Annex

Country: Israel

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Assessment of the seasonal forecast for the winter season

DJF 2013-14

1. MedCOF-1 Climate outlook for the 2013-14 winter season:

The MedCOF-1 temperature outlook assigned 40% chance for the "above normal" tercile, 35% for the "normal" tercile and 25% for the "below normal" terciles (fig. 1).

The MedCOF-1 precipitation outlook had no preference for any climate defined category. Therefore a-priori the forecast skill was zero (fig 2).

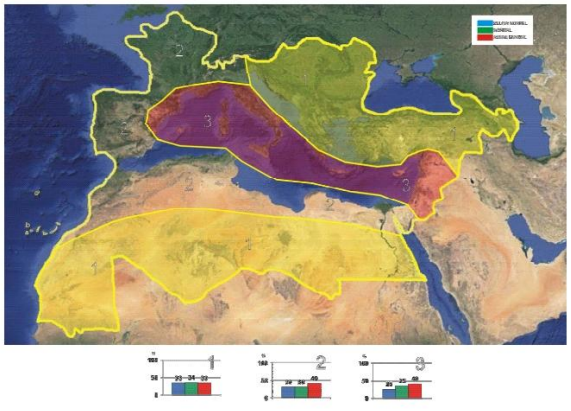

Figure 1. Graphical presentation of 2013/14 winter temperature outlook

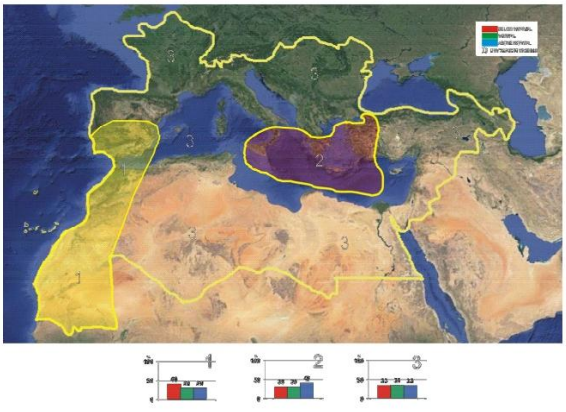

Figure 2. Graphical presentation of 2013/14 winter precipitation outlook

2. Analysis of the 2013-14 winter season:

Temperature

The average temperature of five stations, which represent most of the country's climate regimes, was used. The stations used are: Eilat (southern Israel) Negba (southern coastal plan), Bet-Gimal (central low mountain ridge), Jerusalem (central mountain ridge) and Zefad (Northern mountain ridge). The choice was proved to be correct as these stations' average temperature for the last decade (2001-2010) turned out to be almost identical to the average temperature produced from 39 stations spread all over the country.

It can be seen from figure 3 that the 2013-14 DJF average temperature resides in the "above normal" tercile.

