SEECOF-4 verification for DJF 2010-2011 over Israel

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a. Precipitation

21 stations from Northern and Central Israel were used to calculate DJF precipitation average for the most recent 30 years 1980-2009. The distributed is not normal as 2/3 of the years are below average and 1/3 are above average. Therefore, both averages and median are given. The average precipitation amounts are relatively constant with time and vary from 349 mm for 1961-1990, 351 mm for 1971-2000 and 343 mm for 1980-2009. Although the average does not change the distribution has changes and the median value decreased from 333 mm at 1961-1990 to 315 mm at 1980-2009.

1) Comparing to 1980-2009 period, DJF 2010-2011 was 5% below median and 13% below average. Both values are within the normal tercile.
2) The SEECOF-4 precipitation outlook gave 40% chance for below normal tercile and 30% for normal and above normal terciles (Fig. 1).
3) Verifying the forecast of 10 GPC's (Figs. 2, 3) shows that Washington was the closest to realty as -0.2 mm/day are -18 mm for 3 months which are -5% of average value. Only Exeter indicate a very wet DJF all the other indicated correctly within the normal tercile.
4) A possible idea to verify a probabilistic forecast for a single year Expected Deterministic Value (EDV) is to sum the probability assigned for each tercile weighted by the climatology average anomaly of the tercile:

$$EDV = \sum_{Tercile=1}^{3} \overline{Anomaly_{Tercile}} * \Pr ob_{Tercile}$$

5) The DJF expected value would be -2.8% of the average 1980-2009 (see table).

	Below	Normal	Above	sum
*Tercile Average Anomaly	-27.89	-9.67	37.56	0
Tercile Probability	0.4	0.3	0.3	1
Expected Deterministic Value	-11.16	-2.90	11.27	**-2.8****

*note that the 30 years anomalies are not distributed normally.

**For the 1971-2000 period EDV=-3.0.

6) The Israeli Meteorological Service (IMS) statistical forecast based on EOF regression of global teleconnections gave 70% chance for the below normal tercile, 20% for normal and 10% for above normal. Therefore, EDV = -18%.

7) **To conclude:** Although the observed 2010-2011 DJF did not hit the most probable tercile of both SEECOF-4 and IMS forecasts, their EDV's proves that these forecasts are better than assigning equal probability to all terciles.

