
COMPUTER MODELING STATION
COULDN'T GET THE 24-HOUR FORECAST RIGHT....
WORST NYC BLIZZARD EVER!
OOPS, SORRY.
COMPUTER MODELING STATION
STILL WANTS YOU TO BELIEVE HIS 100-YEAR FORECAST.
GLOBAL WARMING! DEATH! DESTRUCTION!
IT'S SETTLED!
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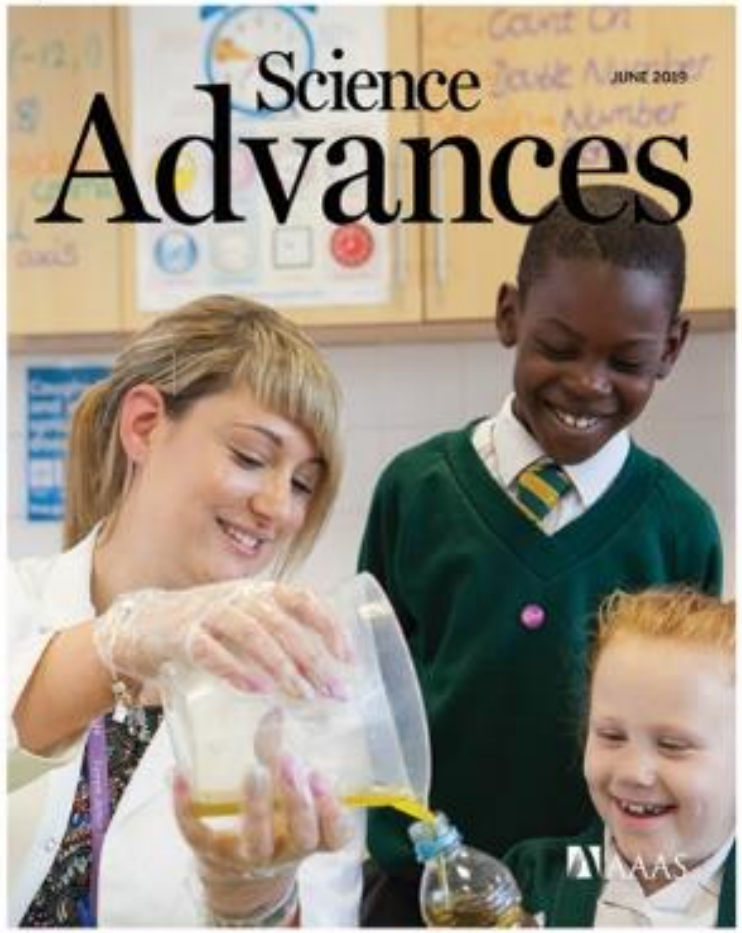
Science Advances

AAAS's open-access journal

"A new dynamical systems perspective on atmospheric predictability: Eastern Mediterranean weather regimes as a case study"

A. Hochman *et al.*

eaau0936



June 05, 2019

AAAS

Porter School of the
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The Raymond and Beverly Sackler
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Tel Aviv University

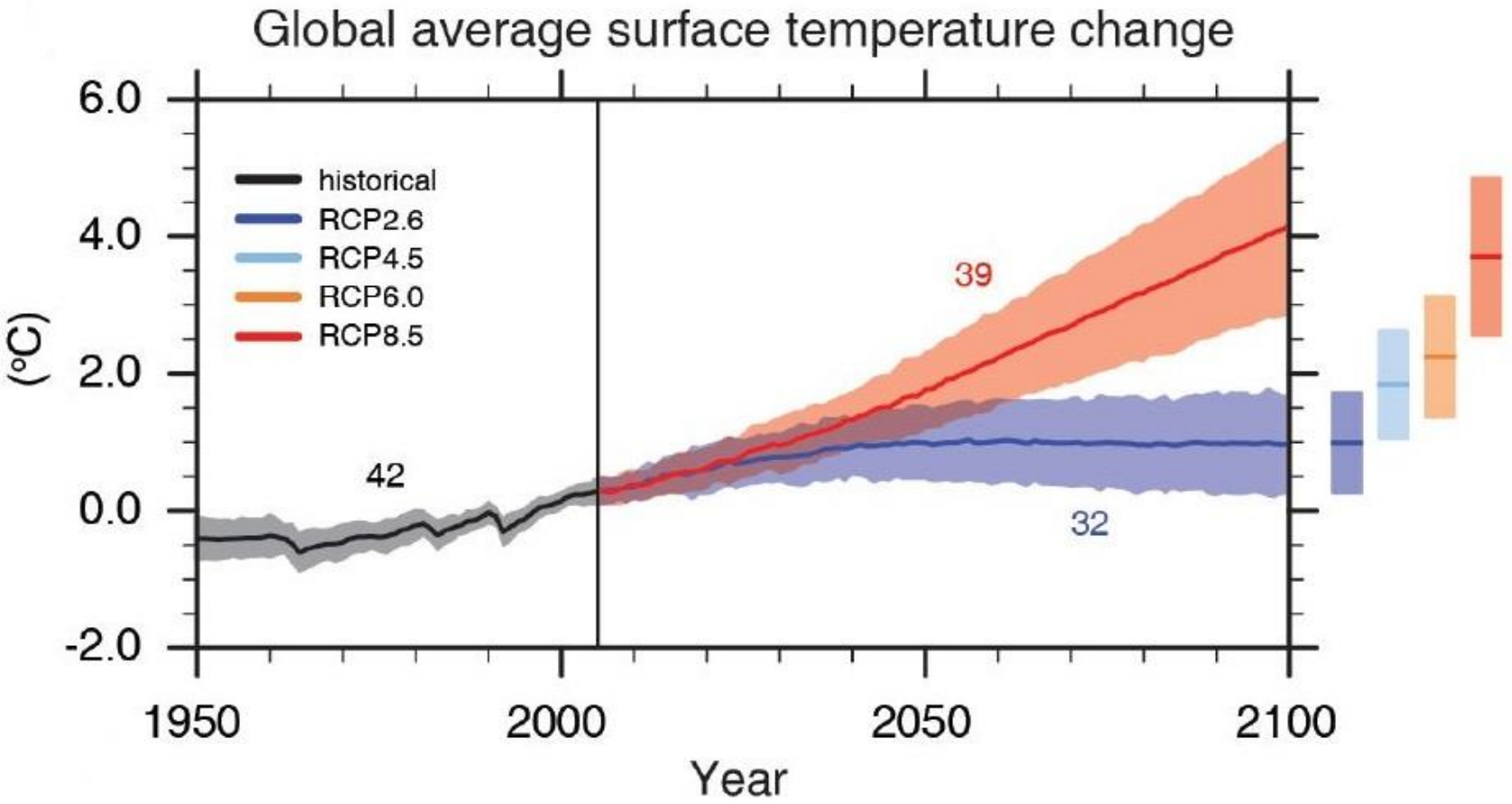
Eastern Mediterranean Climate Changes in the 21st Century

