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Confederazione Svizzera
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Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology **MeteoSwiss**

Neighbourhood shapes and sizes for COSMO-2

Pirmin Kaufmann, MeteoSwiss

COSMO WG4 workshop on verification of high resolution models



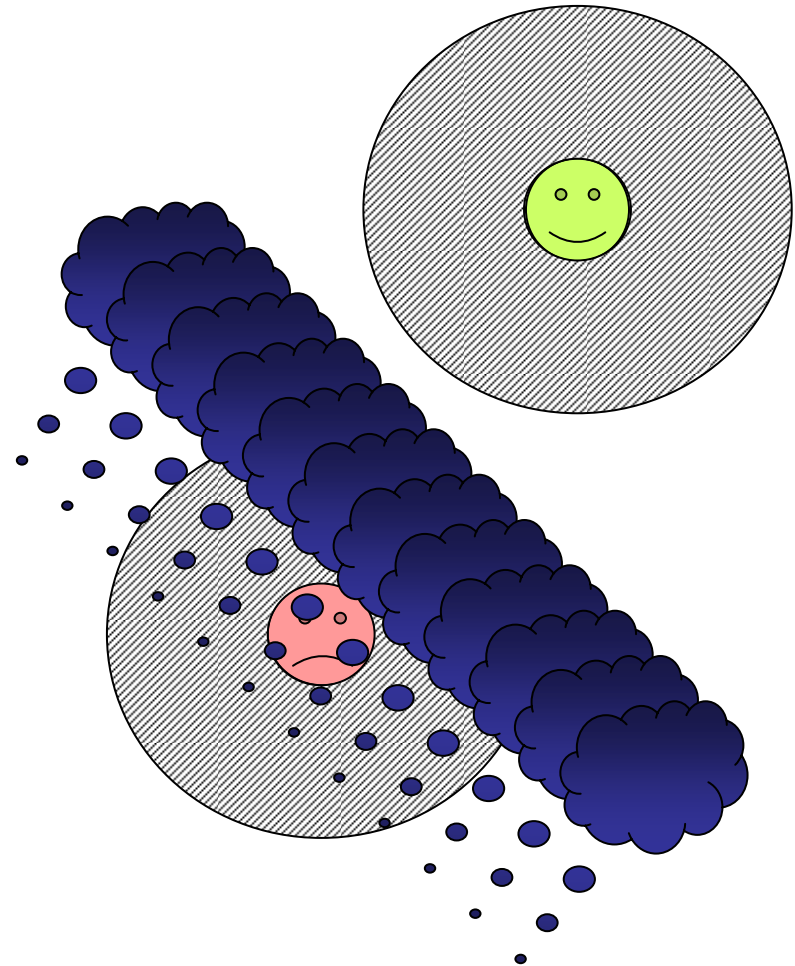
Neighbourhood method

- Probabilistic forecast from deterministic model
- Represents probability related to local-scale spatial and temporal model uncertainty and predictability
- Important especially on small scales (e.g. thunderstorms)



Neighbourhood method

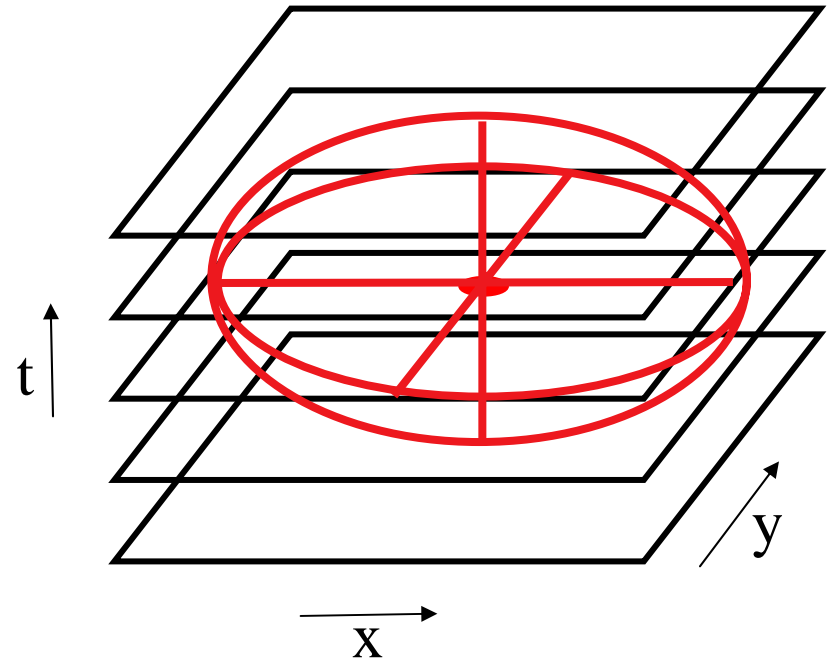
- Probabilistic forecast from deterministic model
- Represents probability related to local-scale spatial and temporal model uncertainty and predictability
- Important especially on small scales (e.g. thunderstorms)





Ellipsoidal neighbourhood

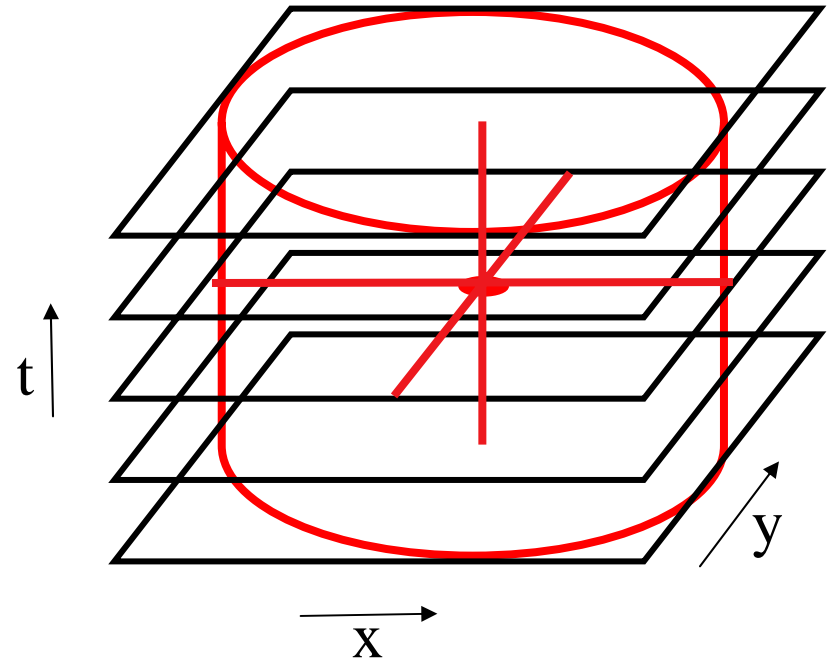
- Original shape of Theis et al. (2005)
- Spatial radius decreases with increasing distance in time: Space-time dependency