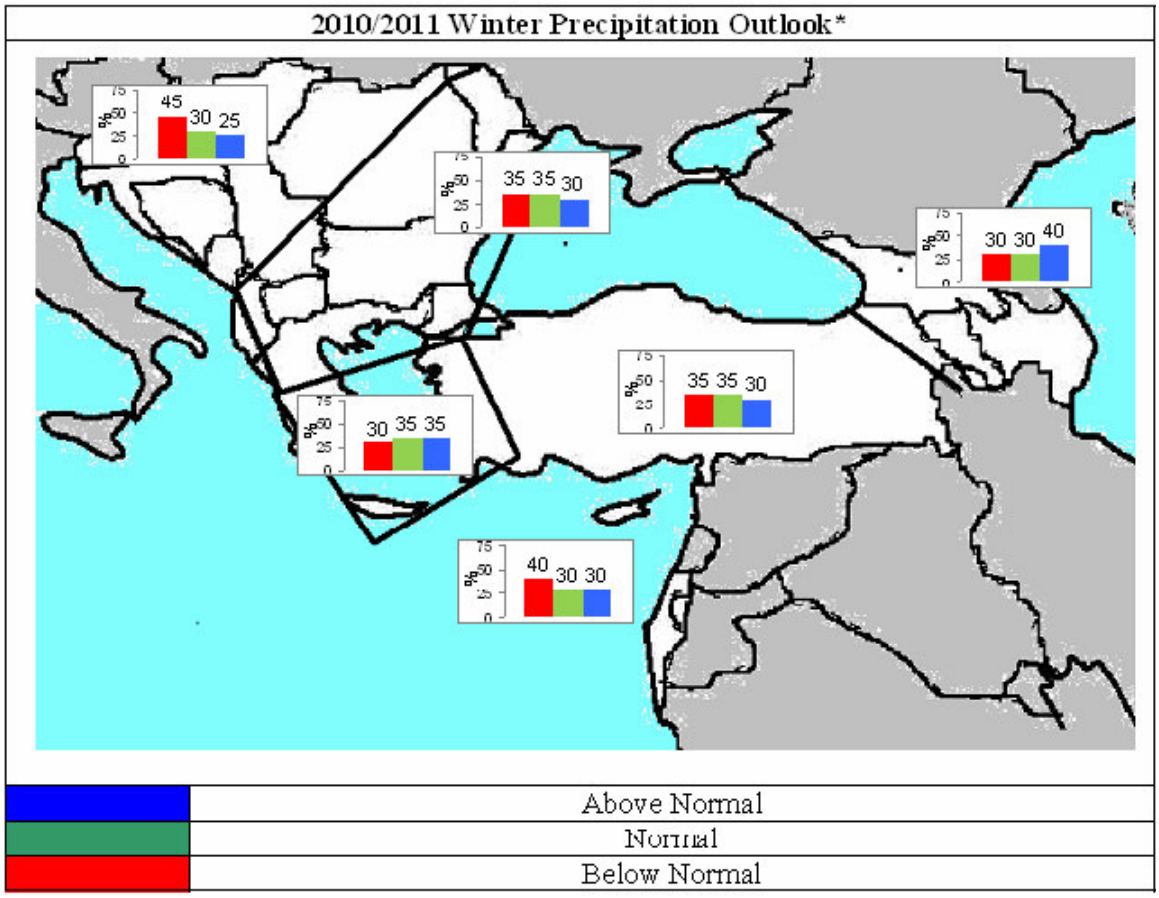


Fig. 1: The SECOFF-4 DJF precipitation forecast.

