Annex

Country: Israel

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Assessment of the seasonal forecast for DJF 2016-17

1. SEECOF-16 Climate outlook for the 2016-17 winter season:

The SEECOF-16 temperature outlook assigned 60% chance for the "above normal" tercile, 30% for the "normal" tercile and 10% for the "below normal" terciles (fig. 1). The SEECOF-16 precipitation outlook assigned 20% chance for the "above normal" tercile, 35% for the "normal" tercile and 45% for the "below normal" terciles (fig. 2).

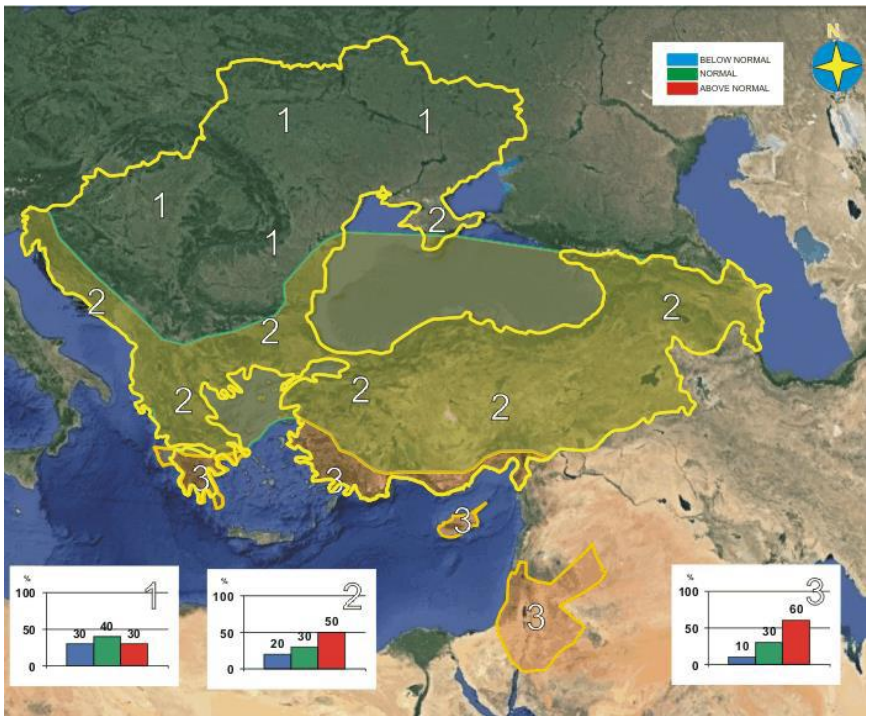

Fig 1. SEECOF-16 temperature outlook for 2016-2017.

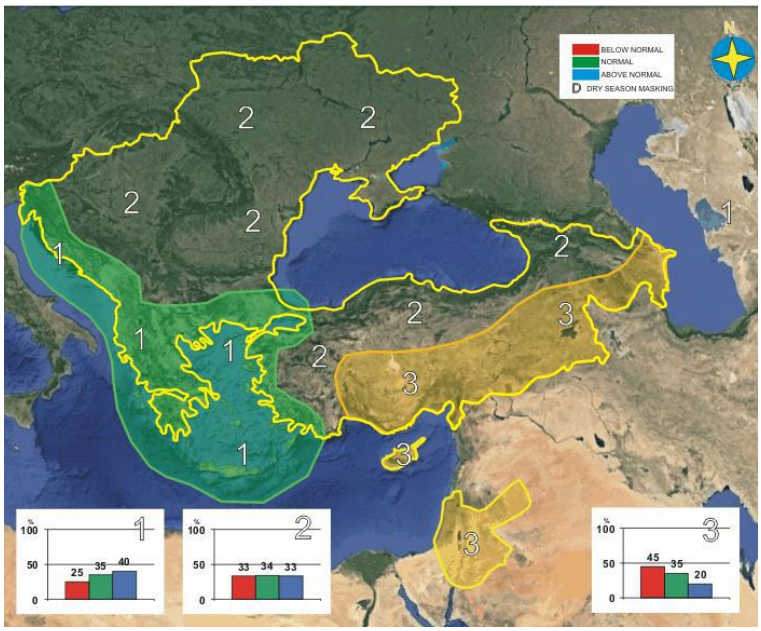

Fig 2. SEECOF-16 precipitation outlook for 2016-2017.

