Probabilistic forecast of weather elements

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1. EPS Synoptic assessment

1.1 Ensemble spread

As a measure of Ensemble spread we consider the distribution of the members on the units of the classifier. As a measure of order we use the entropy [1,2].

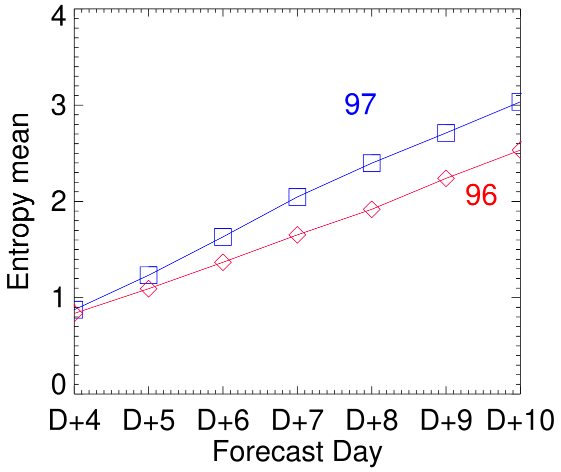
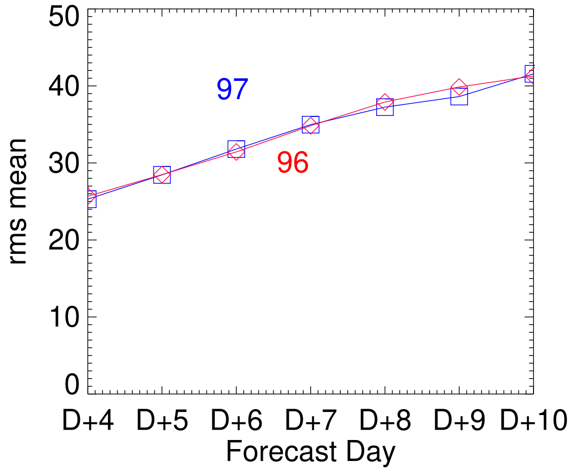


Fig 2.a Entropy mean as function of forecast day.



2.b Distance rms mean between the analysis and the control forecast.

As expected by increasing the resolution from T63 to T_L159, the spread is amplified. Figure 2.a shows clearly a larger entropy associated to the higher resolution EPS in 97.
In the same time, the average distance (rms) between the control forecast and the analysis is not significantly reduced by using a higher resolution (Fig.2.b).

A larger spread of EPS is profitable only if it is associated with a reduction of the number of cases where the verifying analysis is not included in the ensemble.

rms distances between the analysis and the unit corresponding to the EPS members are evaluated. On table 1, we display the rates of analyses lying outside the ensemble (according to a rms criteria).

Year	cases	D+4	D+5	D+6	D+7	D+8	D+9	D+10
1996	354 (D+4)	13	19	26	37	40	43	46
1997	296 (D+4)	11	16	23	29	32	34	36

Table 1. Relative numbers (in %) of analyses lying outside the ensemble.

This comparison shows that the rate of analysis lying outside of the ensemble is obviously decreased by introducing 50 members and improving the resolution, especially beyond day +7.

1.2 Similarity control - operational

We have calculated the rms distances between the unit associated with the operational run (T213) and the control forecast (T63 in 1996 and T_L159 in 1997).
The results presented in table 2 show an increased similarity between the operational and the control forecasts when the latter is computed with a higher resolution.

Year	cases	D+4	D+5	D+6	D+7	D+8	D+9	D+10
1996	354 (D+4)	12.8	14.9	19.1	21.2	24.8	27.7	30.1
1997	296 (D+4)	6.0	8.3	12.2	15.8	18.8	22.2	26.4

Table 2. Average rms distance between operational and control forecast.

1.3 Skill of the control forecast

The entropy given by the EPS may be used as a skill indicator for the control forecast. Figure 3 presents the relationship between the relative number of good control forecasts and the calculated entropy at day +6 and day +8.