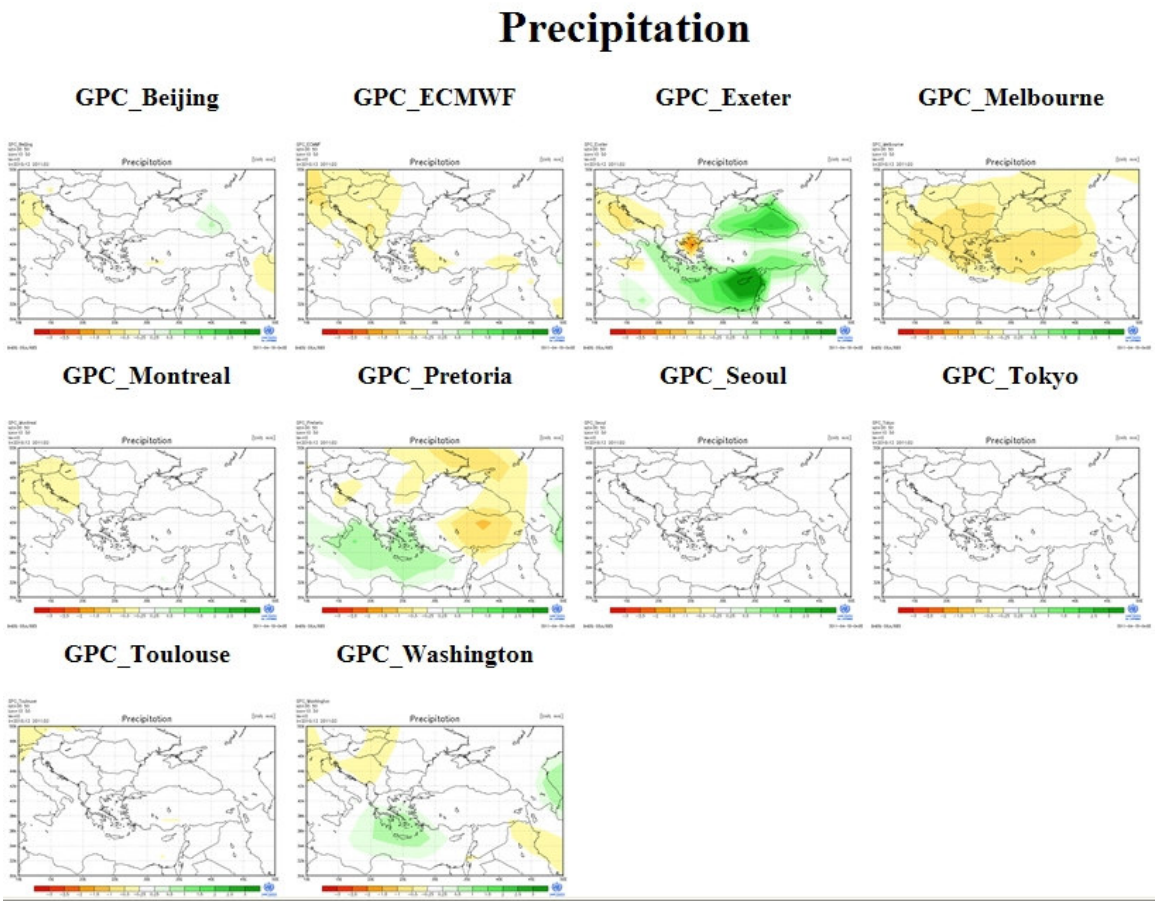


Fig 2: 10 GPC forecast for DJF precipitation anomaly over SEECOF domain.

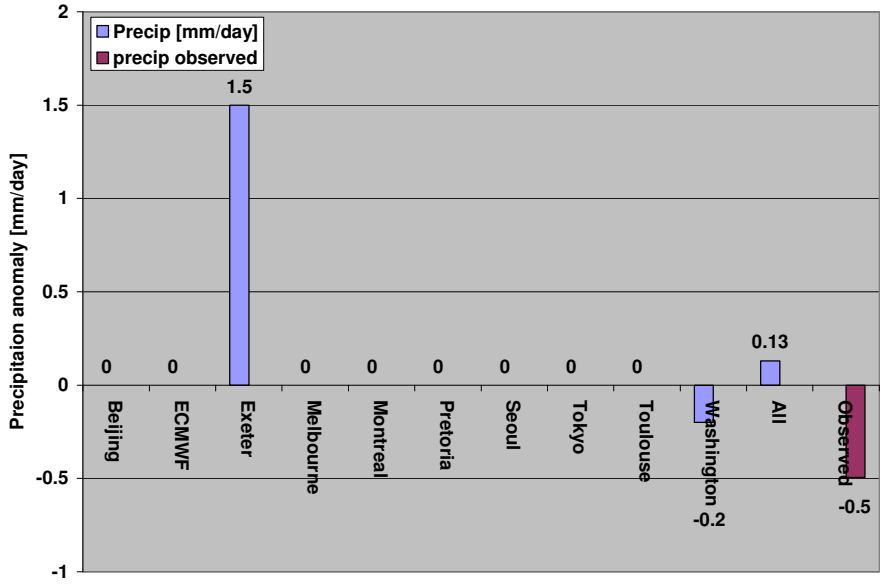


Fig 3: 10 GPC forecast for DJF precipitation anomaly over Israel. The values were subjectively retrieved from figure 3.