Cylindrical neighbourhood

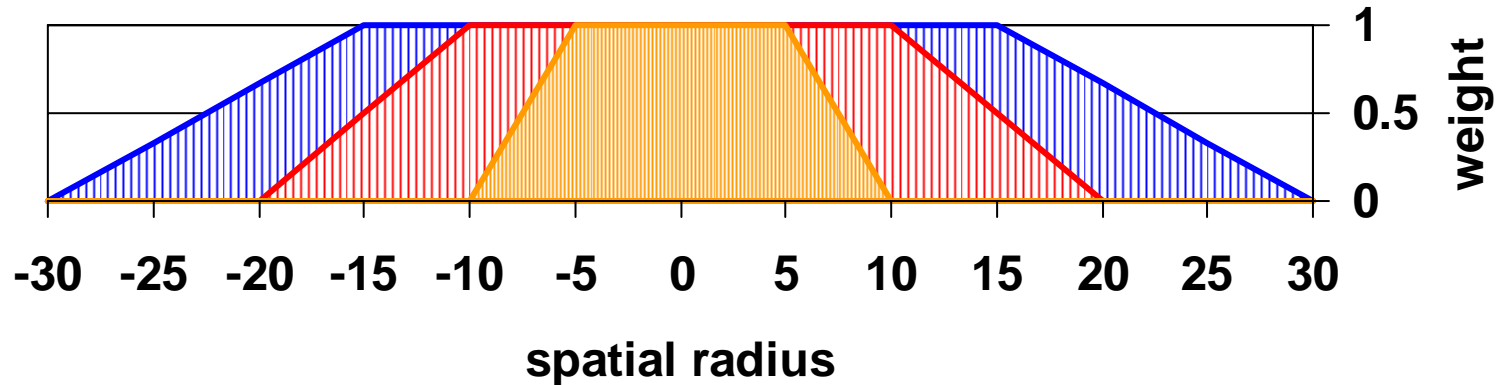
- Assuming spatial and temporal uncertainty are independent





