

DROUGHT EVALUATION OVER THE MIDDLE EAST



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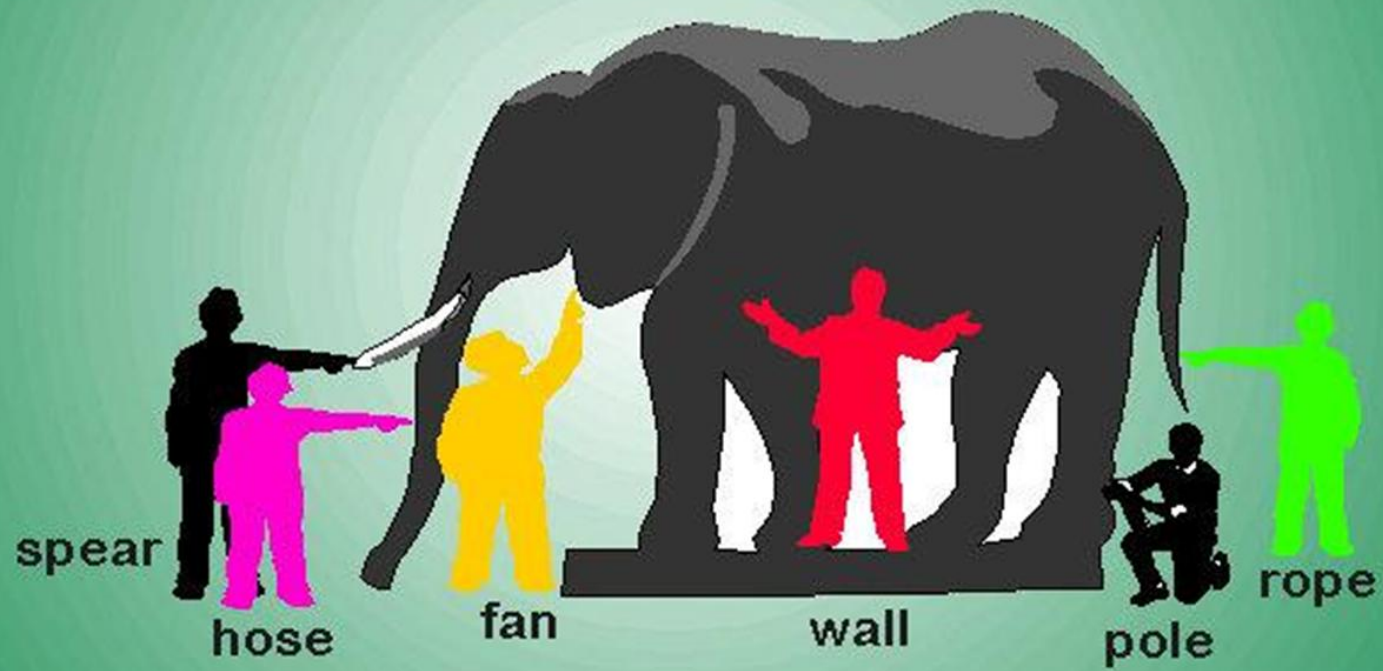
23 October 2017

