situation:

wed, 03rd:

high pressure influence over entire aor, diurnal variation of weather elements.

 thu, 04th:

still high pressure weather type, slack pressure gradients.

 fri, 05th:

weak mediterranean depression approaching boh, kosovo still high pressure.

 sat, 06th:

remnants of above mentioned low affecting entire aor.

day 2			day 3			day 4			day 5		
wed,03th, 04z	till		thu,04th, 04z	till		fri,05th, 04z	till		sat,06th, 04z	till	
thu,04th, 04z	fri,05th, 04z		sat,06th, 04z		sun,07th, 05z						
f	a	e /	f	a	e /	f	a	e /	f	a	e /
o	f	vn	o	f	vn	o	f	vn	o	f	vn
r	t	ei	r	t	ei	r	t	ei	r	t	ei
e	e	ng	e	e	ng	e	e	ng	e	e	ng
n	r	ih	n	r	ih	n	r	ih	n	r	ih
o	n	nt	o	n	nt	o	n	nt	o	n	nt
o	o	g	o	o	g	o	o	g	o	o	g
n	o		n	o		n	n		n	o	
	n			n						n	

personnel	day 2			day 3			day 4			day 5		
mnd-n	:none	none	none	none	none	none	none	none	none	none	none	none
mnd-sw	:none	none	none	none	none	none	none	none	none	none	none	none
mnd-se	:none	none	none	none	none	none	none	none	none	none	none	none
kos	:none	none	none	none	none	none	none	none	none	none	none	none

Fig 5a

	day 2	day 3	day 4	day 5
ground ops				
mnd-n	:none none none	none none none	none none none	none none none
mnd-sw	:none none none	none none none	none none none	none none none
mnd-se	:none none none	none none none	none none none	none none none
kos	:none none none	none none none	none none none	none none none

	day 2	day 3	day 4	day 5
helicopter ops				
mnd-n	: mod none mod	mod none mod	none none mod	none none mod
mnd-sw	:none none mod	none none mod	none mod mod	none none mod
mnd-se	:none none mod	none none mod	none none mod	none none mod
kos	: mod none mod	none none mod	none none mod	none none mod

	day 2	day 3	day 4	day 5
air support				
mnd-n	:none none none	none none none	none mod mod	none none mod
mnd-sw	:none none none	none none none	none mod mod	none none mod
mnd-se	:none none none	none none none	none none mod	none none mod
kos	:none none none	none none none	none none mod	none none mod

	day 2	day 3	day 4	day 5
air lift				
mnd-n	:none none none	none none none	none none none	none none none
mnd-sw	:none none none	none none none	none none none	none none none
mnd-se	:none none none	none none none	none none none	none none none
kos	:none none none	none none none	none none none	none none none

Fig 5b

	day 2	day 3	day 4	day 5
air recce				
mnd-n	:none none mod	none none mod	none mod mod	mod mod mod
mnd-sw	:none none mod	none none mod	none mod mod	mod mod mod
mnd-se	:none none mod	none none mod	none none mod	mod none mod
kos	: mod none mod	none none mod	none none mod	mod mod mod

	day 2	day 3	day 4	day 5
naval ops				
mnd-se	:none none none	none none none	none none none	none none none

Fig 5c