Linearly fading weights

Large, medium, small neighbourhood

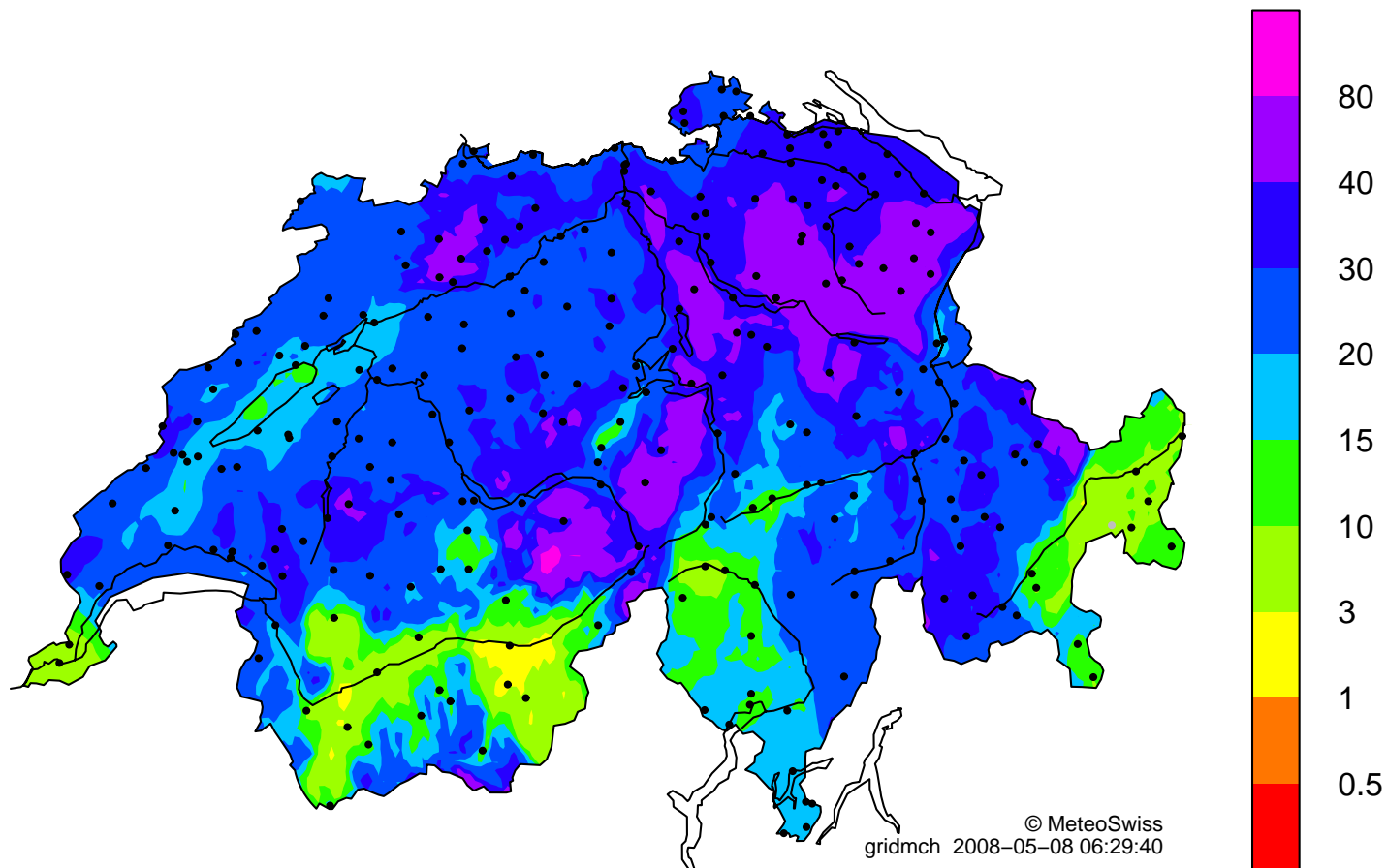


- Sponge layer around neighbourhood



Recent case: 21 April 2008

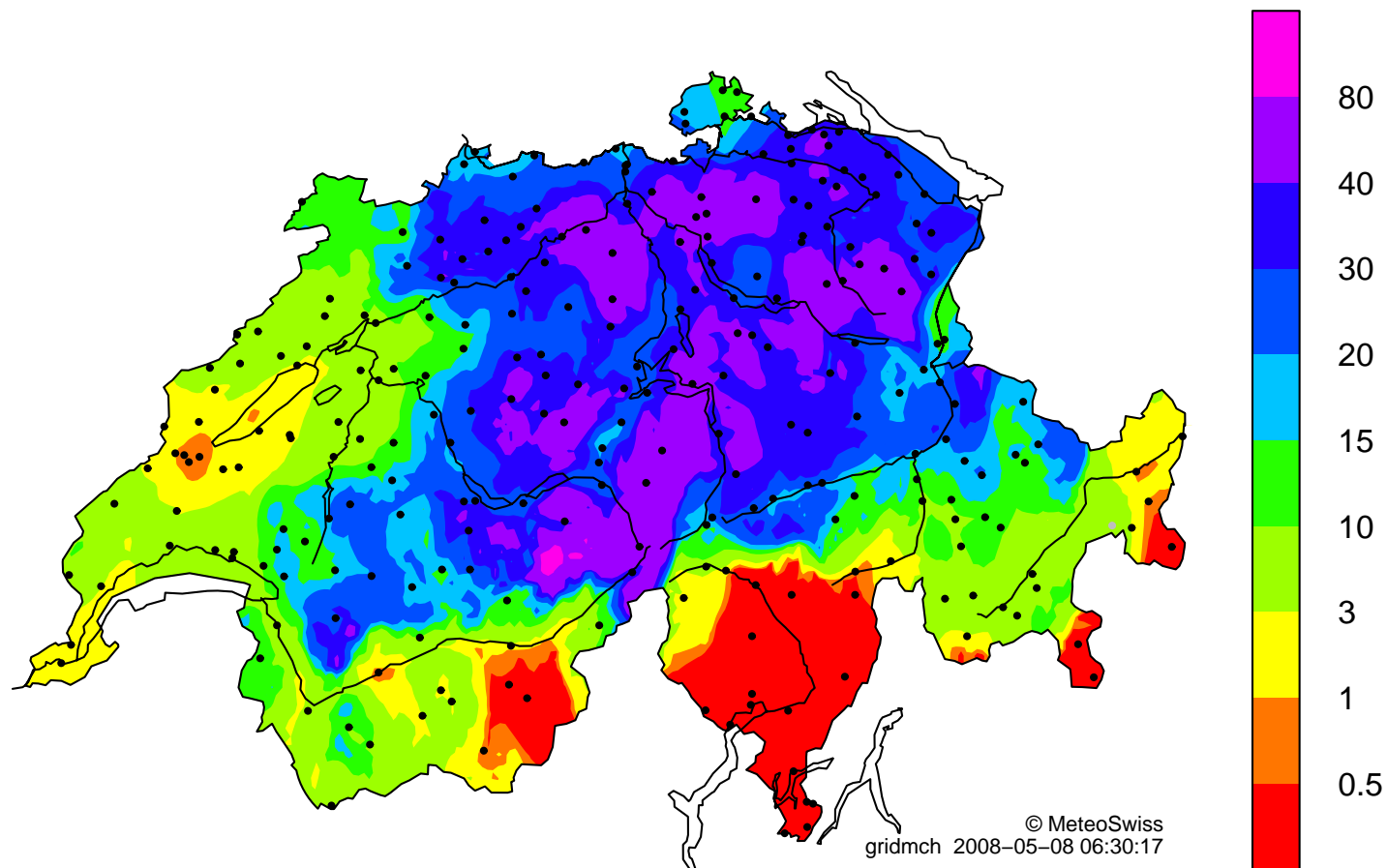
Precipitation (mm) 2008-04-21





Recent case: 22 April 2008

Precipitation (mm) 2008-04-22





Threshold 15 mm / 3 h

Obs. 6 UTC

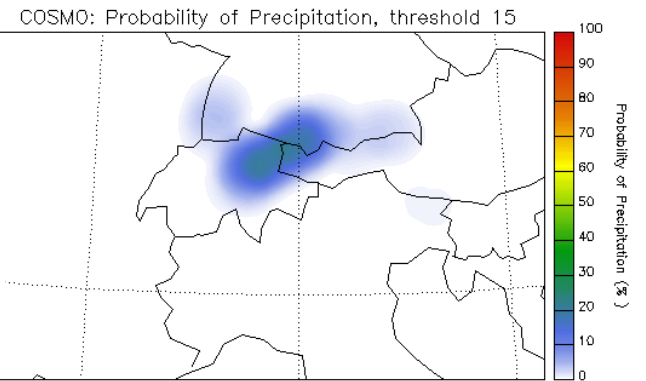


cylindrical

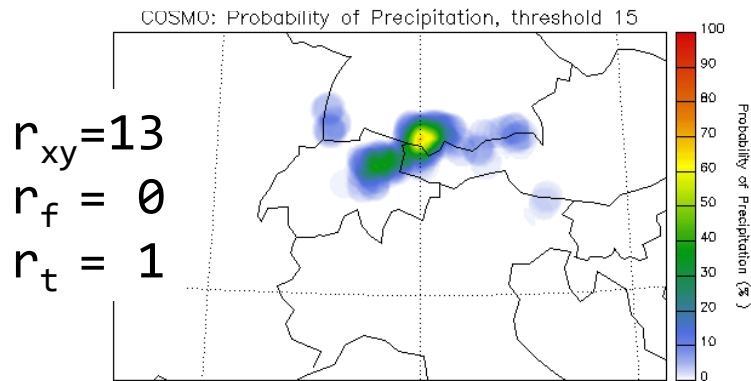
$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$