Republic of Turkey
The Ministry of
Forestry and Water
Affairs



Drought Definition

Drought Definition



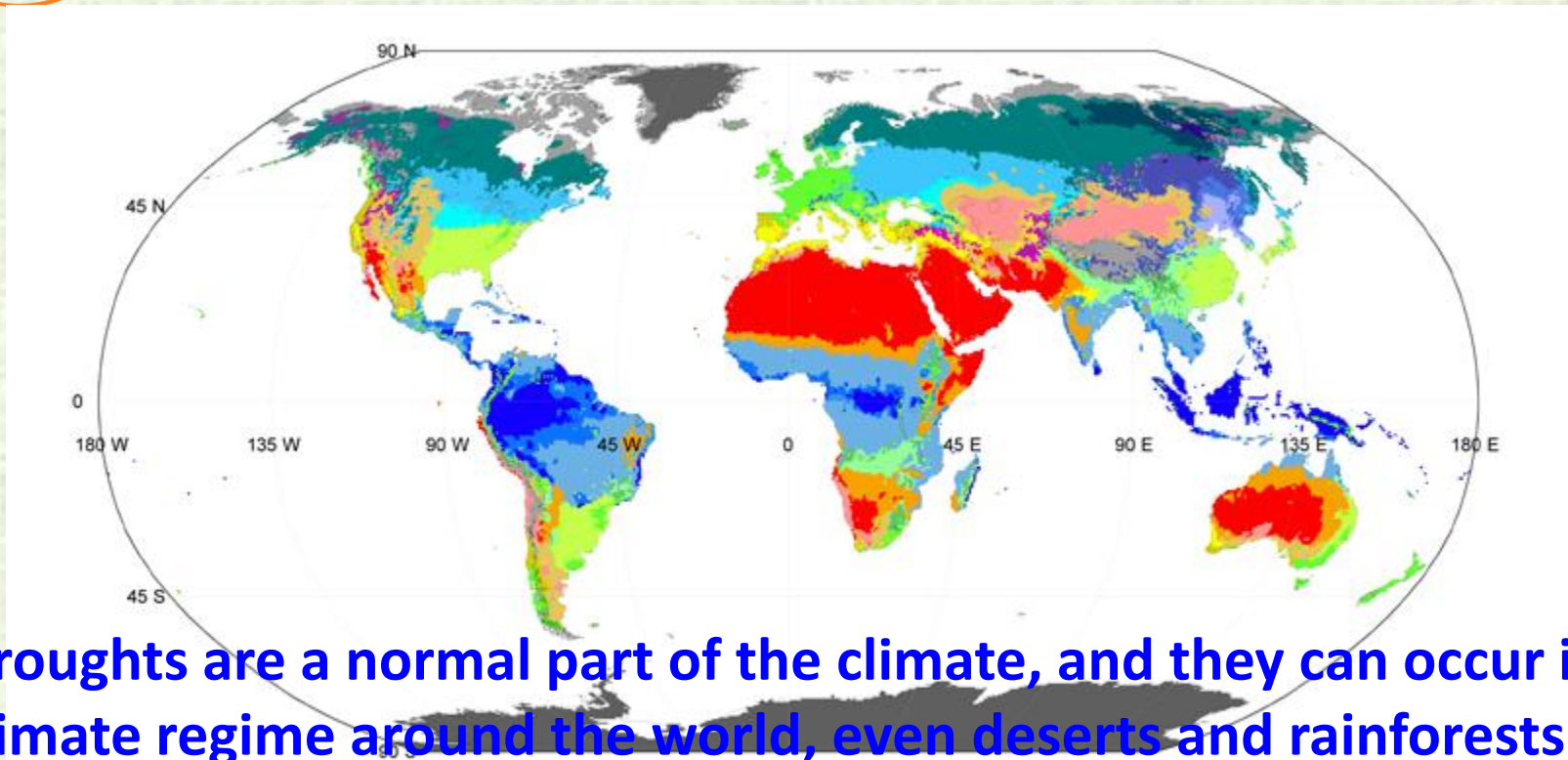
Drought Definition



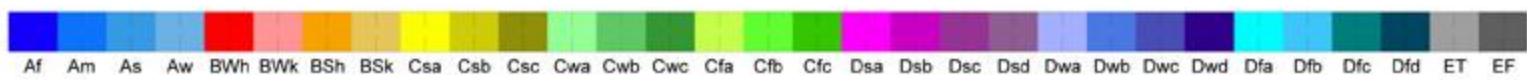
Drought vs. Aridity

- **Aridity** is a permanent feature of climate.
- **Drought** is a temporary feature of climate, an aberration.

Drought vs. Water Scarcity



Droughts are a normal part of the climate, and they can occur in any climate regime around the world, even deserts and rainforests.



First letter	Second letter	Third letter
A: Tropical	f: Fully humid	T: Tundra
B: Dry	m: Monsoon	F: Frost
C: Mild temperate	s: Dry summer	h: Hot arid
D: Snow	w: Dry winter	k: Cold arid
E: Polar	W: Desert	a: Hot summer
	S: Steppe	b: Warm summer
		c: Cool summer
		d: Cold summer

Drought vs. Water Scarcity



Water scarcity occurs where there are insufficient water resources to satisfy long-term average requirements. It refers to long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system.