b. Temperature

1) The SECOFF-4 DJF temperature forecast indicated 33% for each tercile, i.e. no skill (Fig. 4).
2) DJF 2010-2011 in Israel was clearly in the above normal category although colder then the extreme 2009-2010 DJF (Fig. 5). At Kfar Blum in Northern Israel 0.9°C, Jerusalem 1.4°C and Bet Dagan 2.3°C above 1971-2000 averages. All values are above the upper tercile threshold that varies from 0.41°C for Bet Dagan to 0.56°C for Kfar Blum.
3) Verifying the forecast of 10 GPC's (Figs. 6, 7) shows that only Exeter forecast was correct with a 1.5°C anomaly.
4) In the eastern Mediterranean usually cold DJF comes with a wet season and warm DJF with a dry season. This makes the area potentially easier to forecast as only two categories are possible (hot and dry or cold and wet). The Exeter model indicated warm and wet area over both the eastern Mediterranean and the black sea. Perhaps the physical coupling between the SST and the atmosphere should be revised.

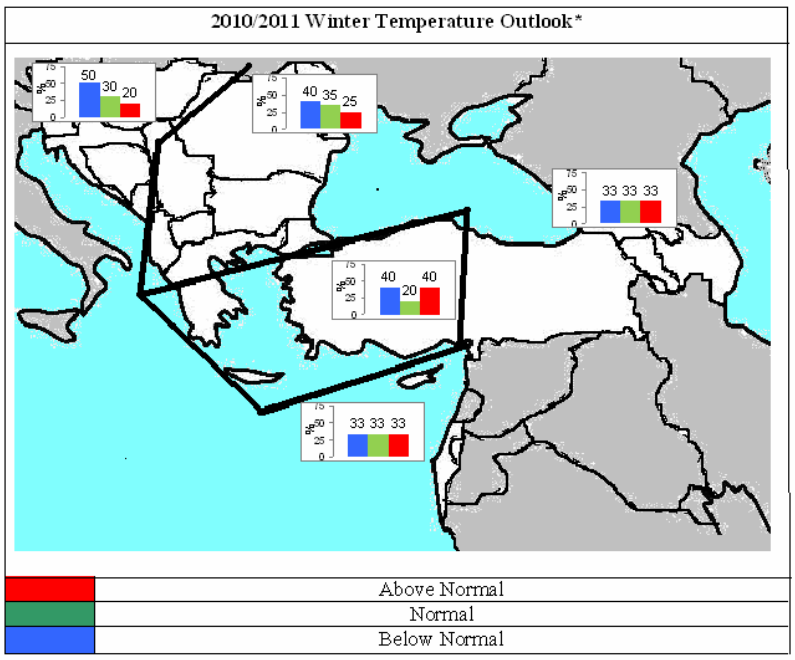


Fig. 4: The SECOFF-4 DJF temperature forecast.