Assaf Hochman, Hadas Saaroni, Pinhas Alpert

Supported by: Porter School of the Environment and Earth Sciences, Tel-Aviv University
DESERVE, funded by the German Helmholtz Association
Tel-Aviv University president and Mintz foundation
Mediterranean Research Center of Israel (MERCI)

Water Sensitive Cities Workshop, 18 July 2019, Tel-Aviv University

Motivation



IPCC (2014)

ועכשיו טראמפ משנה את המספרים

תחזיות קשות בנוגע לשינויי האקלים? נשיא ארה"ב מתכוון לשנות את טווחי הבדיקה ולהשמיט את התרחישים הקיצוניים

ציפי שמילוביץ | ניו־יורק

בזמן שהמערב התיכון בארצות־הברית סופג מכת סופות חסרת תקדים, מחריף ממשלו של דונלד טראמפ את המאבק בקונצנזוס הגורף בין מדענים לגבי חלקם ואחריותם של בני אדם בשינויי האקלים. אחרי שהפך את ארה"ב למדינה היחידה בעולם שלא נמצאת בהסכם פריז, עובר עכשיו טראמפ פשוט לשנות את המספרים.

עיתון ה"ניו יורק טיימס" דיווח שלשום כי המכון הגיאולוגי האמריקאי (USGS) מתכוון לצמצם את ההערכות לגבי הטווחים העתידיים של ההשפעות הקשות ביותר של שינויי האקלים. כמו כן, בכוונת הממשל להשמיט את תחזיות התרחישים הקיצוניים ביותר מתוך "הערכת האקלים הלאומית", דו"ח שנתי בין־משרדי הבוחן את השפעת שינויי האקלים.

לפי ה"טיימס", ראש ה־USGS, ג'יימס רייל, הורה כי מעכשיו ישתמשו רק במודלים אקלימיים שיכולים להעריך את ההשפעות עד שנת 2040, ולא עד סוף המאה ה־21 כפי שהיה עד כה. ג'יימס יואיט, דובר הסוכנות לאיכות הסביבה (EPA) אמר לעיתון, כי "המודלים הקודמים המתמקדים בתרחישים של פליטת גזים חמורה ביותר, אינם משקפים תנאים של העולם האמיתי, וצריכים להיבחן מחדש".

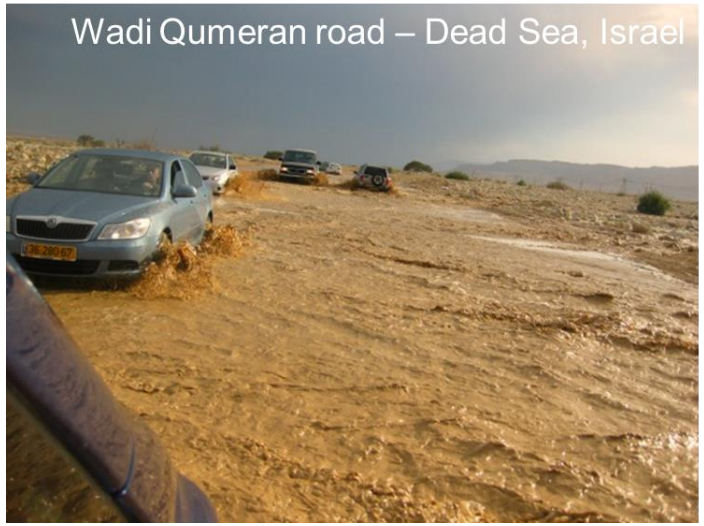
את המאבק של ממשל טראמפ במדע סביב שינויי האקלים מוביל ויליאם הארפר, פיזיקאי בן 79. להארפר עבר מכובד באוניברסיטת פרינסטון, ובשנים האחרונות הוא הפך למתנגד קיצוני למדע שינויי האקלים ולתומך נלהב של פחמן דו־חמצני. ל"טיימס" אמר הארפר כי "הדמוניזציה של הפחמן הדו־חמצני היא כמו הדמוניזציה של יהודים ענייים בידי היטלר".

טראמפ | צילום: אי־אף־פי

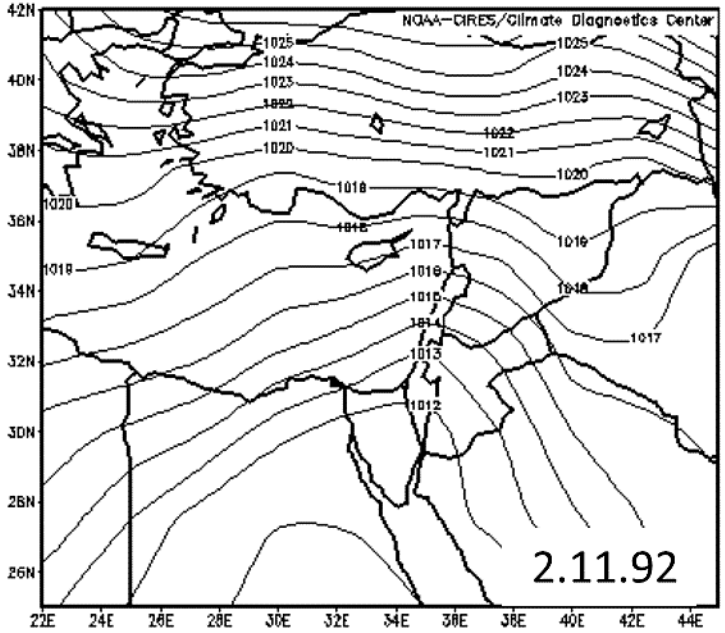
Eastern Mediterranean weather regimes

Synoptic group	Abbreviation	English name
Cyprus Lows	Lw	cold Low to the West of Cyprus
	CL_N-D	Cyprus Low to the North (Deep)
	CL_N-S	Cyprus Low to the North (Shallow)
	CL_S-D	Cyprus Low to the South (Deep)
	CL_S-S	Cyprus Low to the South (Shallow)
	L_E-D	Low to the East (Deep)
	L_E-S	Low to the East (Shallow)
Red Sea Troughs	RST_E	Red Sea Trough with an Eastern axis
	RST_C	Red Sea Trough with a Central axis
	RST_W	Red Sea Trough with a Western axis
Persian Troughs	PT-W	Persian Trough (Weak)
	PT-M	Persian Trough (Medium)
	PT-D	Persian Trough (Deep)
Highs	H_W	High to the West
	H_E	High to the East
	H_N	High to the North
	H_C	High over Israel (Central)
Sharav Lows	SL_W	Sharav Low to the West of Israel
	SL_C	Sharav Low over Israel (Central)