Water scarcity and drought are different phenomena although they are liable to aggravate the impacts of each other. In some regions, the severity and frequency of droughts can lead to water scarcity situations, while overexploitation of available water resources can exacerbate the consequences of droughts.

Drought Definition

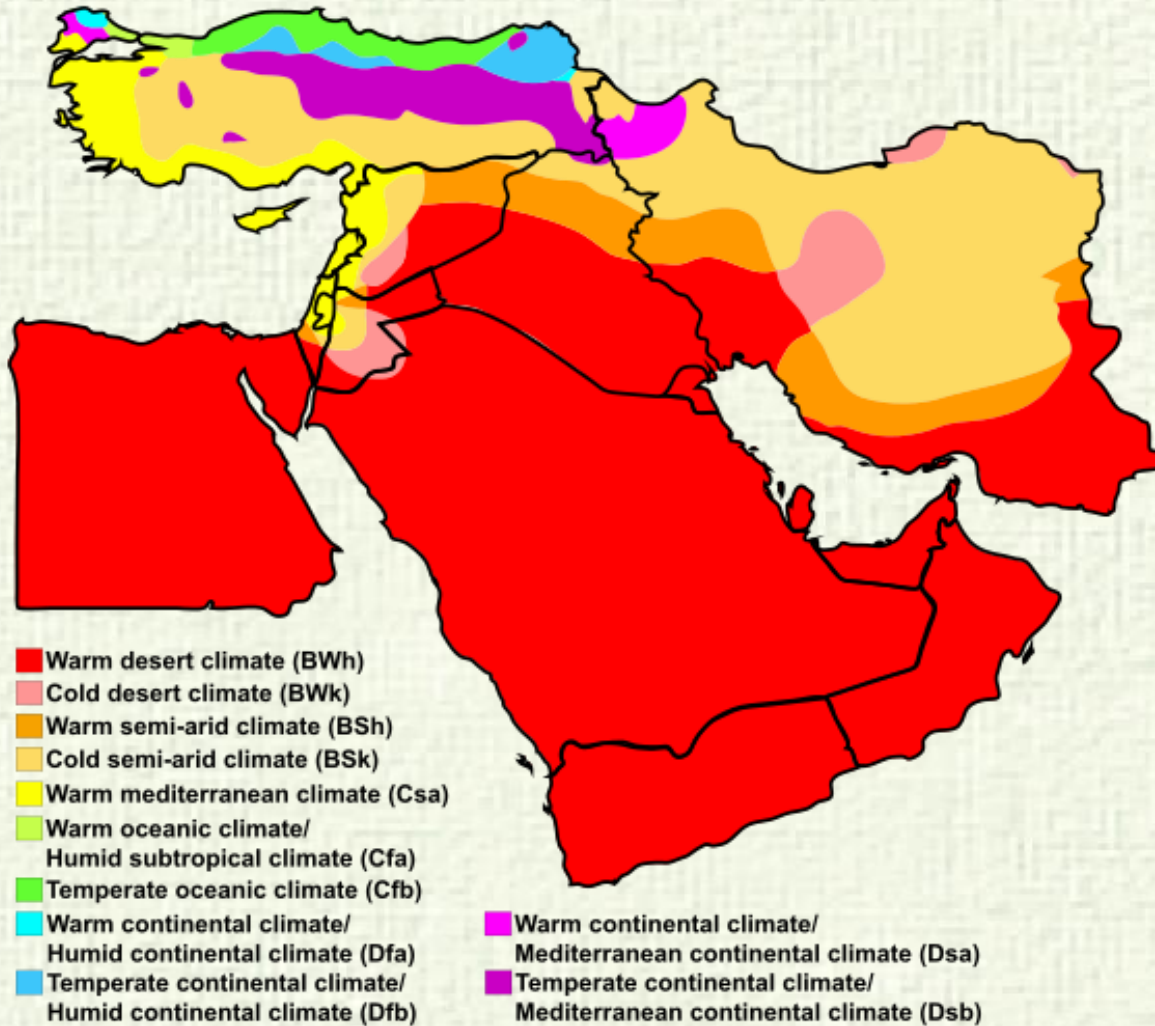


DROUGHT

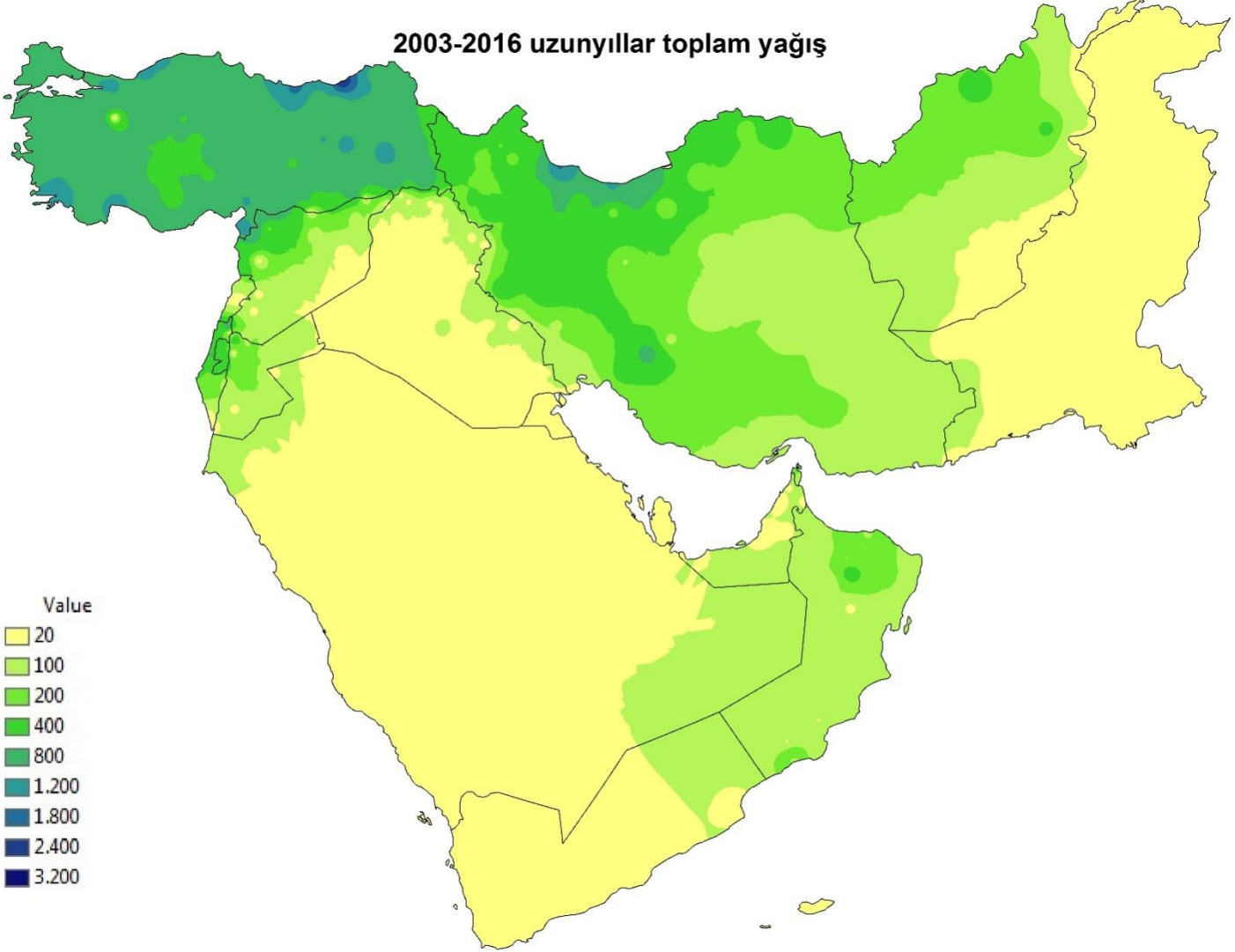
DROUGHT : a deficiency of precipitation (**intensity**) from expected or “normal” that extends over a season or longer period of time (**duration**) . . . Meteorological drought and is insufficient to meet the demands of human activities and the environment (**impacts**).