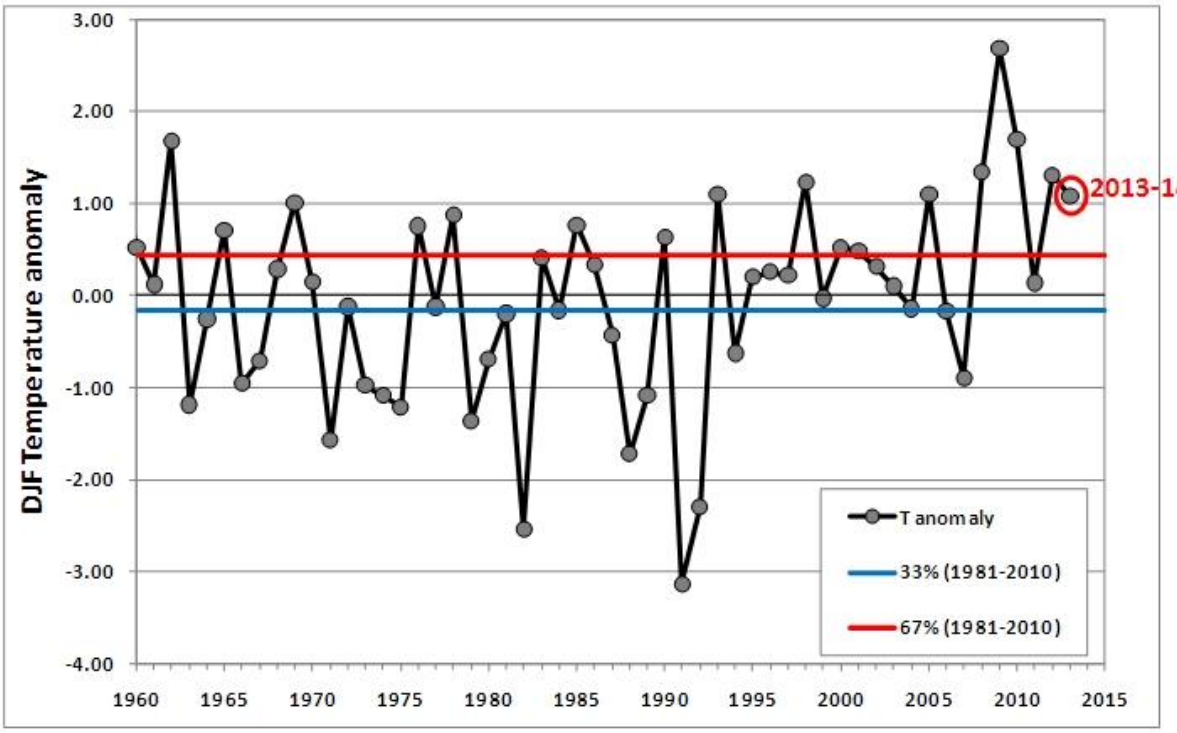

Fig. 3: DJF average temperature anomalies for Israel since 1960. The horizontal lines represent the upper and lower tercile thresholds for the 1981-2010 reference periods.

Precipitation

The average DJF 2013-14 precipitation observed for Northern and Central Israel was 242 mm. This value is 19% below median and 28% below average. Therefore, DJF 2013-14 resides well in the "below normal" tercile (Figs. 4a, 4b).