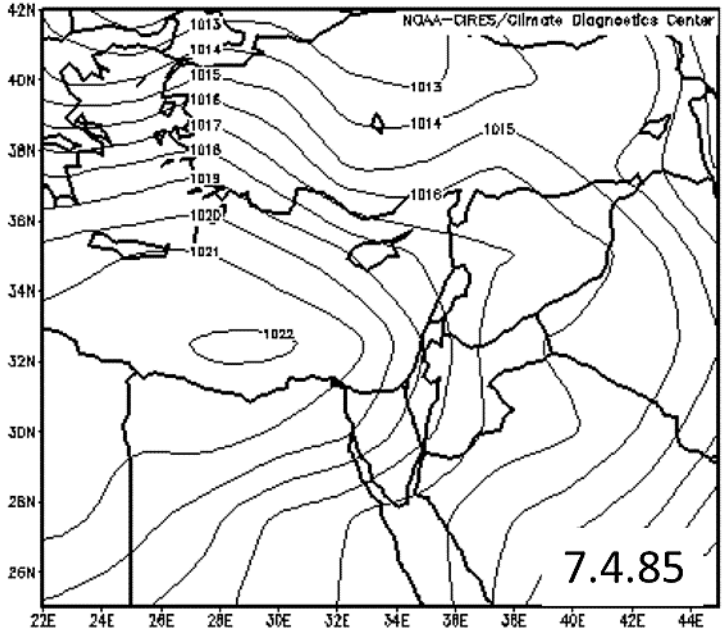
Alpert et al., (2004)