Middle East map of Köppen climate classification

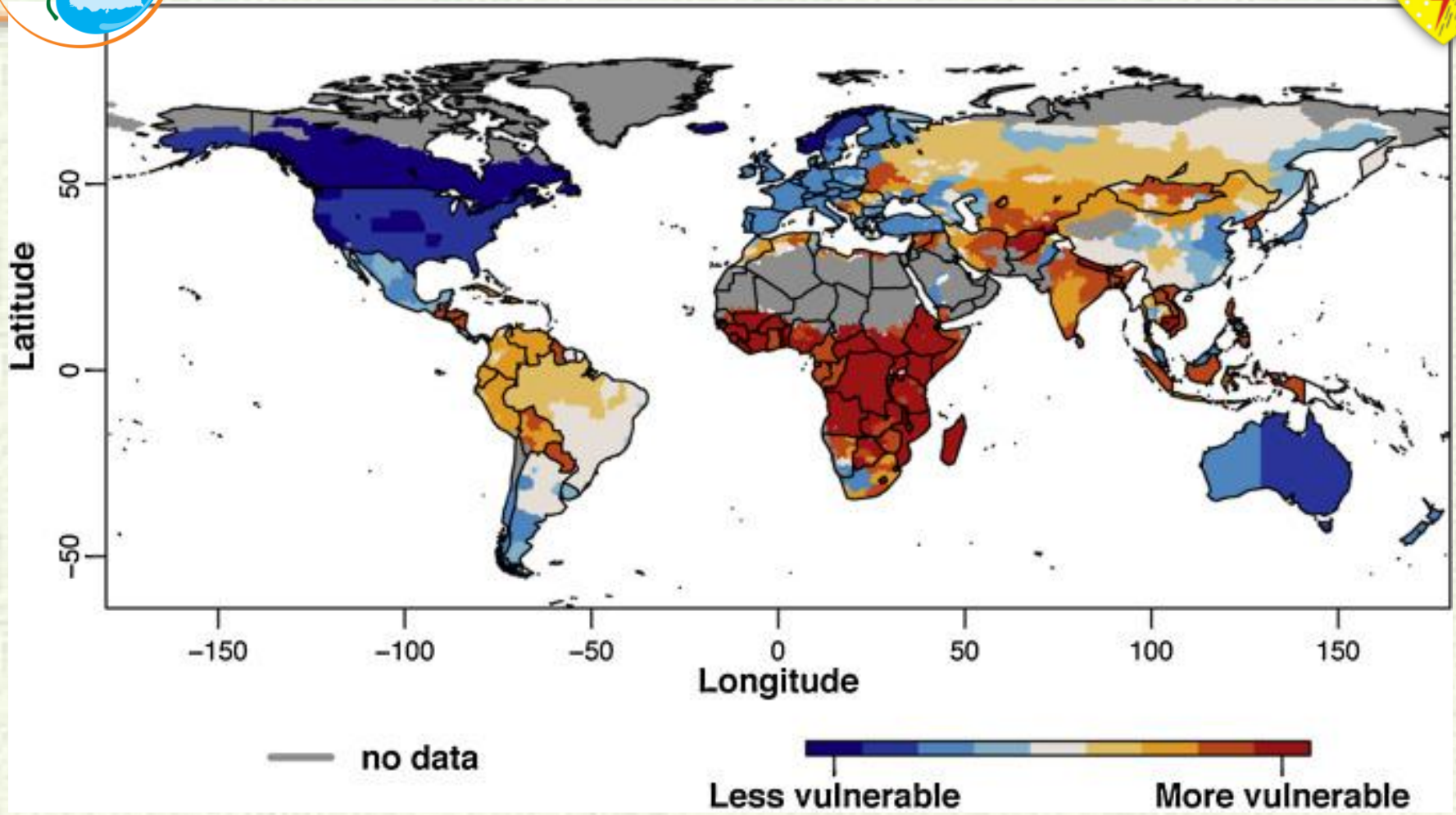


2003-2016 uzun yıllar toplam yağış



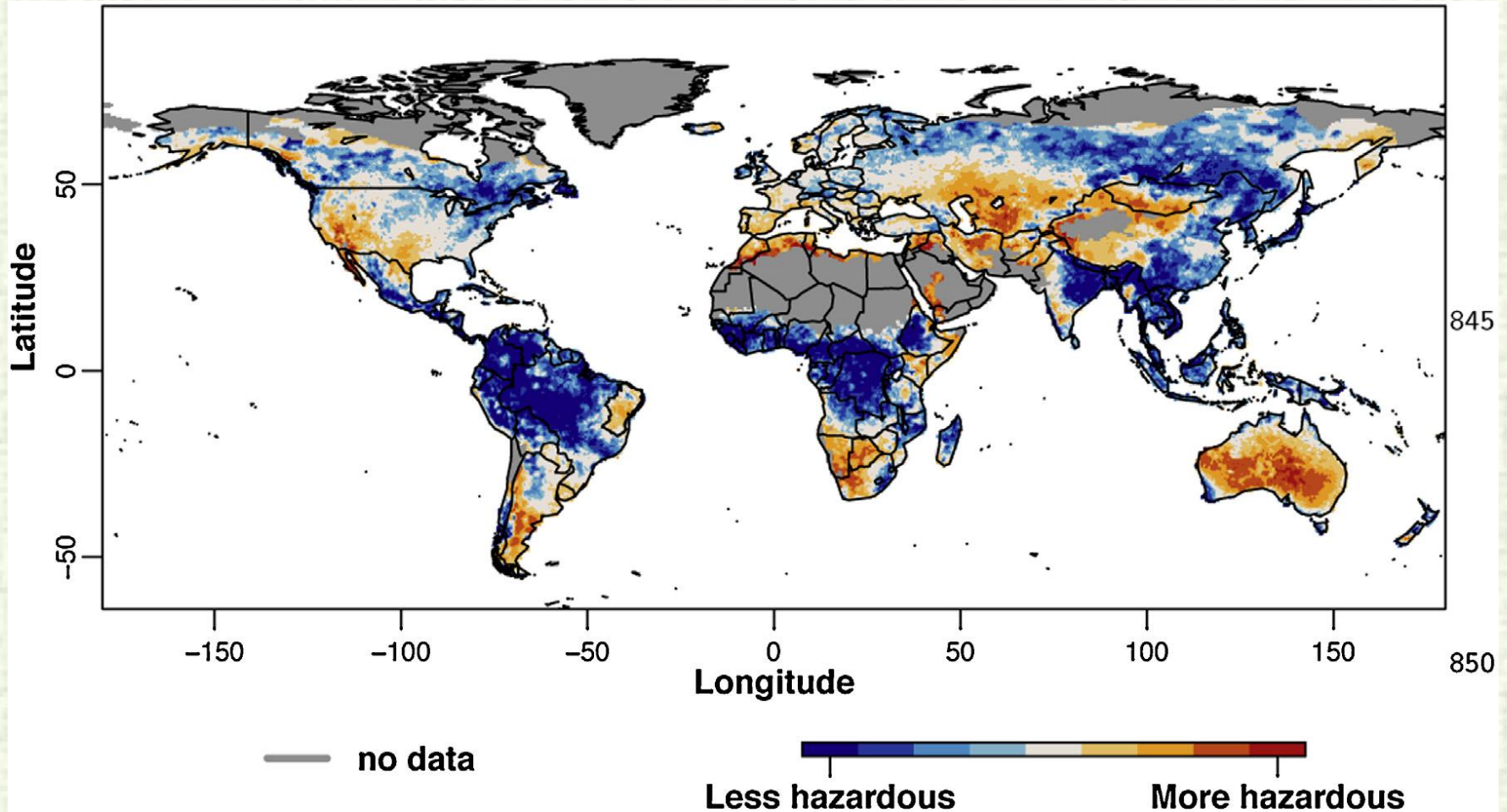


Global map of drought vulnerability



drought vulnerability is computed as the arithmetic composite of high level factors of social, economic and infrastructural indicators, collected at both the national and sub-national levels.