In the displayed cases the relationship between good forecasts and entropy is similar, the higher rate of good forecasts corresponds to the lower entropies. The difference between 96 and 97 is of course the range of the calculated entropies which is enlarged with increasing resolution and members.
In order to reveal the differences between the two years, let us look at the relative number of good and bad forecasts associated to an entropy lower than a given threshold. We have chosen this threshold to be 'average_entropy / 2'.

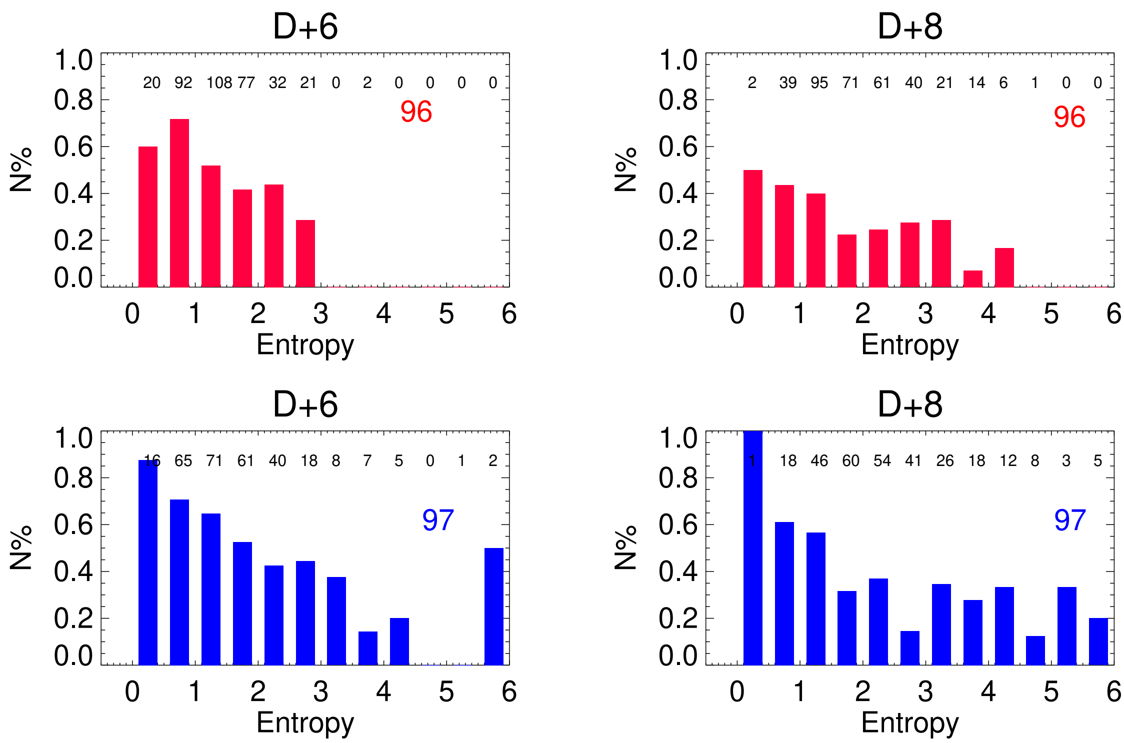


Fig.3 Relative number of good control forecasts as a function of entropy

On figure 4 are displayed the cases of good/bad control forecast with an EPS entropy lower than (average_entropy / 2).