ellipsoidal

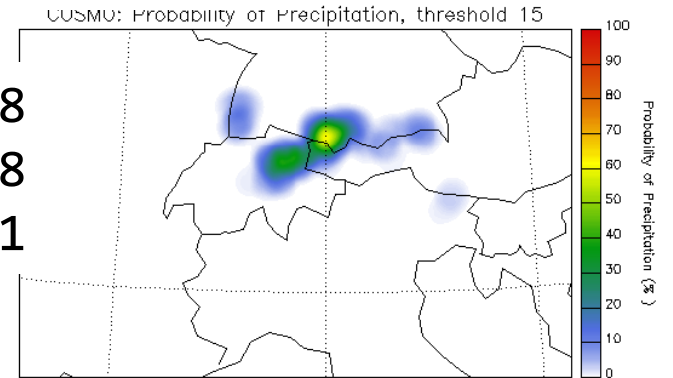


cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

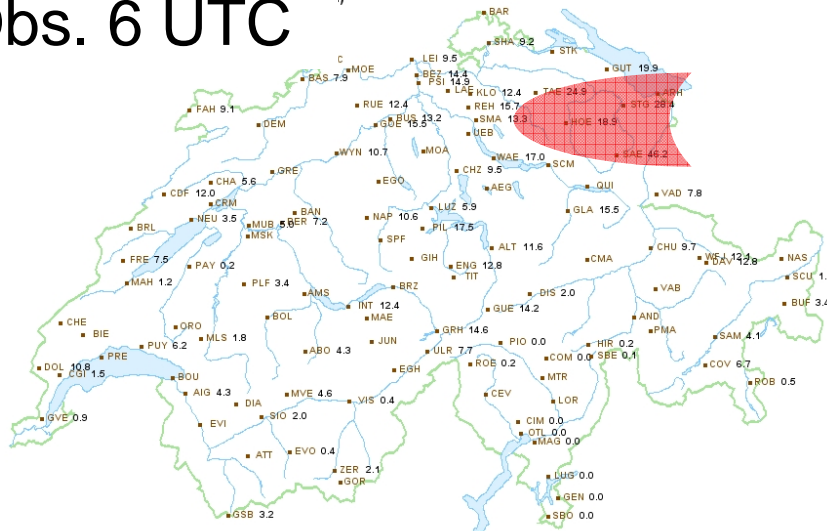
$$r_t = 1$$





Threshold 25 mm / 6 h

Obs. 6 UTC



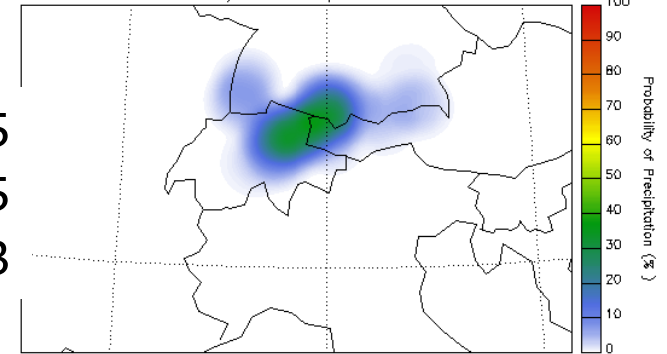
cylindrical

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$

COSMO: Probability of Precipitation, threshold 25



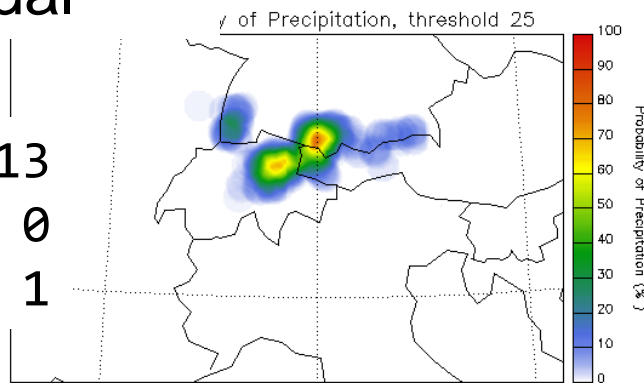
2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z

ellipsoidal

$$r_{xy} = 13$$

$$r_f = 0$$

$$r_t = 1$$



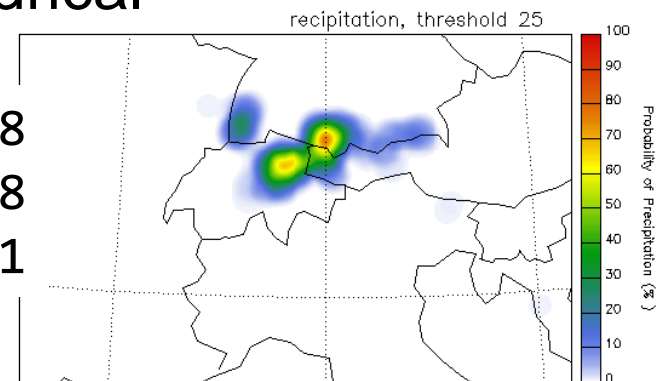
2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z

cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 1$$



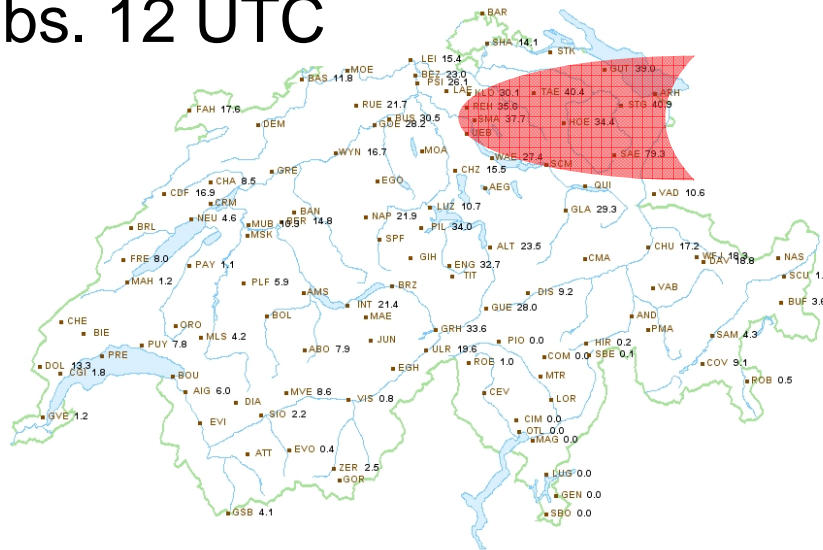
2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z

WG4 Works!



Threshold 35 mm / 12 h

Obs. 12 UTC

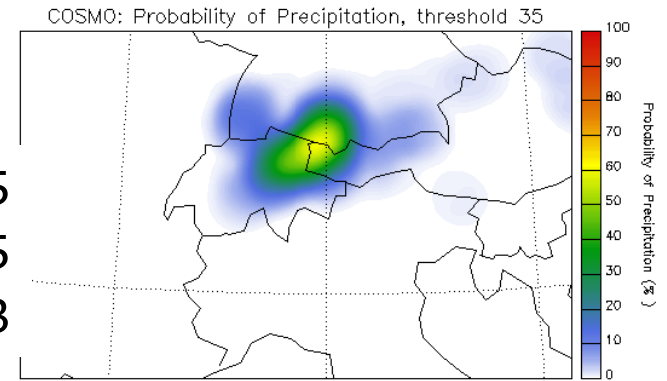


cylindrical

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$



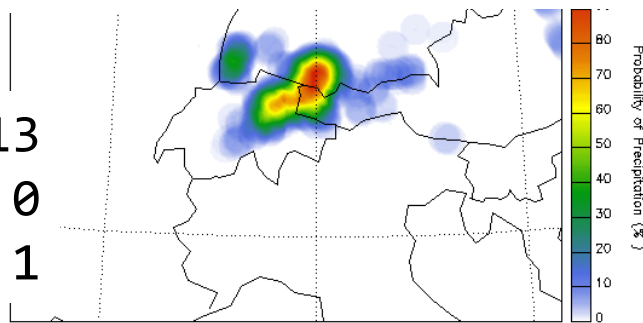
2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z