Global map of drought hazard

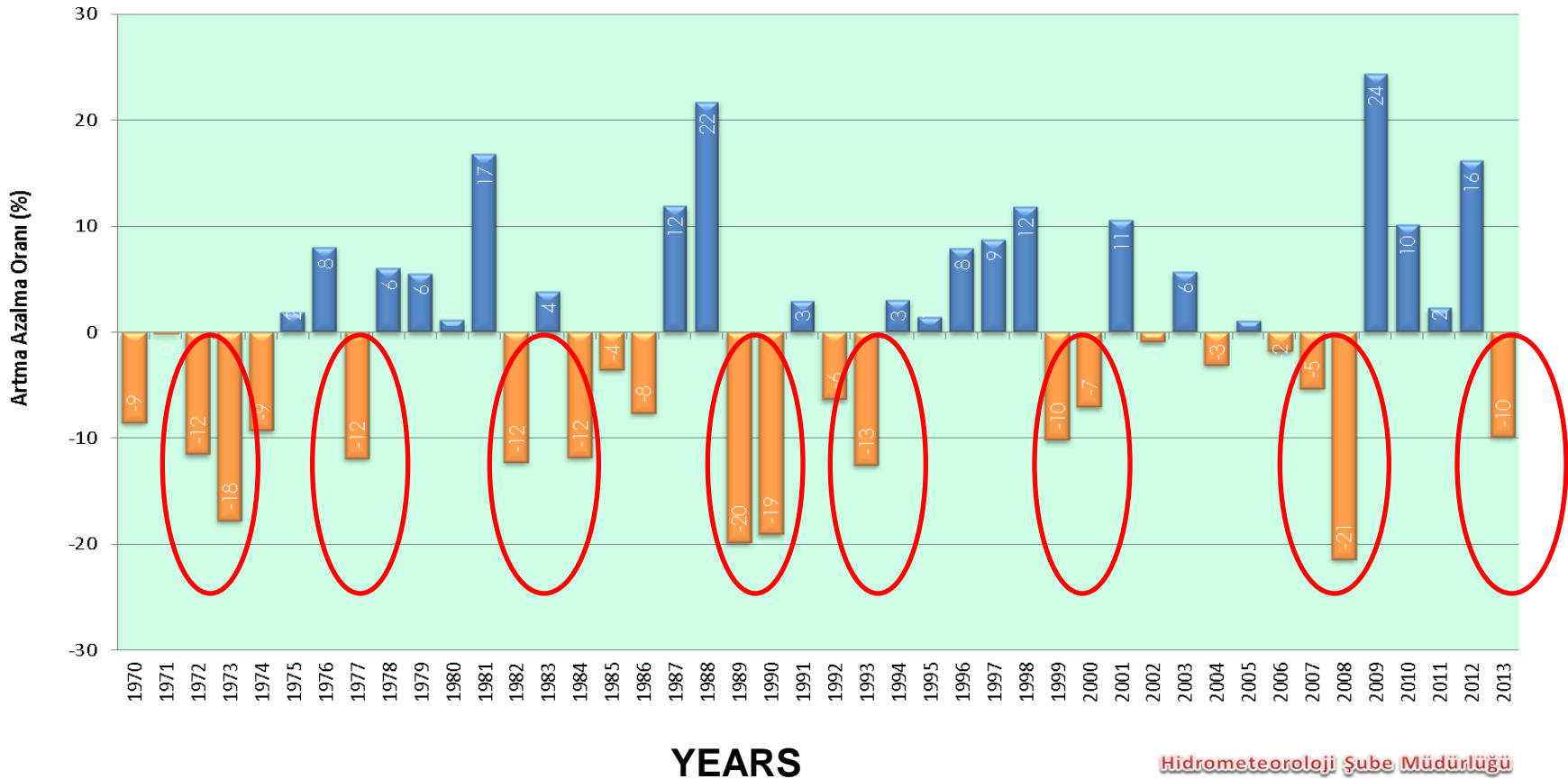


Drought hazard is derived from a non-parametric analysis of historical precipitation deficits