2. Analysis of the 2016-17 winter season:

2.a) 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 DJF 2016/17 average temperature resides in the "below normal" tercile.

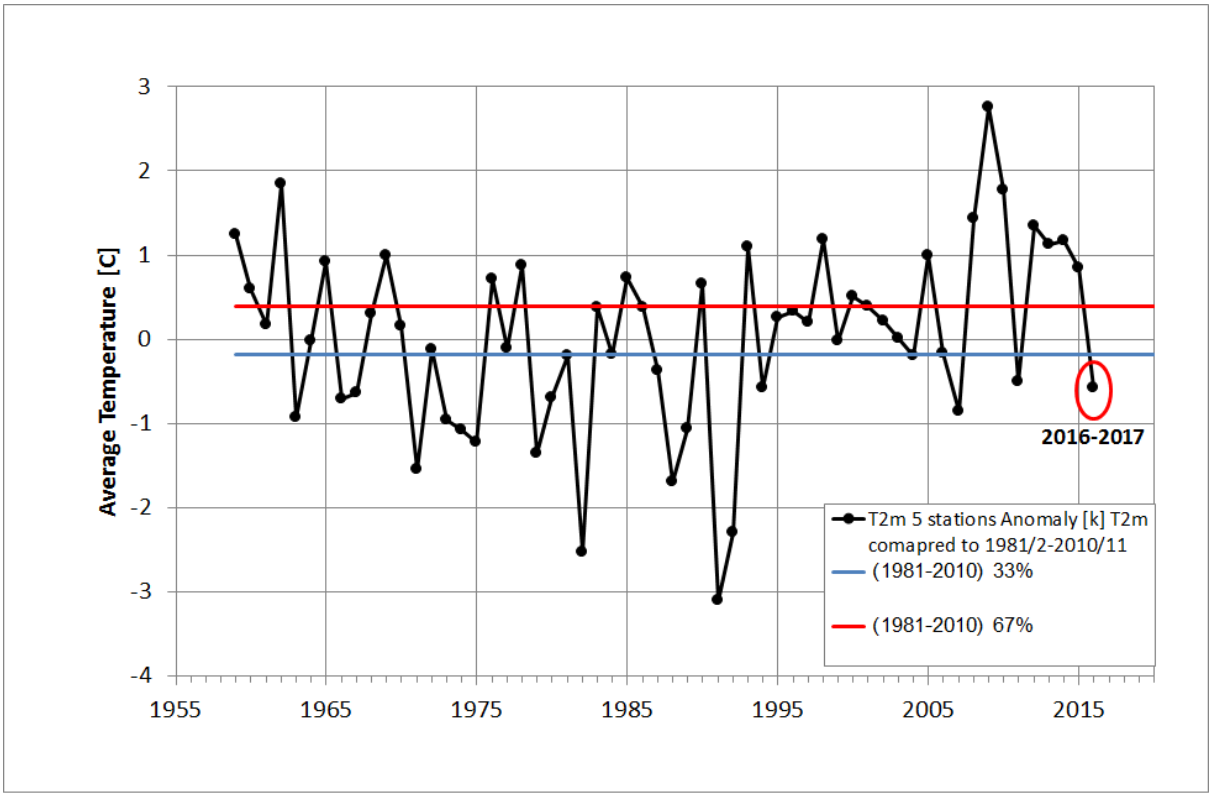

Fig. 3. DJF average temperature anomalies for Israel since 1959 (DJF 1959/1960) until 2016-2017 (DJF 2016/17). The horizontal lines represent the upper and lower tercile thresholds for the 1981-2010 reference periods.

Winter 2016-2017 (DJF 2016/17) was colder by -0.58°c relative to the period 1981/82-2010/11 (1981-2010). Winter 2016-2017 in temperature is below the average and in the percentile of 15.8% relative to the period 1981/82-2010/11.