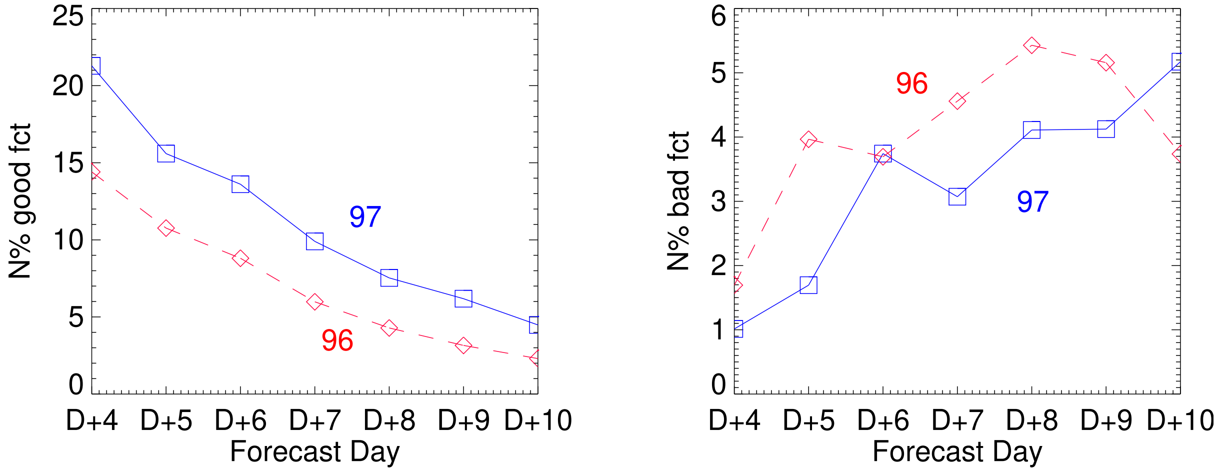
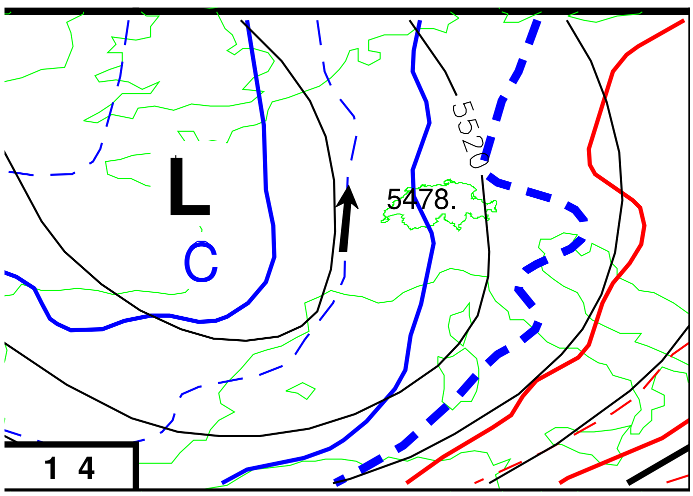


Fig.4 Relative number of good/bad control forecasts associated with an entropy lower than the average_entropy/2 as function of the forecast day.

2. Probability products

A local probability of precipitation (POP) and relative sunshine are statistically associated to each unit of our classifier.



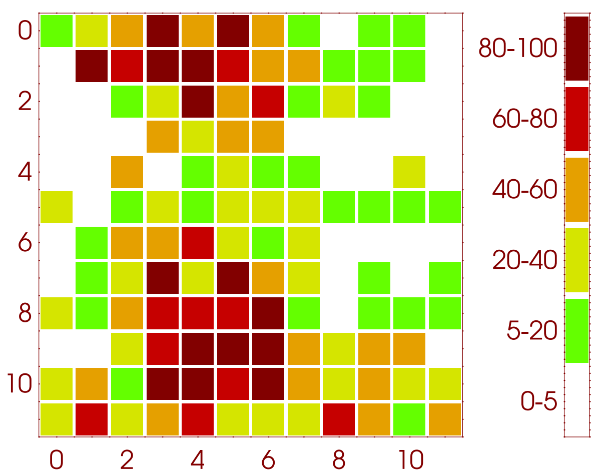
Unit (1,4)

Station	> 1mm/24h	>10mm/24h	>20mm/24h	0-25%	25-70%	70-100%
Genève	71	39	13	84	11	5
Zürich	29	10	3	79	11	10
Lugano	90	87	68	80	10	10