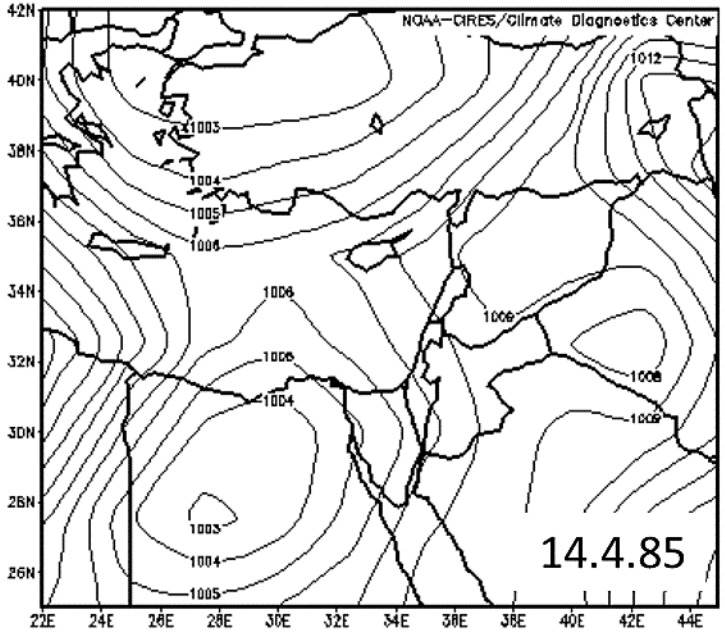
Red Sea Trough



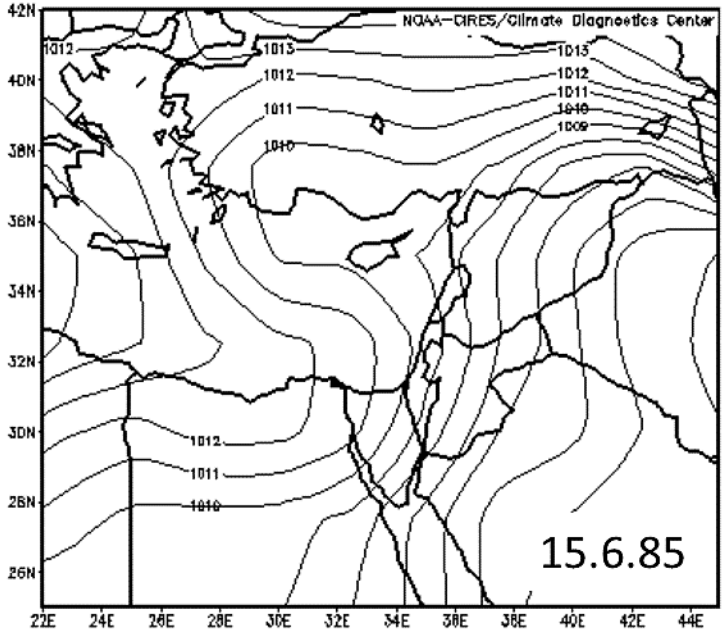
High



Sharav Low



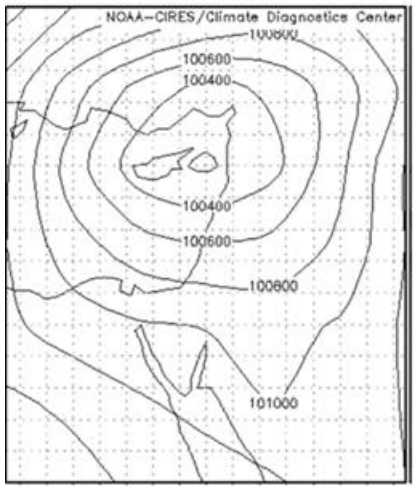
Persian Trough



Cyprus Low types – winter storms

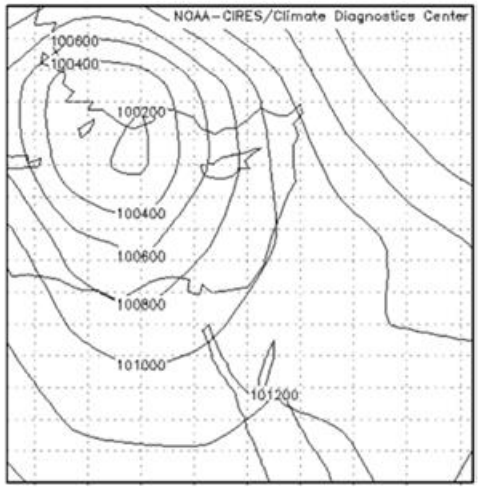
Jan 31 1992 12 Z

CLN-D



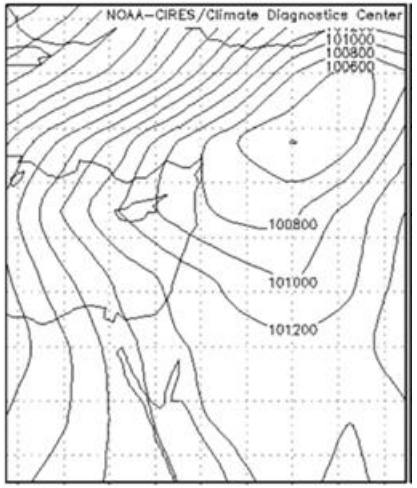
Jan 25 2004 12 Z

LW



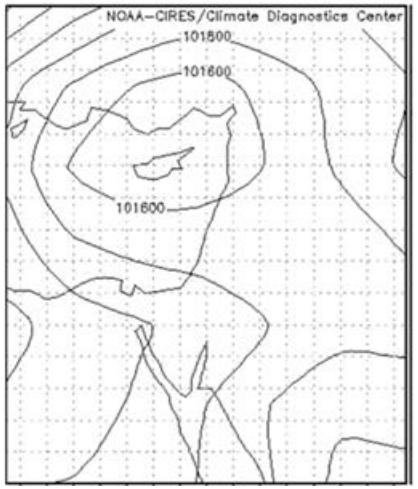
Dec 2 1994 12 Z

LE-D



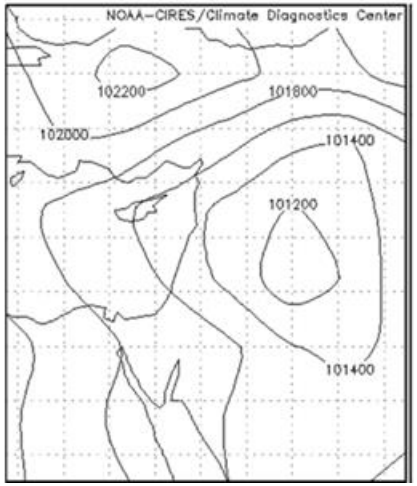
Dec 25 1998 12 Z

CLN-S



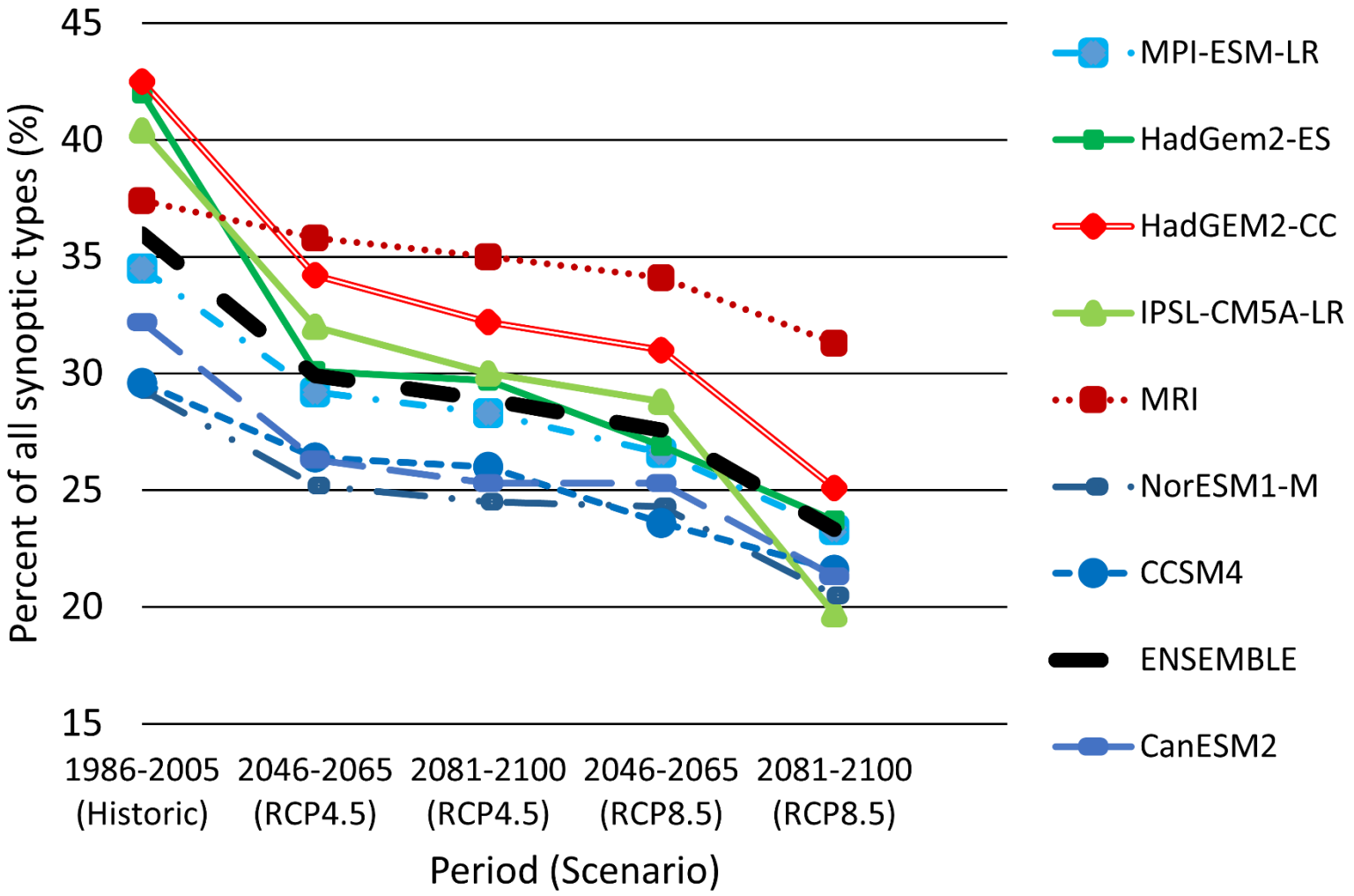
Dec 18 2002 12 Z

LE-S



How will the increase in greenhouse gas concentrations influence the frequency of Cyprus Lows in the 21st century over the eastern Mediterranean?