ellipsoidal

$$r_{xy} = 13$$

$$r_f = 0$$

$$r_t = 1$$



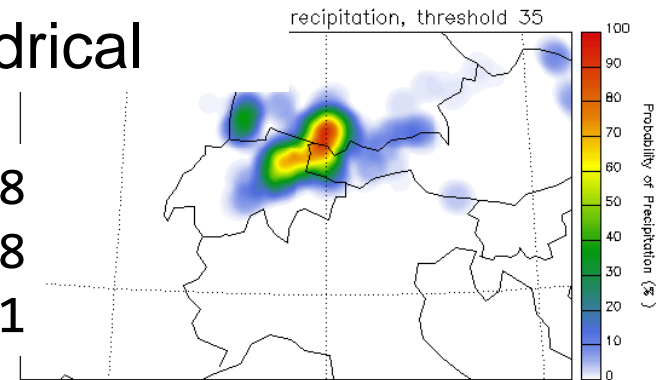
2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z

cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 1$$

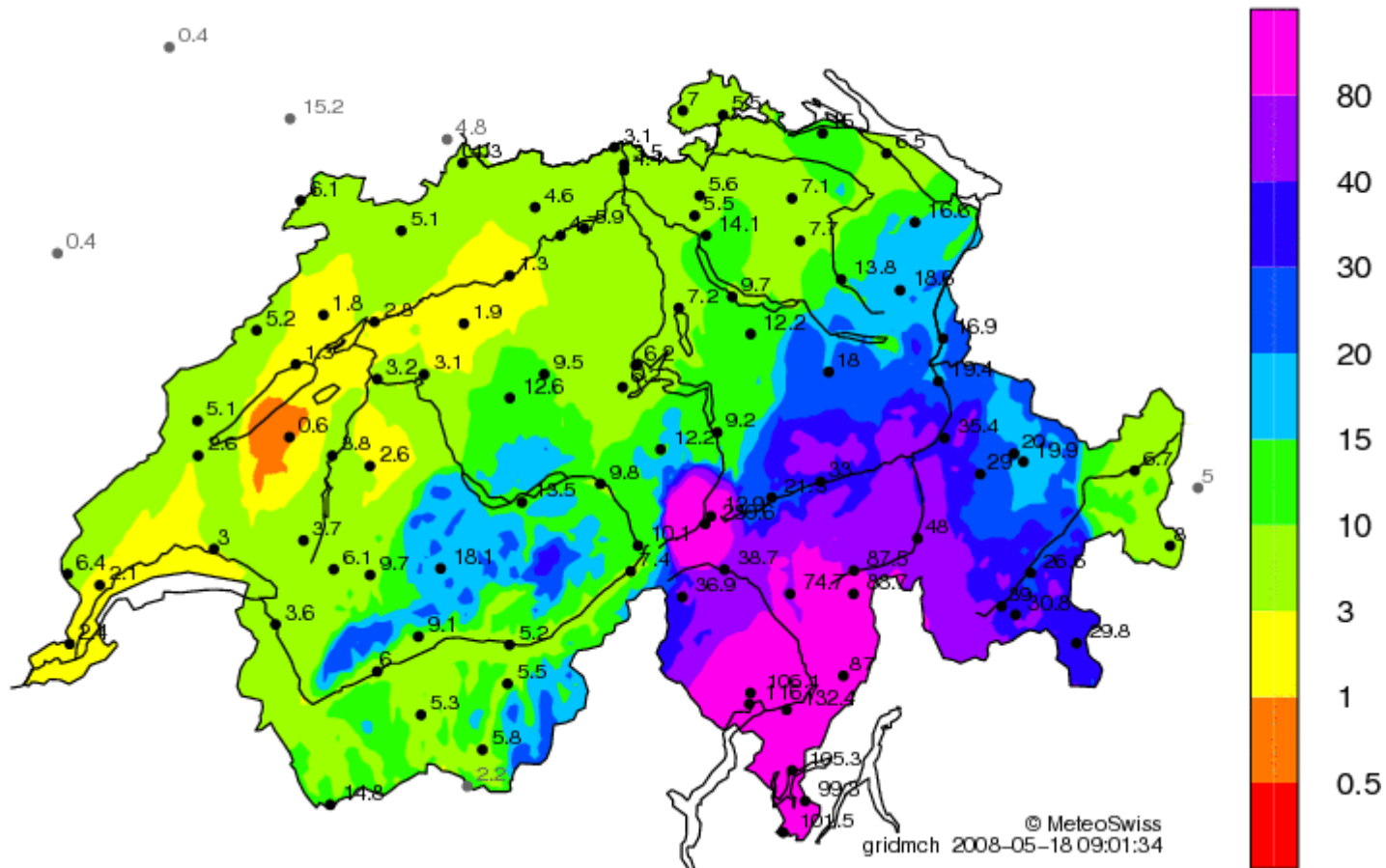


2008-04-21 12:00z +18 h valid: 2008-04-22 06:00z



Recent case: 17 May 2008

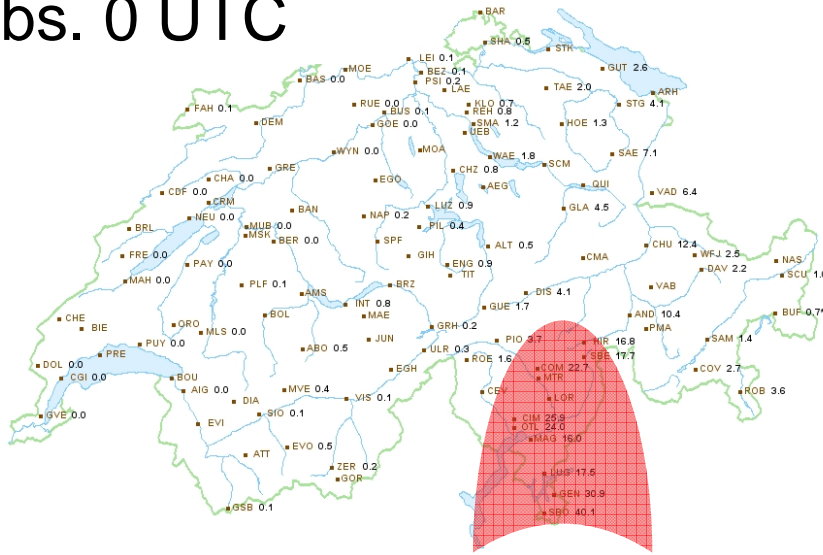
Precipitation (mm) 2008-05-17 (preliminary analysis)