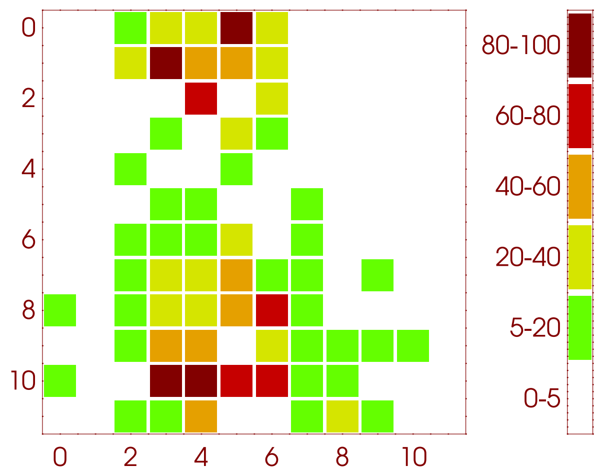
Probabilities of occurence of the meteorological event.

2.1 Probability of precipitation

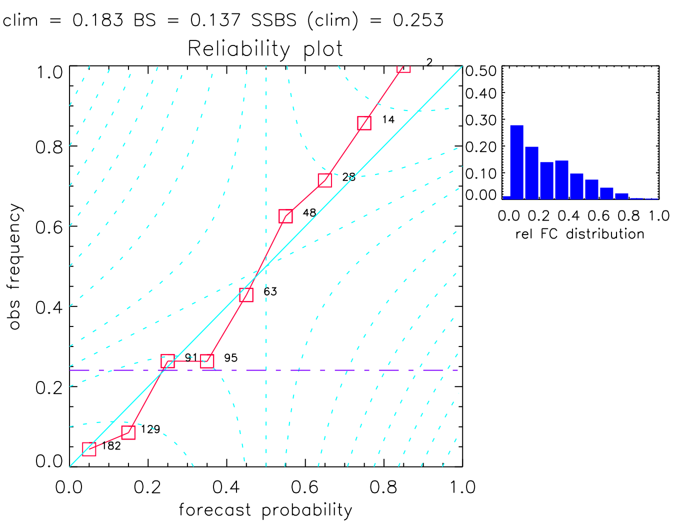
GENEVA prob of prec. gt 1mm/24h (autumn)



GENEVA prob of prec. gt 10mm/24h (autumn)

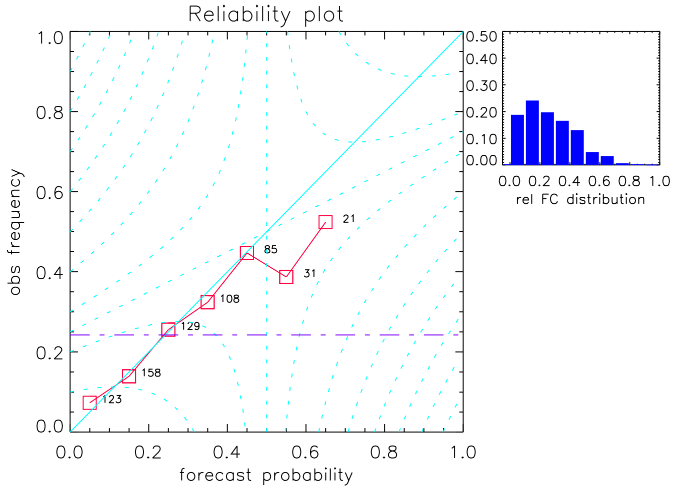


EPS-ANN range 84-108h (D+4) prec. gt 1mm/24h Geneva 1996-1997(10)