Annual frequency of Cyprus Lows in 21st century CMIP5 predictions



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Published online in Wiley Online Library
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RMetS
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Synoptic classification in 21st century CMIP5 predictions over the Eastern Mediterranean with focus on cyclones

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[b] *Department of Geography and the Human Environment, School of Geosciences, Tel-Aviv University, Israel*
[c] *Porter School of Environmental Studies, School of Geosciences, Tel-Aviv University, Israel*

ABSTRACT: The Mediterranean has been recognized as a 'hot spot', currently influenced by climate change, and predicted to be strongly affected in the future by significant warming and drying. This trend is expected to be expressed in changes in the occurrence and intensity of Mediterranean cyclones, in general, and of East Mediterranean (EM), i.e. Cyprus Lows (CL), in particular, as well as in the occurrence of all other synoptic systems dominating the region.

Here we have modified the semi-objective synoptic classification (Alpert *et al.*, 2004) to investigate future changes in the occurrence of EM synoptic types, with an emphasis on CLs. The modified classification was applied to eight CMIP5 models for the present (1986–2005), mid-21st century (2046–2065) and end of the century (2081–2100) periods, for both RCP4.5 and RCP8.5 scenarios.

The modified classification captured the synoptic-type frequencies for the present period well, and particularly excelled in capturing that of the CLs. For the future period, approximately a 35% reduction in CL occurrence is found towards the end of the 21st century (RCP8.5). Analysing this reduction for each of the seven specific types of CLs showed that lows located to the west of Cyprus are the main contributors to this decrease. The reductions in the frequencies of CLs are accompanied by an increase in the frequencies of Red Sea Troughs in winter. The predicted changes in the occurrence of various synoptic types in general and of CLs, in particular, will lead to a more accurate forecast of local potential climatic hazards.

KEY WORDS CMIP5; synoptic classification; Cyprus Lows; cyclones; Eastern Mediterranean

Received 4 April 2017; Revised 2 July 2017; Accepted 1 August 2017

How will the increase in greenhouse gas concentrations influence the length of seasons in the 21st century over the eastern Mediterranean?

Motivation

Seasons' length

Agriculture

Health

Air pollution

Flooding

Fires

Seasons' definitions

1) **Astronomical definition (Northern Hemisphere)**

Winter – 22nd December – 21st March

Spring – 22nd March – 22nd June

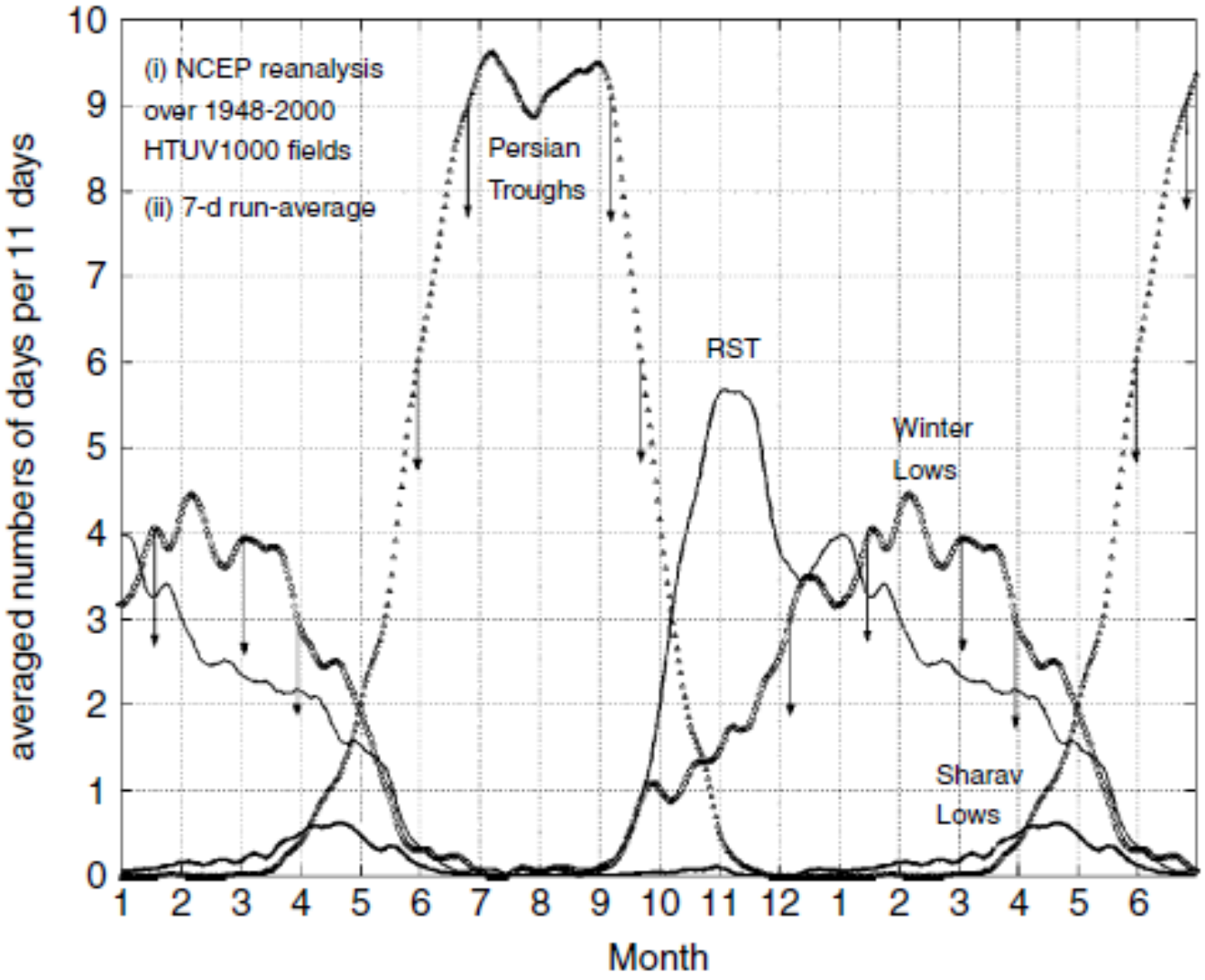
Summer – 23rd June – 22nd September

Autumn – 23rd September – 21st December.