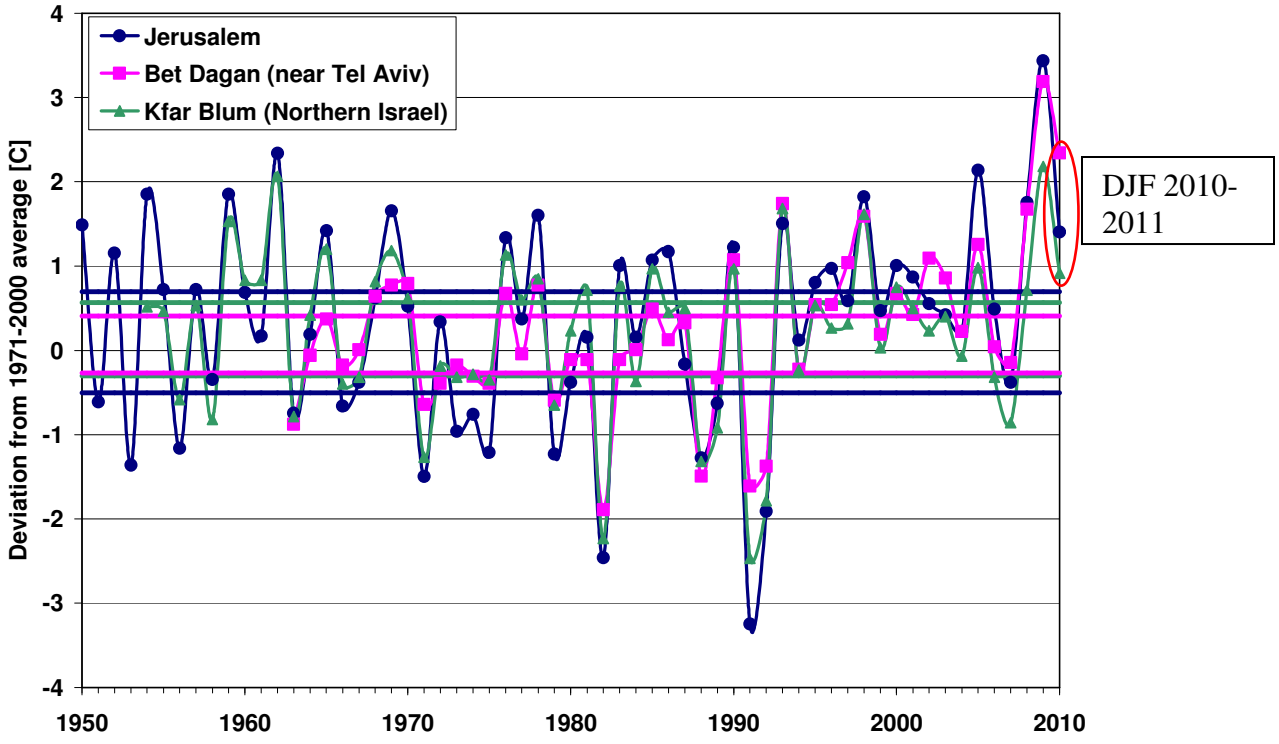


Fig. 5: The deviation of DJF average temperatures from DJF 1971-2000 average. The horizontal lines represent the upper and lower terciles for Jerusalem (blue), Bet Dagan (magenta) Kfar Blum (blue).