Threshold 15 mm / 3 h

Obs. 0 UTC

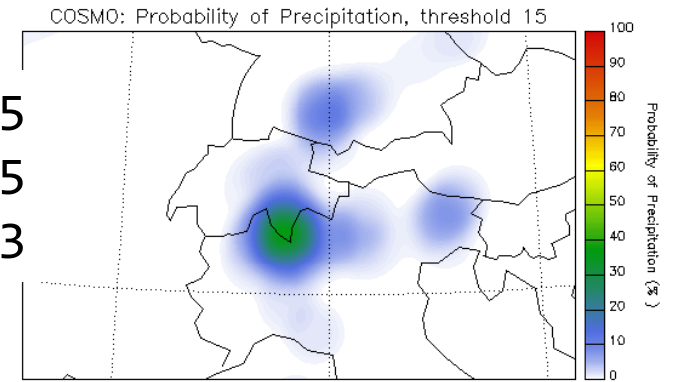


cylindrical

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$



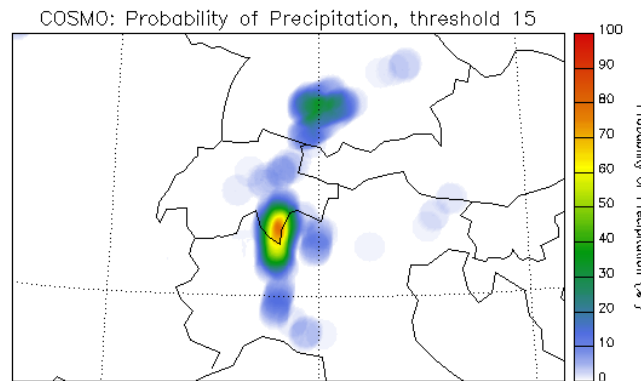
2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

ellipsoidal

$$r_{xy} = 13$$

$$r_f = 0$$

$$r_t = 1$$



2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

Neigl

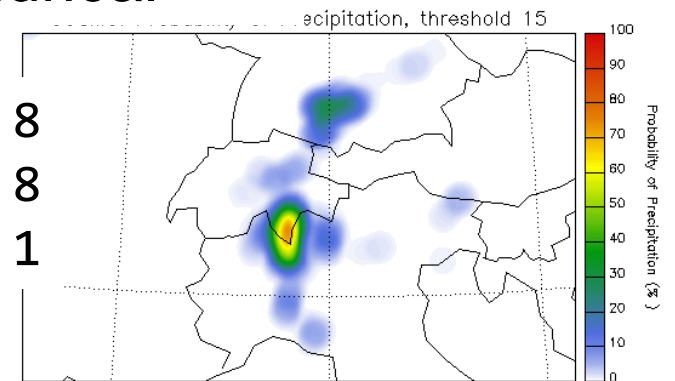
Pirmil... ..

cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 1$$



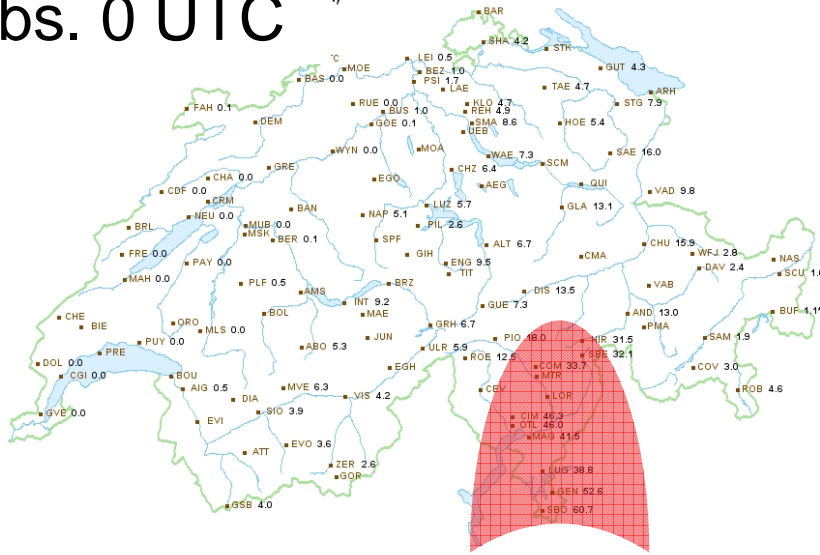
2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

rk:



Threshold 25 mm / 6 h

Obs. 0 UTC

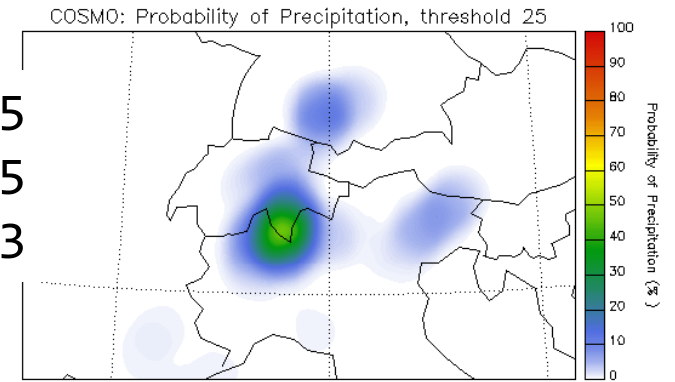


cylindrical

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$



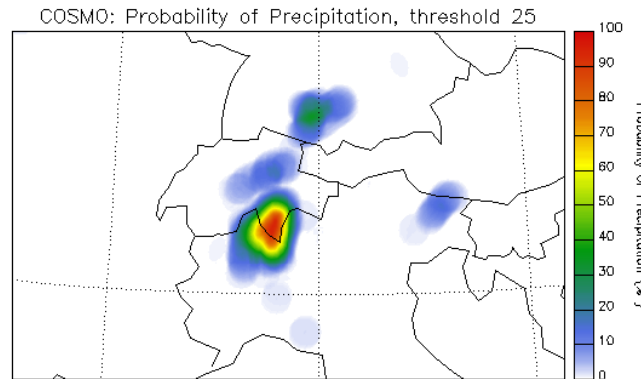
2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

ellipsoidal

$$r_{xy} = 13$$

$$r_f = 0$$

$$r_t = 1$$



2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

Neigl

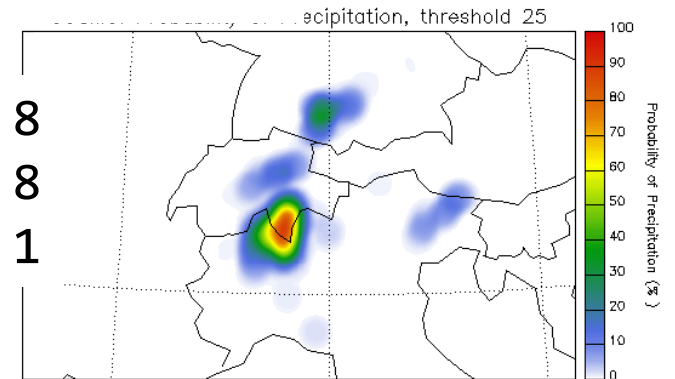
Pirmil...

cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 1$$



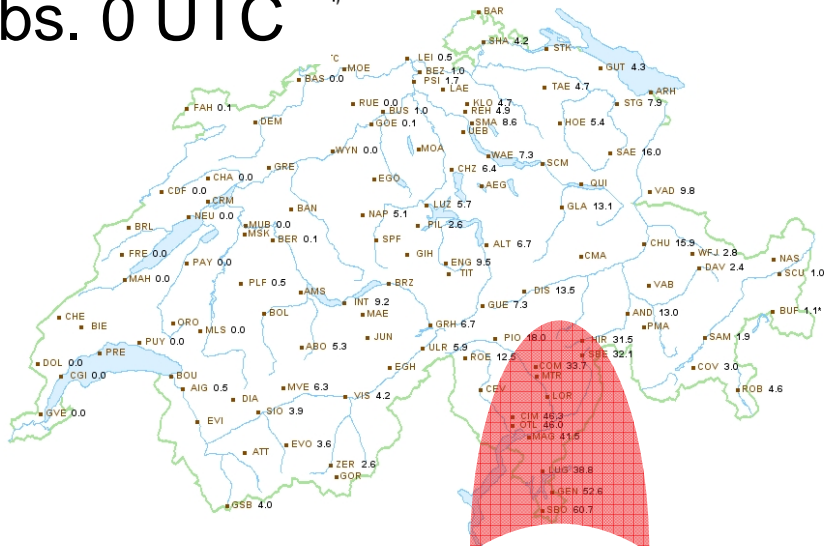
2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

rk:



Threshold 25 mm / 6 h

Obs. 0 UTC



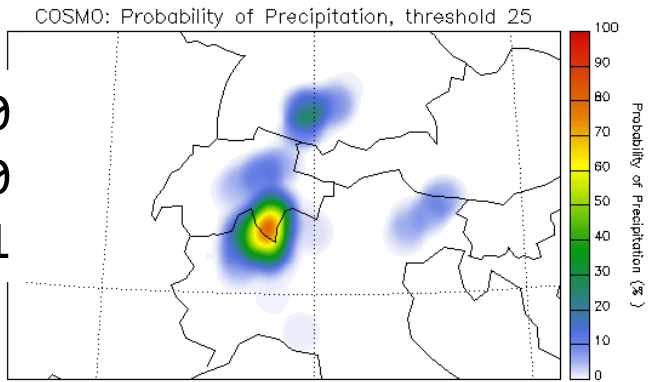
Quelle: MeteoSchweiz

cylindrical

$$r_{xy} = 10$$

$$r_f = 10$$

$$r_t = 1$$



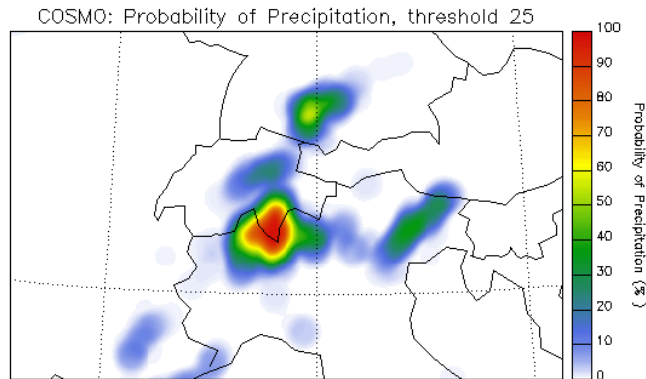
08-05-18 00:00z

cylindrical, maximum over time

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 3$$



2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

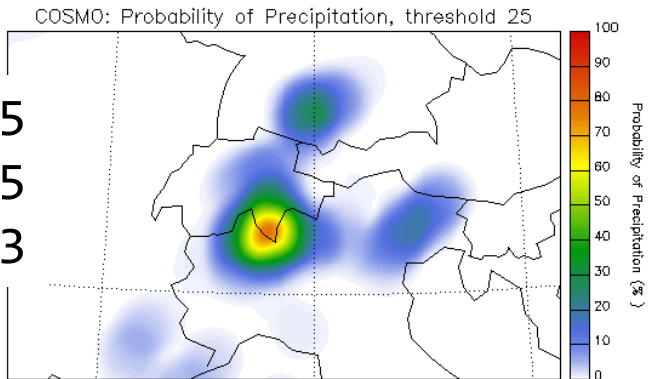
Neigl

Pirmil... (partially obscured)

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$



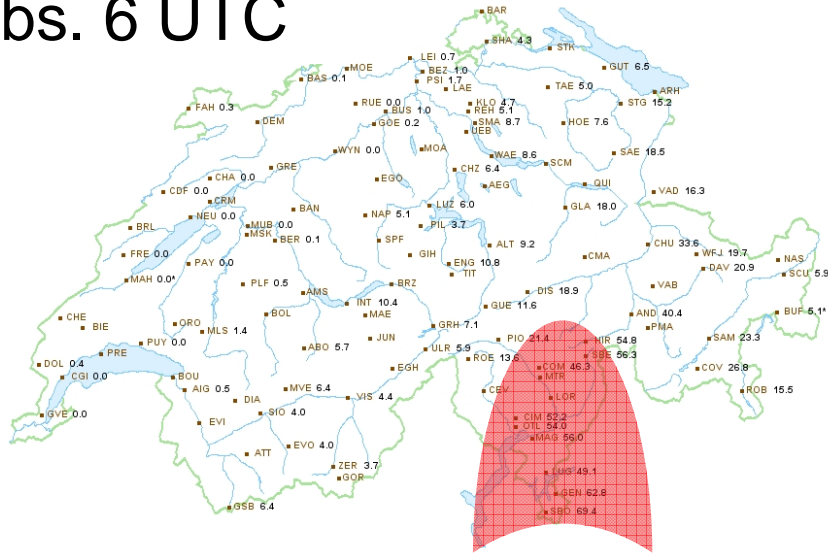
2008-05-17 12:00z +12 h valid: 2008-05-18 00:00z

rk:



Threshold 35 mm / 12 h

Obs. 6 UTC

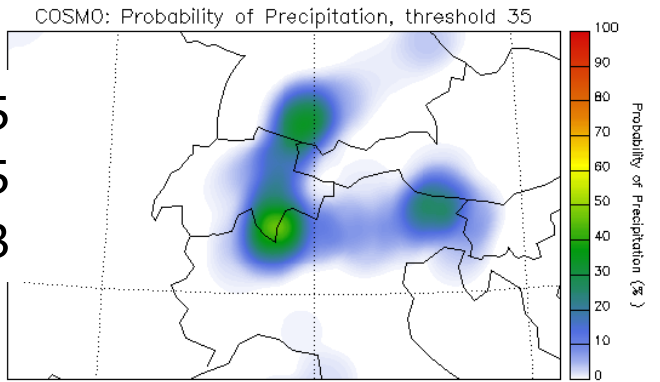


cylindrical

$$r_{xy} = 15$$

$$r_f = 15$$

$$r_t = 3$$

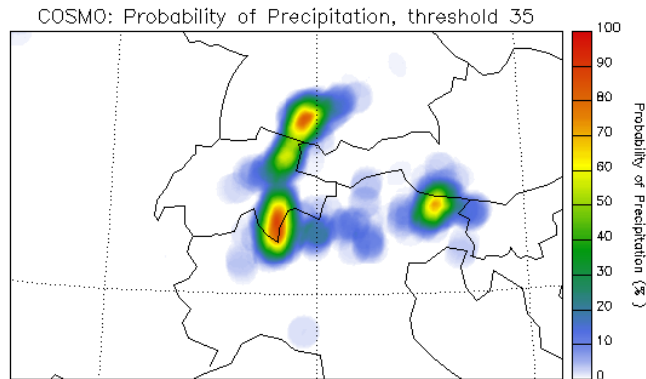


ellipsoidal

$$r_{xy} = 13$$

$$r_f = 0$$

$$r_t = 1$$



Neigl

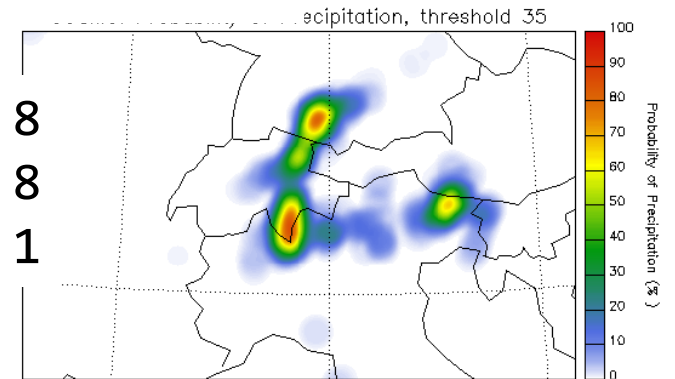
Pirmil...

cylindrical

$$r_{xy} = 8$$

$$r_f = 8$$

$$r_t = 1$$

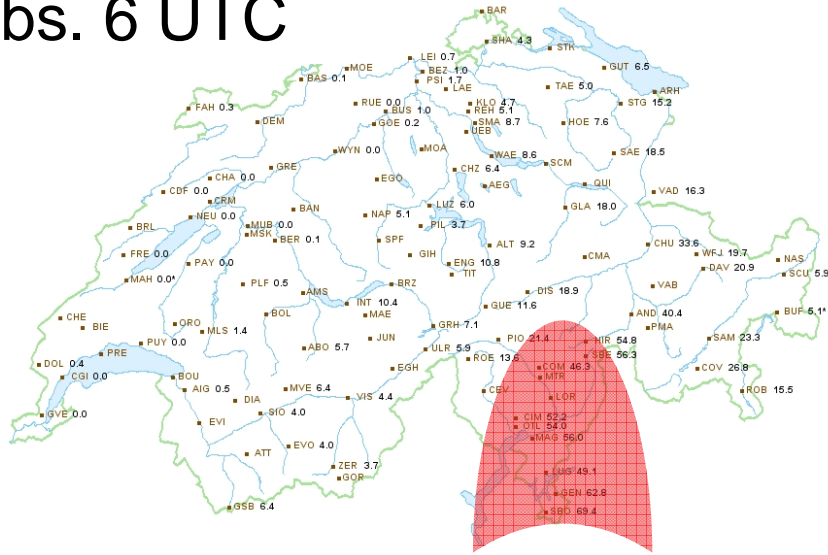


rk:



Threshold 35 mm / 12 h

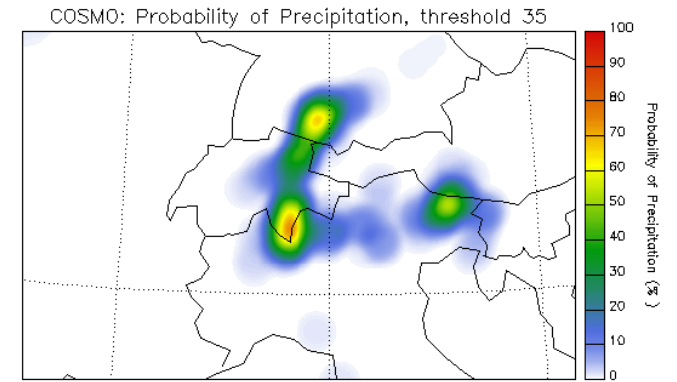
Obs. 6 UTC



Quelle: MeteoSchweiz

cylindrical

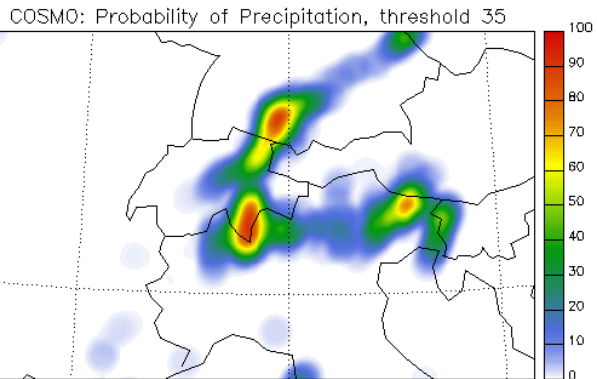
r_{xy}
 r_f
 r_t



2008-05-17 12:00z +18 h valid: 2008-05-18 06:00z

cylindrical, maxim

$r_{xy} = 8$
 $r_f = 8$
 $r_t = 3$

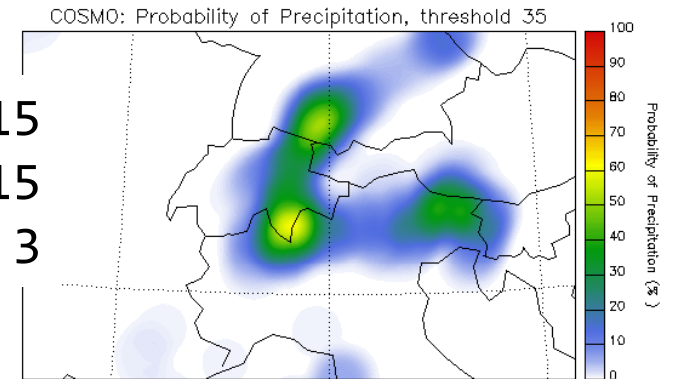


2008-05-17 12:00z +18 h valid: 2008-05-18 06:00z

Neigl

Pirmil...

$r_{xy} = 15$
 $r_f = 15$
 $r_t = 3$



2008-05-17 12:00z +18 h valid: 2008-05-18 06:00z

rk:



Objective probabilistic verification

- Objective verification still needs to be done ...



Neighbourhood method

- Current settings at MeteoSwiss:
 - COSMO-2: $r_{xy}=15$, $r_f=15$, $r_t=3$
 - COSMO-7: $r_{xy}= 5$, $r_f= 5$, $r_t=3$
- Future settings at MeteoSwiss:
 - COSMO-2: $r_{xy}=10$, $r_f=10$, $r_t=1$