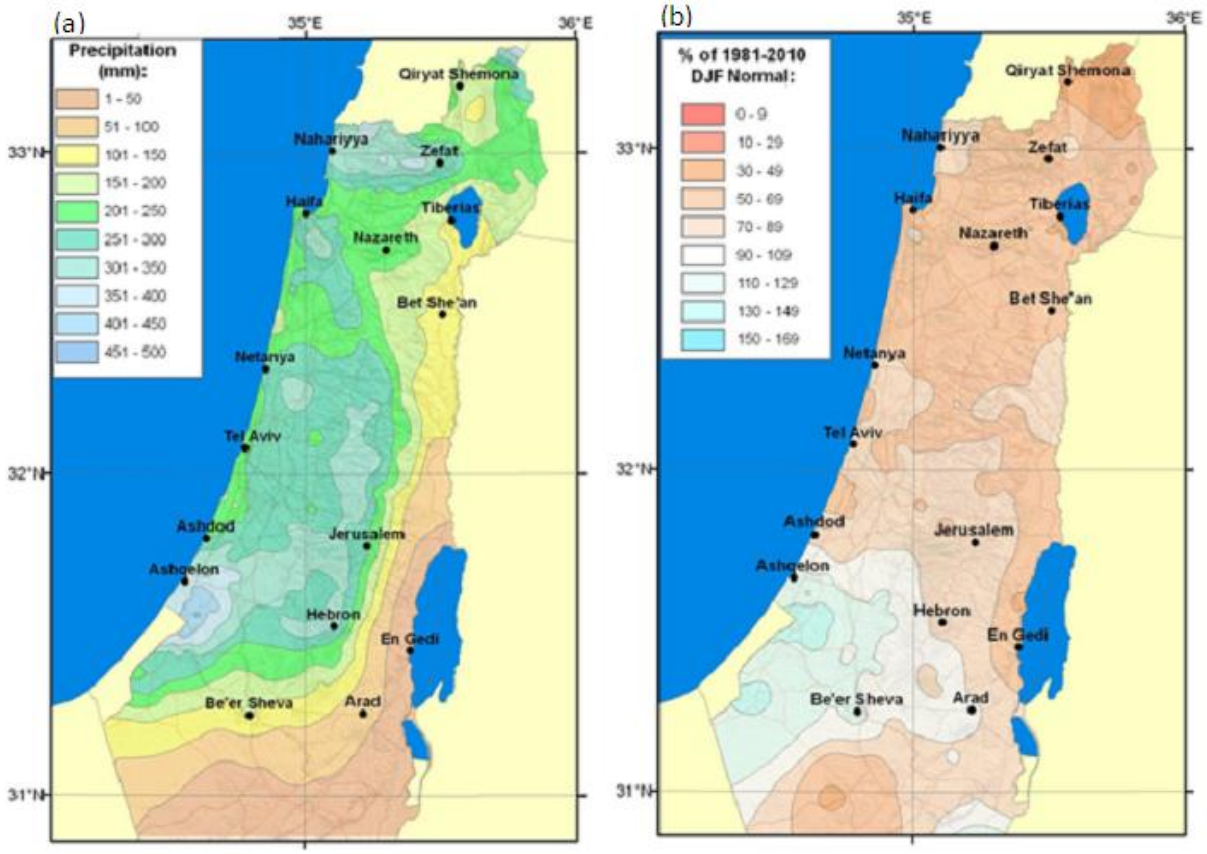

Fig 4: (a) JF 2013-13 accumulated precipitation (mm). (b) Percent of normal (1981-2010).

3. High Impacts Events:

DJF 2013-14 included two opposite high impact events:

1. **cold wave** - A major cold spell storm during 10^{th}-14^{th} of December 2013 which included:
    a. Snow depth of 0.5 m in Jerusalem and up to 1 m in the surroundings mountains.
    b. Over 300 mm in the southern coastal plain. This amount equals the total DJF average for the region.
    c. A record-breaking minimum temperature (since 1978) of -13.6ºC was measured at the Golan Heights.
    d. The storm left 35,000 houses without electricity for up to 4 days.
    e. A direct cost of 24 million Euros was spent for evacuations and for removal of snow and derby.
2. **Drought** - The two and a half months period from mid-December 2013 until the end of February 2014 provided very little precipitation, making it the driest since records began more than 70 years ago.
    a. The drought impact for the winter crop yields is estimated crudely by 70,000 Euros.

It seems that winter 2013-14 was characterized by a slow progression of upper-level Rossby waves which is associated with persistent weather patterns. Such persistent may lead to extreme weather events that result from prolonged conditions, such as drought, flooding and cold spells.

4. Verification of the MedCOF -01 climate outlook for the 2013-14 winter season:

The table below is a verification summary of the climate outlook for the DJF 2013-14 to the reference period of 1981-2010.

Country	Seasonal temperature (DJF)			Seasonal precipitation (DJF)		
	Observed	MedCOF-1 climate outlook for temperature	Ranked Probability Skill Score*	Observed	MedCOF-1 climate outlook for precipitation	Ranked Probability Skill Score
Israel	above normal	40% above normal	0.24	Below normal	No clear signal	0

*The Rank Probability Skill Score (RPSS) is essentially an extension of the Brier score to 3 event situation.

$$RPS = \sum_{m=1}^{j}\left[\left(\sum_{j=1}^{m} F_J\right) - \left(\sum_{j=1}^{m} O_j\right)\right]^2$$

Where F and O denotes the Forecast and Observed values, respectively for tercile forecasts j=3.

The skill score is defined by:

$$RPSS = 1 - \frac{RPS}{RPS_{c\lim}}$$

Were RPS_{clim} is obtained by assigning equal probability of 33.33% to all categories.

5. Users' perceptions of the MedCOF-1 outlook

The seasonal forecast skill is still too low in order to provide it to decision makers in the government or to public services. As there are other professional and unprofessional seasonal forecasts in the air, we provide only the wide public with the seasonal forecast to show our efforts to deal with this tough issue.

The most important forecast is for precipitation. As we did not indicate any preferable scenario, obviously the end users were not satisfied. Furthermore, the northern part of the country ended with a very severe drought that was not forecasted. Therefore, one can assume that the confidence in our forecast next year will not be high.