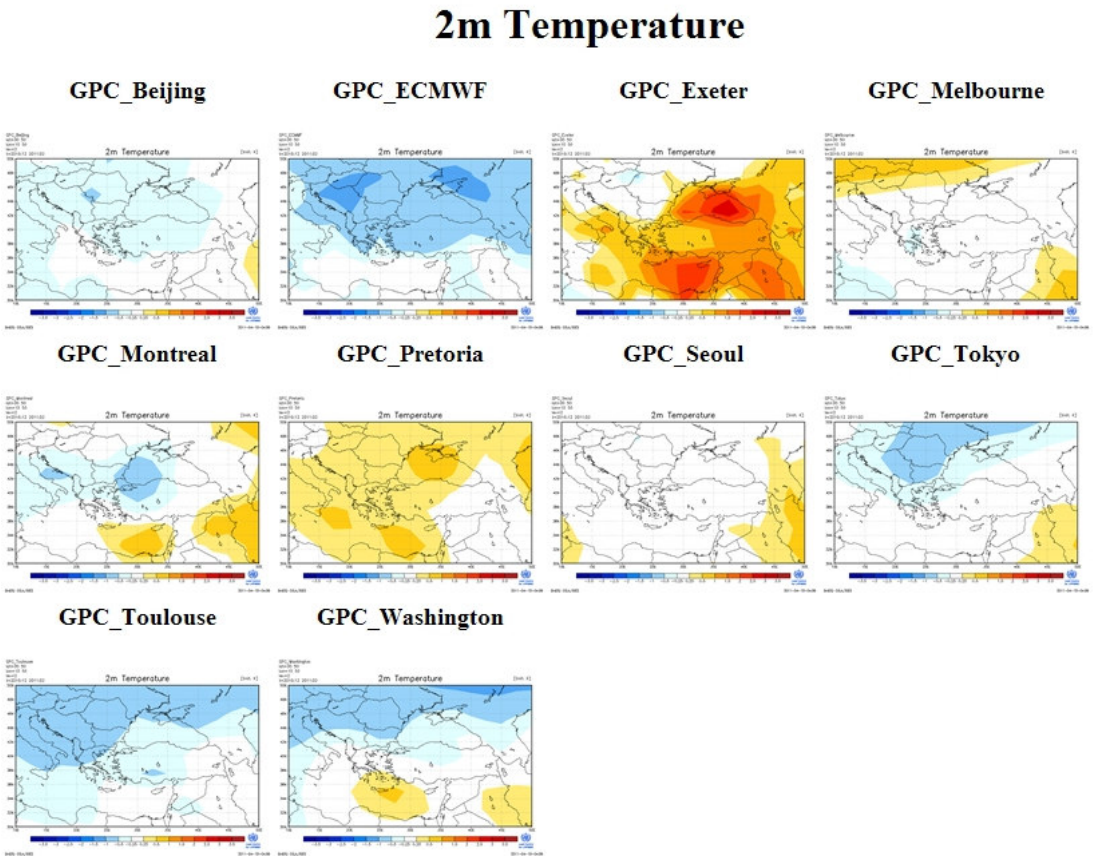


Fig 6: 10 GPC forecast for DJF temperature anomaly over SEECOF domain.

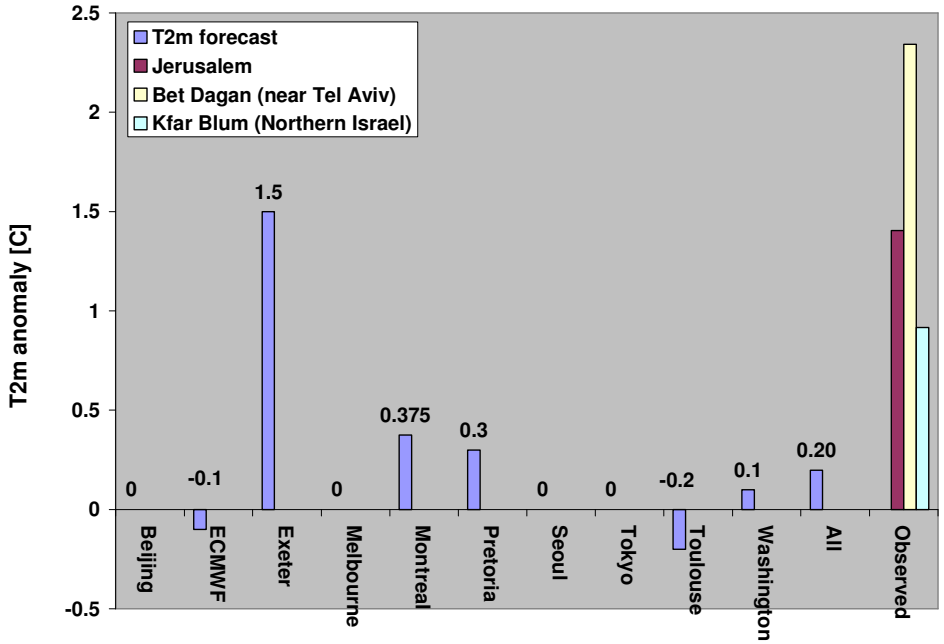
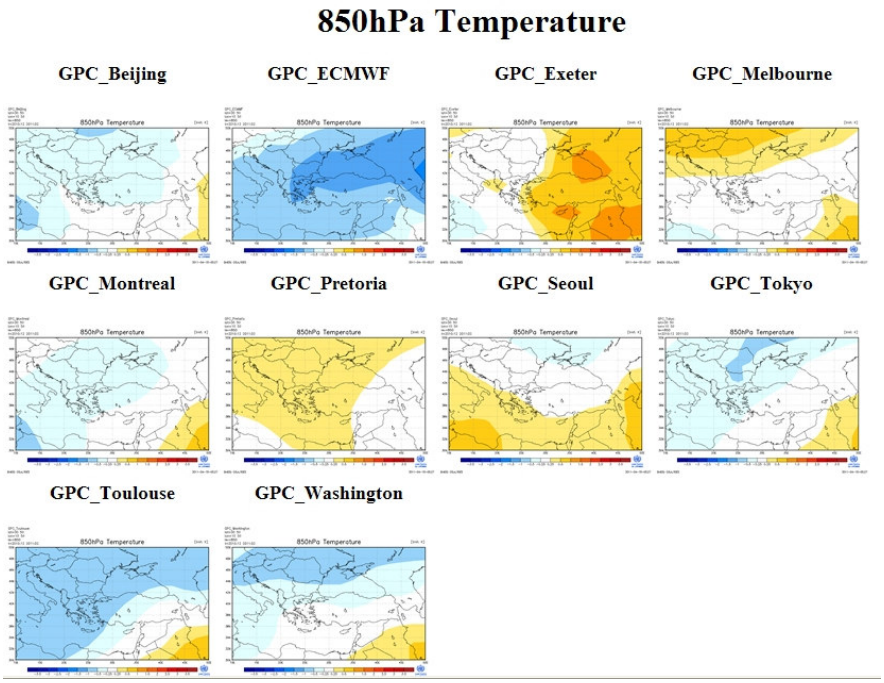