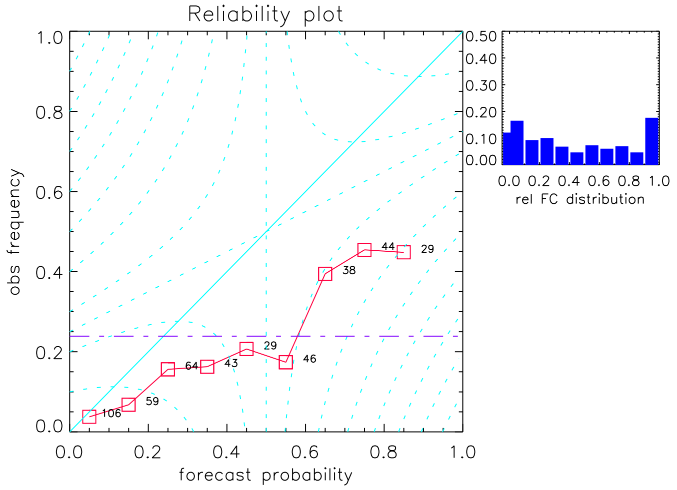
EPS-ANN range 156-180h (D+7) prec. gt 1mm/24h Geneva 1996-1997(10)

Sample clim = 0.184 BS = 0.170 SSBS (clim) = 0.076



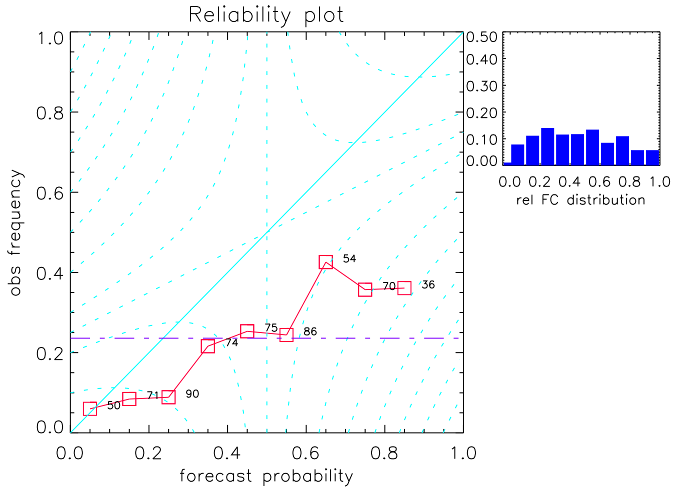
EPS-DMO range 84-108h (D+4) prec. gt 1mm/24h Geneva 1996-1997(10) 1 }

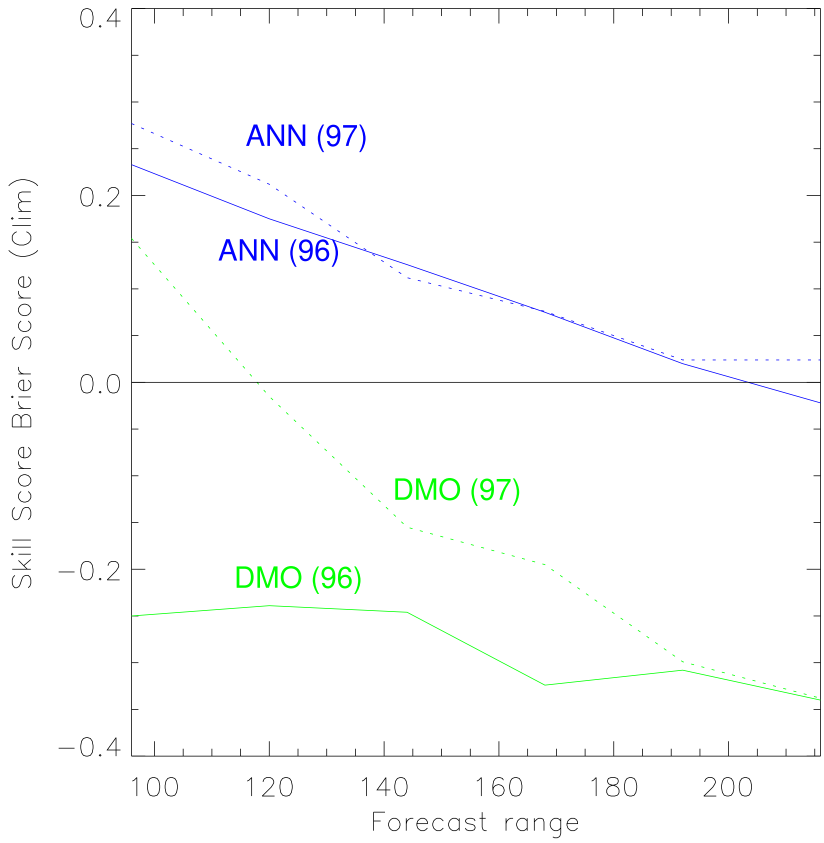
EPS DMO: Sample clim = 0.182 BS = 0.194 SSBS (clim) =−0.065