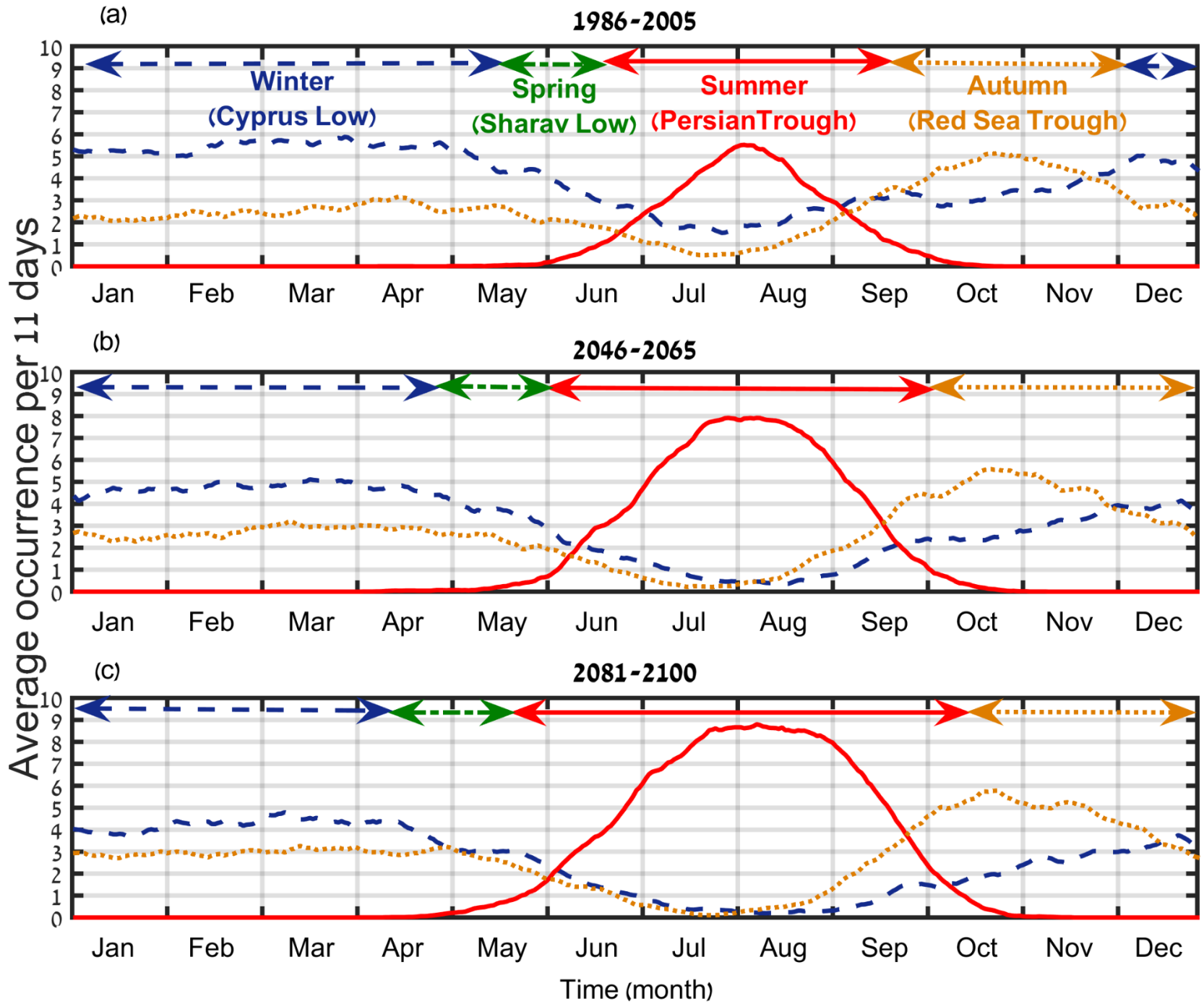
2) **Meteorological definition -** defined as four periods of three months each (AMS, 2001).

3) **Trenberth (1983) -** defined the seasons according to the cycle of the average daily air temperature.

A seasons' definition based on the weather regimes



Alpert P, Osetinsky I, Ziv B, Shafir H. 2004. A new season's definition based on classified daily synoptic systems: an example for the eastern Mediterranean. *International Journal of Climatology* **24**: 1013-1021. DOI: 10.1002/joc.1037


(a)
1986-2005
Winter
(Cyprus Low)
Spring
(Sharav Low)
Summer
(PersianTrough)
Autumn
(Red Sea Trough)
(b)
2046-2065
(c)
2081-2100
Average occurrence per 11 days
0
1
2
3
4
5
6
7
8
9
10
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time (month)

Received: 13 October 2017 | Revised: 10 December 2017 | Accepted: 9 January 2018

DOI: 10.1002/joc.5448

International Journal of Climatology | RMetS

RESEARCH ARTICLE

The seasons' length in 21st century CMIP5 projections over the eastern Mediterranean

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Funding information
Porter School of Environmental Studies at Tel-Aviv University; German Helmholtz Association, DESERVE (Dead Sea Research Venue); ; Mintz foundation; Tel-Aviv University President; Ministry of Science and Technology of Israel

The eastern Mediterranean (EM) is expected to be influenced by climate changes that will significantly affect ecosystems, human health and socio-economic aspects. One aspect of climate change in this vulnerable area is the length of the seasons, especially that of the rainy winter season against the warm and dry summer.

Here, the synoptic seasons' definition of Alpert, Osetinsky, Ziv, and Shafir (2004a) was applied to an ensemble of eight Coupled Model Inter-Comparison Project phase 5 (CMIP5) models, under RCP8.5 and RCP4.5 scenarios, to predict the changes in the lengths of EM seasons during the 21st century. It is shown that the ensemble adequately represents the annual cycle of the main synoptic systems over the EM.

The analysis further suggests that at the end of the 21st century, the duration of the synoptic summer, characterized by the occurrence of the Persian Trough, is expected to be lengthened by 49%, while the synoptic winter, characterized by the occurrence of the Cyprus Low, is expected to be shortened by 56% under the RCP8.5 scenario. This may lead to substantial changes in the hydrological regime and water resources, reduce the potential of dry farming, increase the risk of fires and air pollution and change the timing of seasonal health hazards.