2.b) Precipitation

The Israeli averaged precipitation is based on GIS calculation for stations which spread all around Israel and above the isohyet line of 200mm (for all the rain season not only DJF). The annual average precipitation amount in Be'er Sheva city, which placed in Southern Israel, is 196 mm, therefore, therefore the stations are located north from Be'er Sheva. However, there are few stations which are located north from Be'er Sheva and the isohyet is also lower than 200 mm per season, such as, stations in the Dead Sea area or Juda Desert. We did not take into account the stations with isohyet less than 200mm even if they were in central Israel.

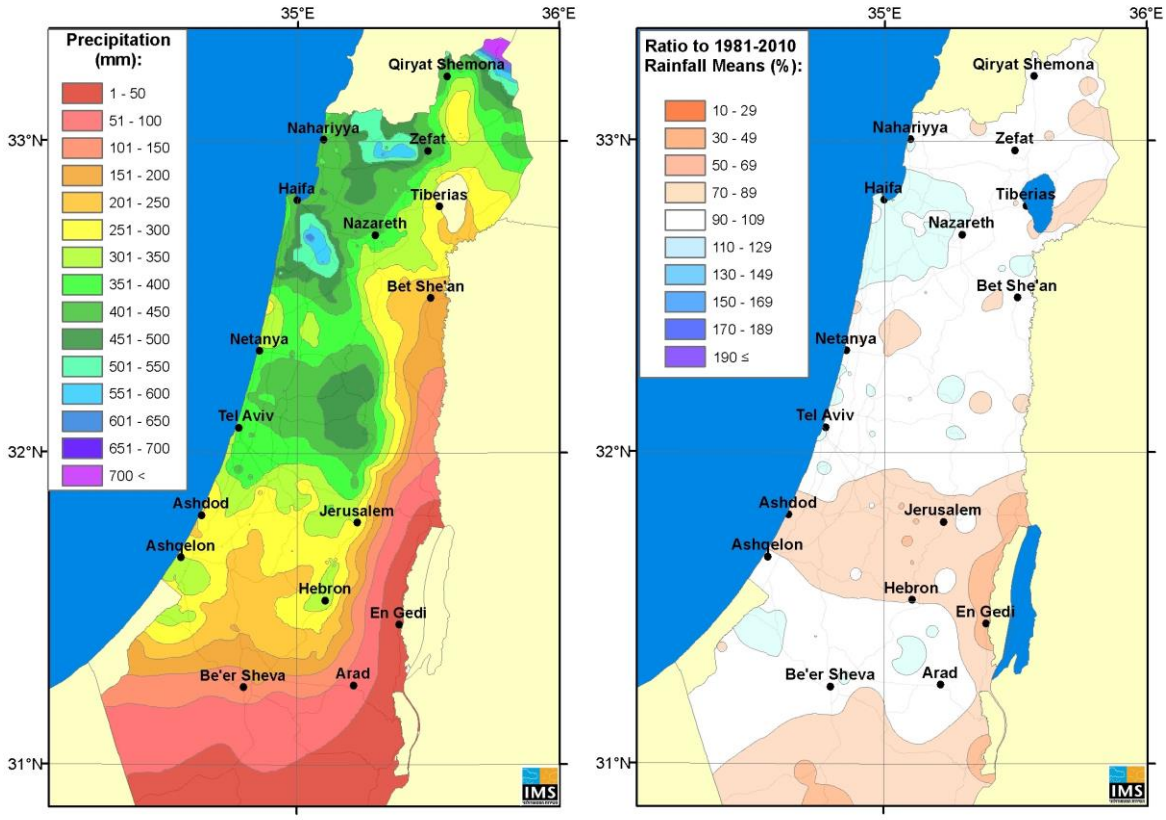

Fig 4. (a) DJF 2016/17 accumulated precipitation (mm). (b) Percent of normal (1981-2010).

The 1981-2010 DJF precipitation distribution is skewed towards high values (figure 5). Therefore, the mean of 332.1 mm is higher than the median (296.3 mm) by 12.1%. The lower tercile resides for precipitation lower than 278.7 mm and the higher tercile resides for precipitation that equals or above 323.3 mm. Therefore the mean resides in the third tercile! Hence, only winters (DJF) with precipitation that are at least in the third tercile or "above normal" can be above the average. Winters with precipitation amounts that resides in the second tercile ("around normal"), are definitely below the average.