EPS-DMO range 156-180h (D+7) prec. gt 1mm/24h Geneva 1996-1997(10) }

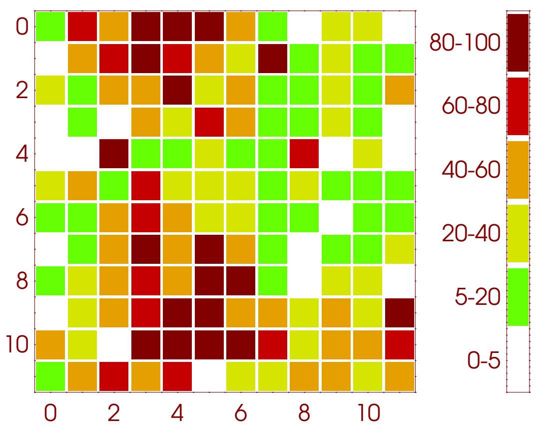
EPS DMO: Sample clim = 0.180 BS = 0.228 SSBS (clim) =−0.265



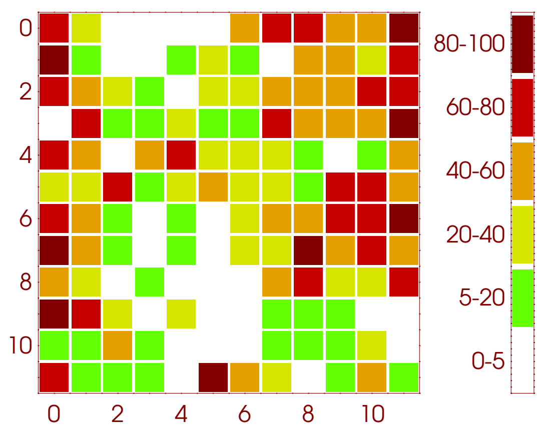


2.1 Probability of and relative sunshine

GENEVA prob of rel. sunshine 0-25% (autumn)

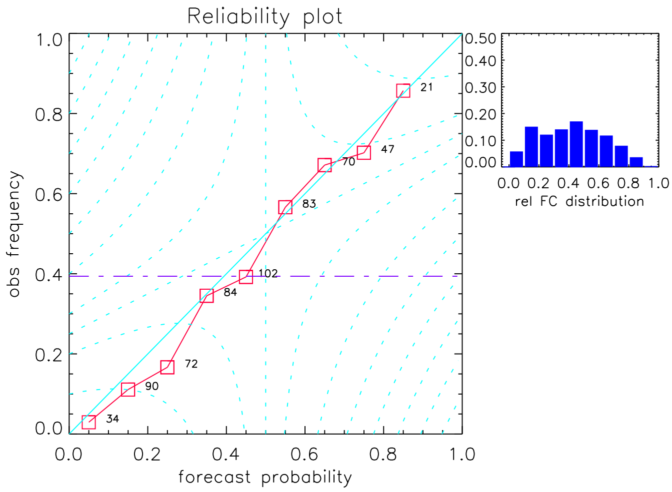


GENEVA prob of rel. sunshine 70-100% (autumn)