KEYWORDS

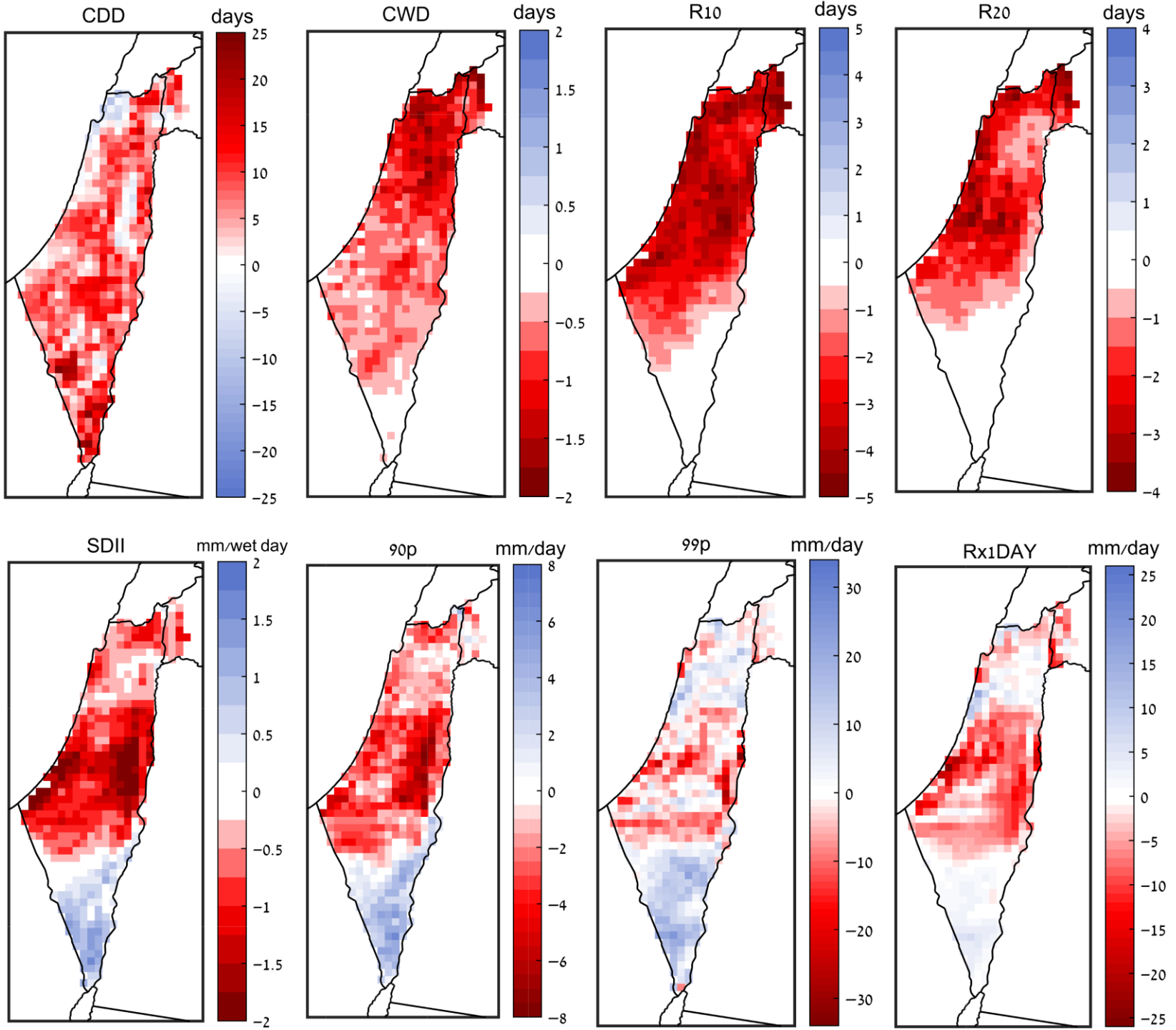
CMIP5, Cyprus Low, Persian Trough, Red Sea Trough, season definition, Sharav Low, synoptic classification

Dynamical downscaling of extreme precipitation indices using COSMO-CLM at the highest resolution ever attempted in Israel (~8km).

Scenario: RCP4.5

Time period:

2041-2070 – 1981-2010.



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DOI: 10.1002/joc.5714

International Journal of Climatology | RMetS

RESEARCH ARTICLE

High-resolution projection of climate change and extremity over Israel using COSMO-CLM

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Funding information
German Helmholtz Association; Ministry of Science and Technology (MOST); Italian Ministry of the Environment, Land and Sea; Italian Ministry of Education

High-resolution climate projections over Israel (about 8 km) have been obtained with the regional model COSMO-CLM, nested into the CORDEX-MENA simulations at 25 km resolution. This simulation provides high-resolution spatial variability of total precipitation and precipitation intensity. Projections are presented not only in terms of average properties, but also using a subset of extreme temperature and precipitation indices from the standard Expert Team on Climate Change Detection and Indices (ETCCDI) for the period 2041–2070 with respect to 1981–2010 (RCP4.5).

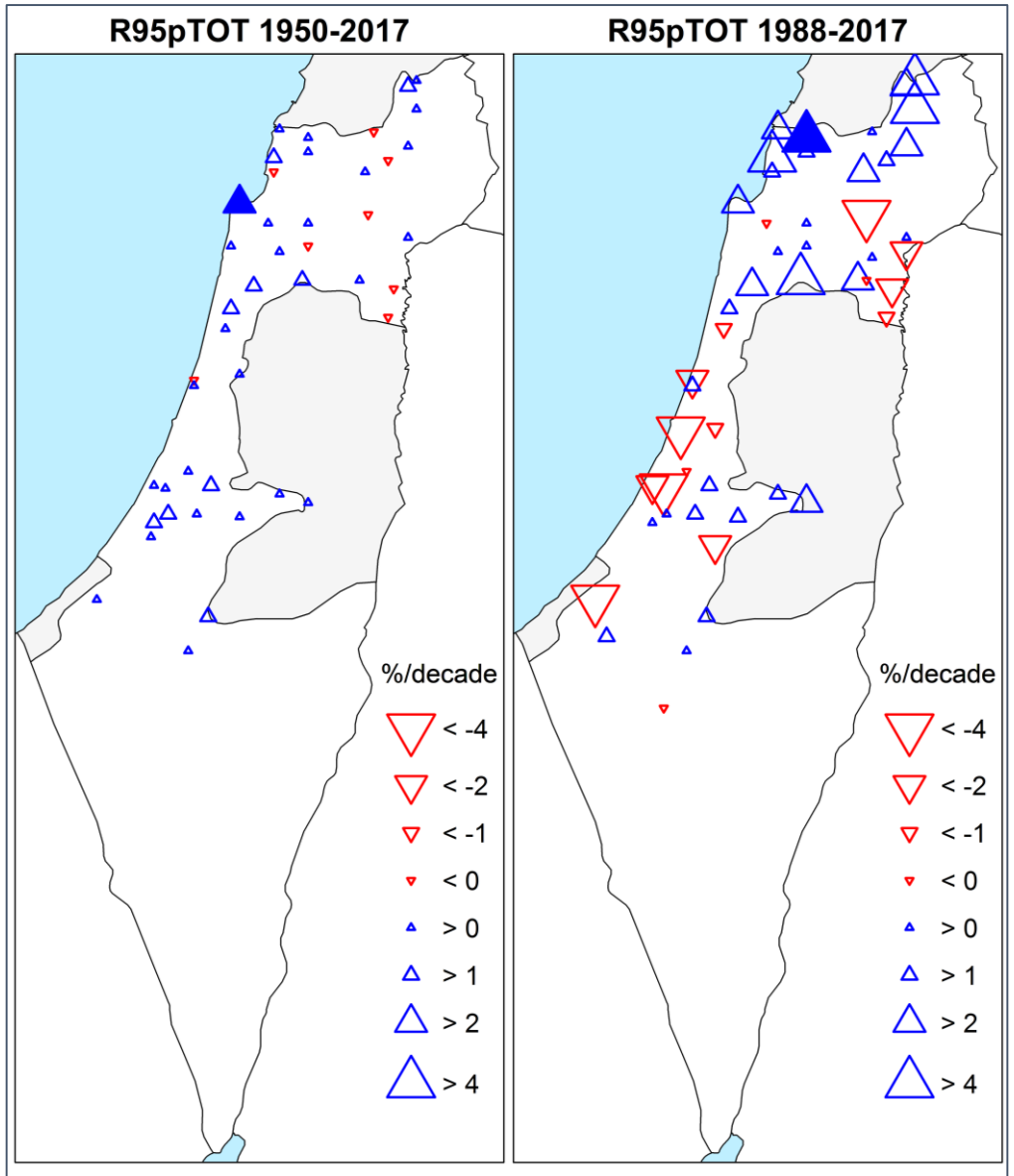
A general increase in seasonal mean temperature is projected throughout the domain with peaks of ~2.5 °C, especially in winter and autumn. Extreme temperature indices show increases, larger in the minimum than in the maximum temperatures. Regarding total seasonal precipitation, decreases were found in the north and central Mediterranean climate parts of Israel, with reductions reaching ~40%, and increases of the same percentage in the most southern arid parts during winter and spring. An increase in precipitation intensity is shown mostly for the southern arid part of the region, with some indications of extremity also in the north. This spatial pattern probably results from a decrease in cyclones' occurrences, which mainly influences the northern and central parts of Israel, and an increase in convective activity in the south.