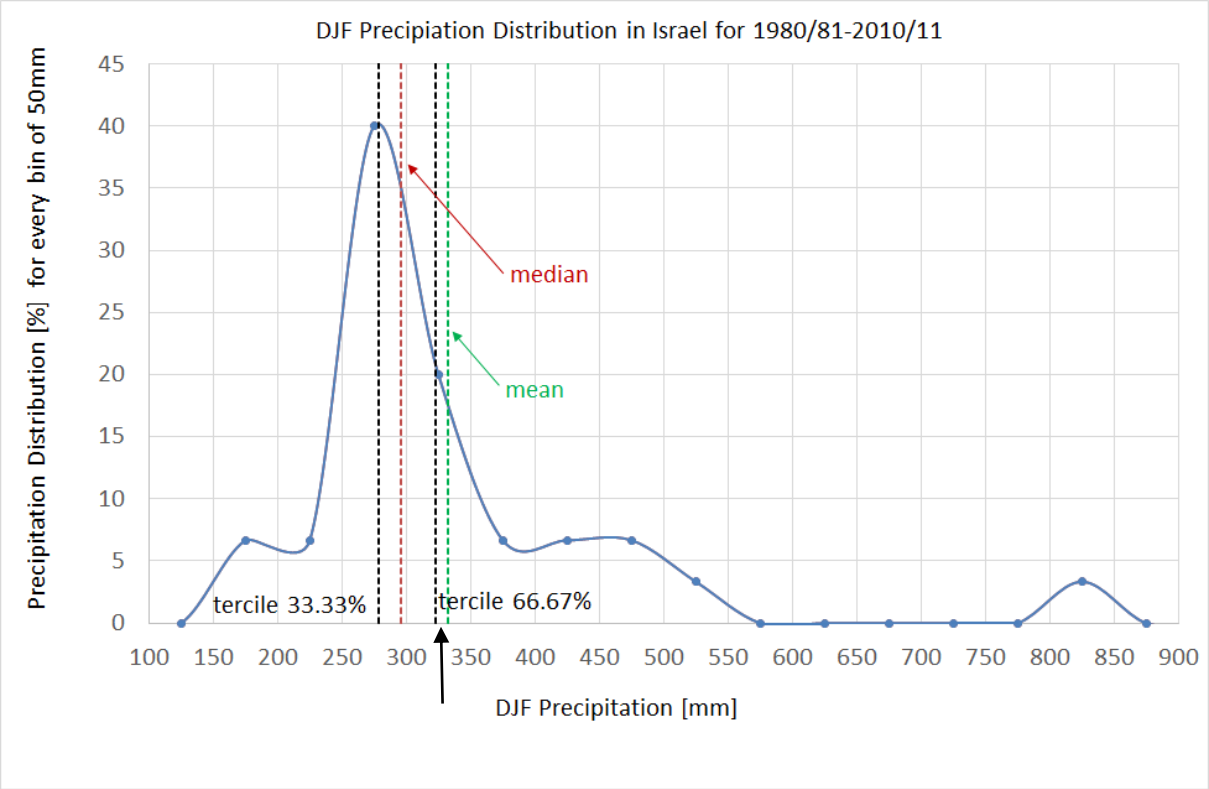

Fig5 DJF precipitation distribution [%] in Israel for 1981/82-2010/11. The arrow represents the precipitation of 2016/2017.

The average DJF 2016/17 precipitation observed for Israel was 327.7 mm. This value is 1.3% below the 1981/82-2010/11 average, 10.6% above the median and resides in the 69.3% percentile from the precipitation distribution. Hence, DJF 2016/17 resides in the "above normal" tercile of 1981/82-2010/11.

3. Verification of the SEECOF -16 climate outlook for the 2016-17 winter season:

The table below is a verification summary of the climate outlook for the DJF 2016-17 to the reference period of 1981-2010.

Country	Seasonal temperature (DJF)			Seasonal precipitation (DJF)		
	Observed	SEECOF-16	RPSS	Observed	SEECOF-16 forecast	RPSS
Israel	below normal	60% above normal 30% around normal 10% below normal	-1.106	above normal	20% above normal 35% around normal 45% below normal	-0.516

*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.

4. Users' perceptions of the SEECOF-16 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. The IMS gave no signal for the DJF precipitation, therefore the end users were not satisfied as they could not use the forecast.