Fig. 7: the 10 GPC forecast temperature anomaly for DJF over Israel. The values were subjectively retrieved from figure 6.

c. 850 hPa temperature

DJF 2010-2011 850 hPa temperature was 1.73°C above 1971-2000 average, which is clearly in the above normal tercile defined by 0.44°C threshold (Fig. 8). Only Exeter managed to forecast correctly the tercile while ECMWF had two categories wrong as it's forecasted value -0.7°C is below the average tercile threshold of -0.32°C.



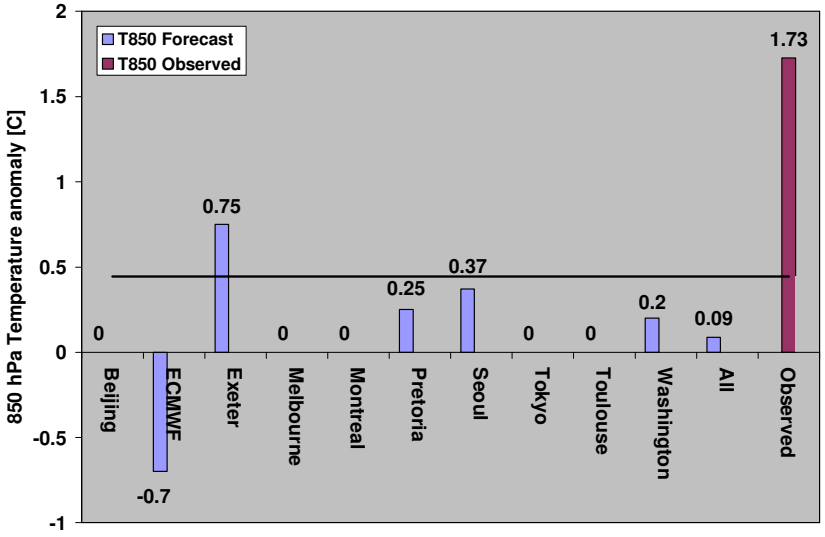
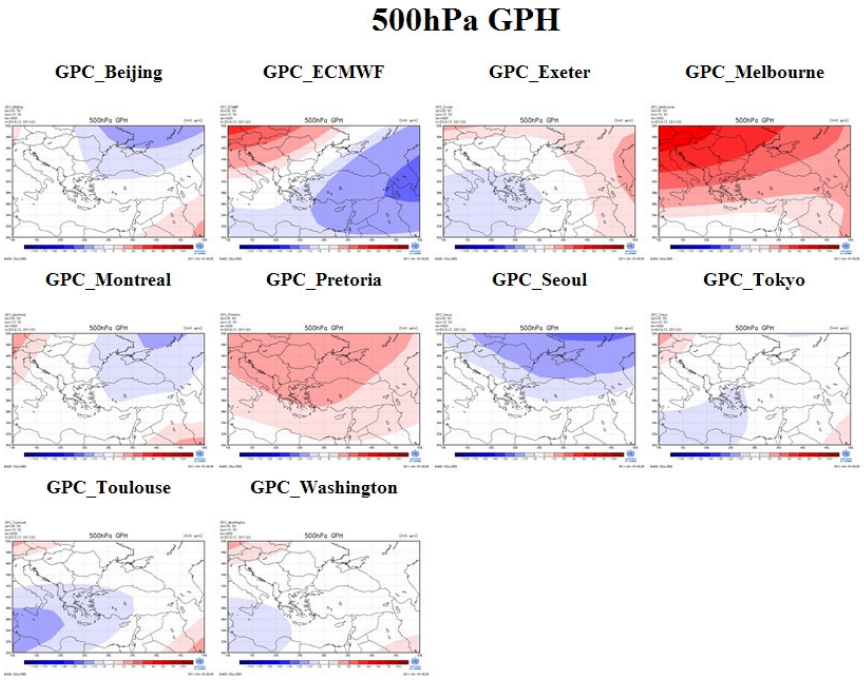