The outcome of this study can serve as a basis for priority setting and policy formulation towards better climate adaptation.

KEYWORDS

COSMO-CLM, downscaling, eastern Mediterranean, ETCCDI, extreme precipitation, extreme temperature, Israel, RCM

מגמה בתרומה מימים גשומים מאוד (R95PTOT), בתקופות 2017-1950 ו- 2017-1988

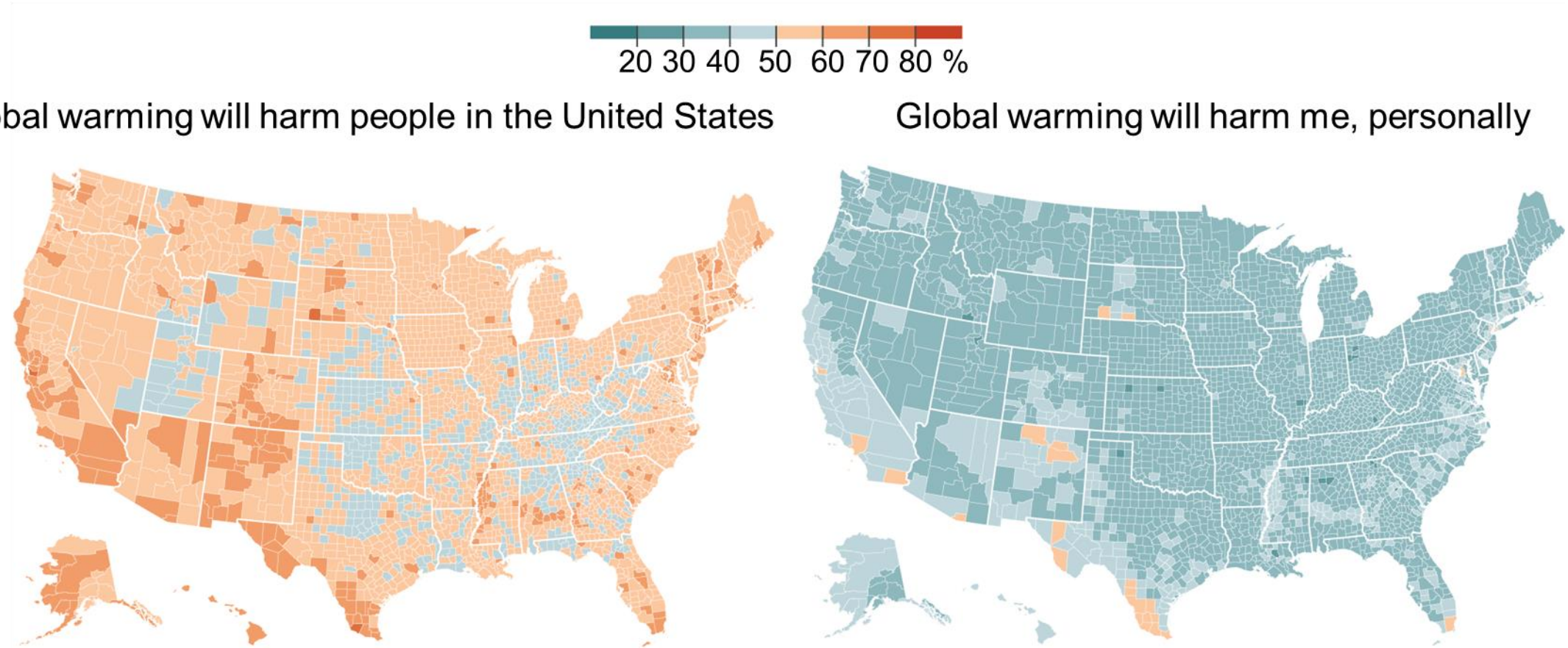


(Yosef et al., 2019)

Conclusions

- A decrease of ~30%, in Cyprus Lows frequency is predicted towards the end of the 21st century (RCP8.5).
- The seasons' length is projected to change significantly during the 21st century.
- The length of the summer season is projected to increase by 25% (~1 month) in the mid-21st century and by 49% (~ 2 months) at the end of the century (RCP8.5).
- Very High-resolution (~8km; RCP4.5) COSMO-CLM simulation provide insight into extreme precipitation distribution.
- Different perspectives are used to reduce uncertainty in climate projections.

Most people think that climate change will harm Americans, but they don't think it will happen to them.



The New York Times