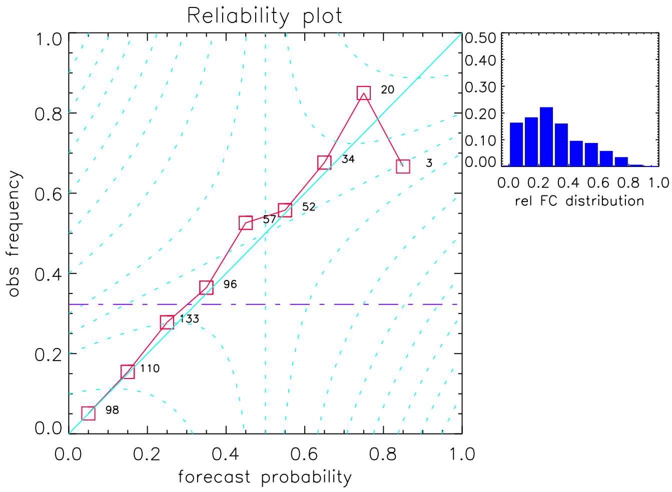
Range 108-132h (D+5) rel sunshine 0-25% Geneva 1996-1997(10)

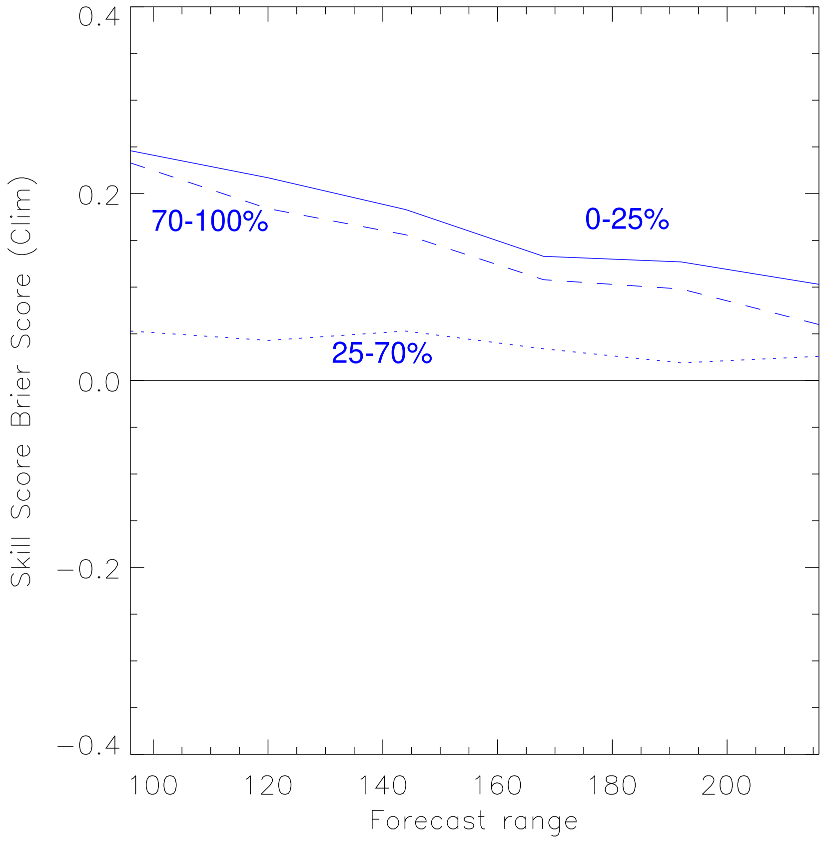
Sample clim = 0.239 BS = 0.187 SSBS (clim) = 0.217



Range 108-132h (D+5) rel sunshine 70-100% Geneva 1996-1997(10)

Sample clim = 0.219 BS = 0.178 SSBS (clim) = 0.184





1996-1997(10) Geneva

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