Fig. 8: GPC forecast of 850 hPa temperature anomaly for DJF over Israel. The values were subjectively retrieved from figure. The horizontal line indicates the upper tercile threshold of 0.44°C. The lower tercile threshold of 0.32°C is not indicated.

d. 500 hPa geopotential height (gph)

DJF 2010-2011 500 hPa gph was 9.04 m above 1971-2000 average, which is within the normal tercile defined by ±10.6 m from average. Pretoria was the nearest to the observed value and only ECMWF didn't forecast correctly the tercile (Fig. 9).



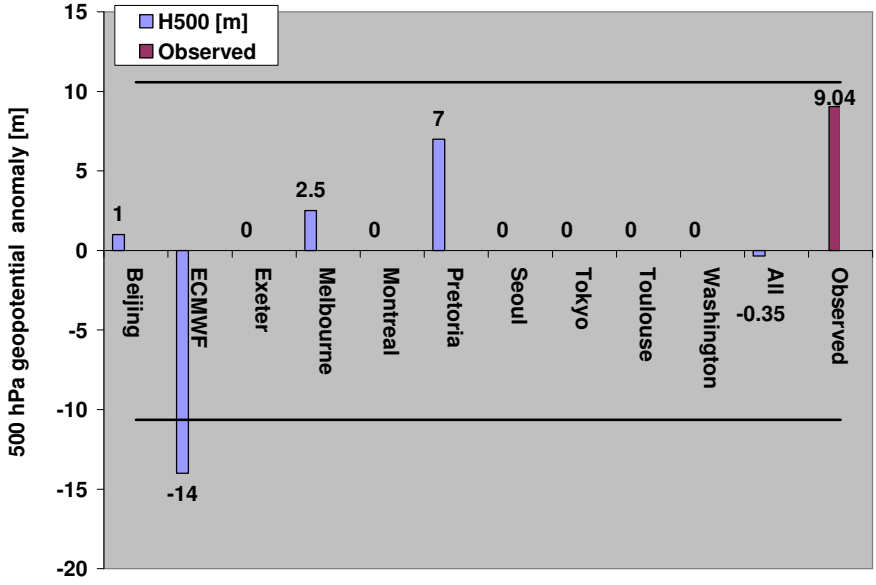


Fig. 9: GPC forecast of the 500 hPa geopotential anomaly for DJF over Israel. The values were subjectively retrieved from the above maps. The horizontal lines indicated the upper and lower tercile thresholds which are both ±10.6 m from 1971-2000 average.