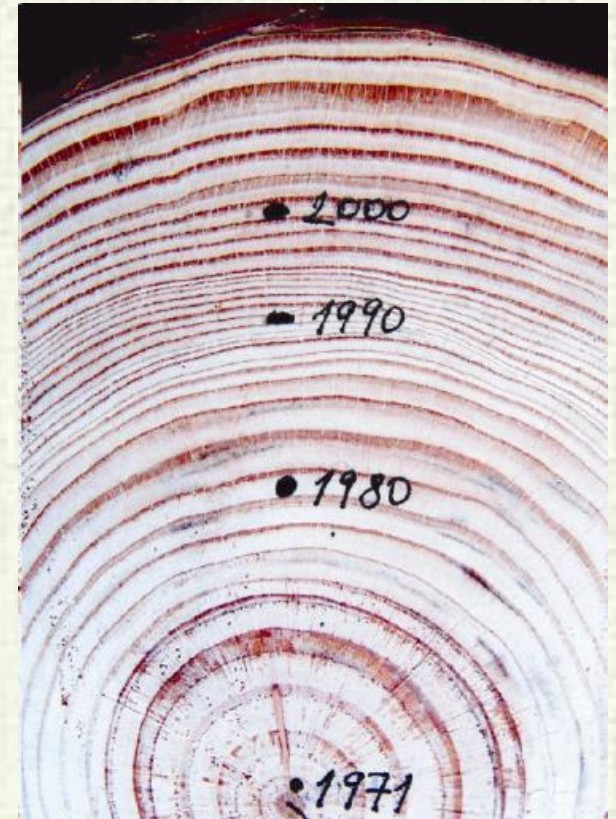
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
67,3	62,9	60,4	59,0	49,1	30,8	16,7	13,9	21,7	49,2	70,0	78,3	574,0

PRECIPITATION ANOMALIES (1970-2013)



1970, 1972/73, 1977, 1982, 1984, 1989/90, 1994, 2000/01, 2006/08, 2013 and 2015 are the drought occurred years in Turkey.

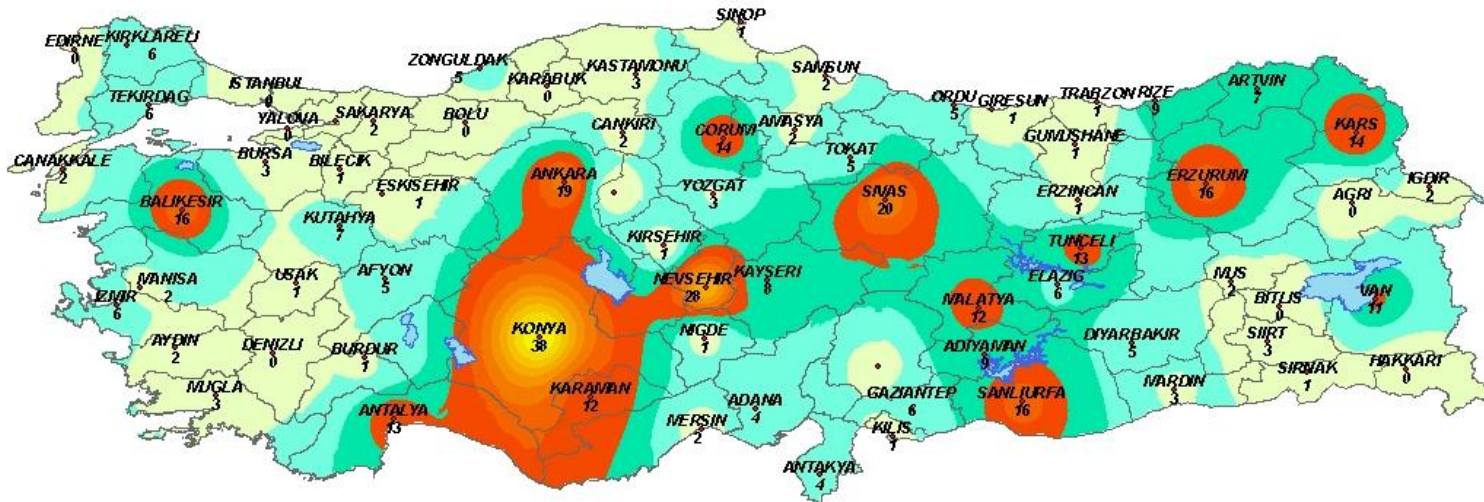
Also, precipitation reconstruction of Anatolia region during the last 350 years from tree-rings showed that the years **1676, 1679, 1696, 1715, 1725, 1746, 1757, 1797, 1804, 1815, 1878/79/80, 1886/87** can be characterized as drought years (Akkemik et al, 2005).



Especially in 1876, drought caused the loss of thousands of people because of famine and epidemic disease.



NUMBER OF DROUGHT OCCURRENCES 1950-2010



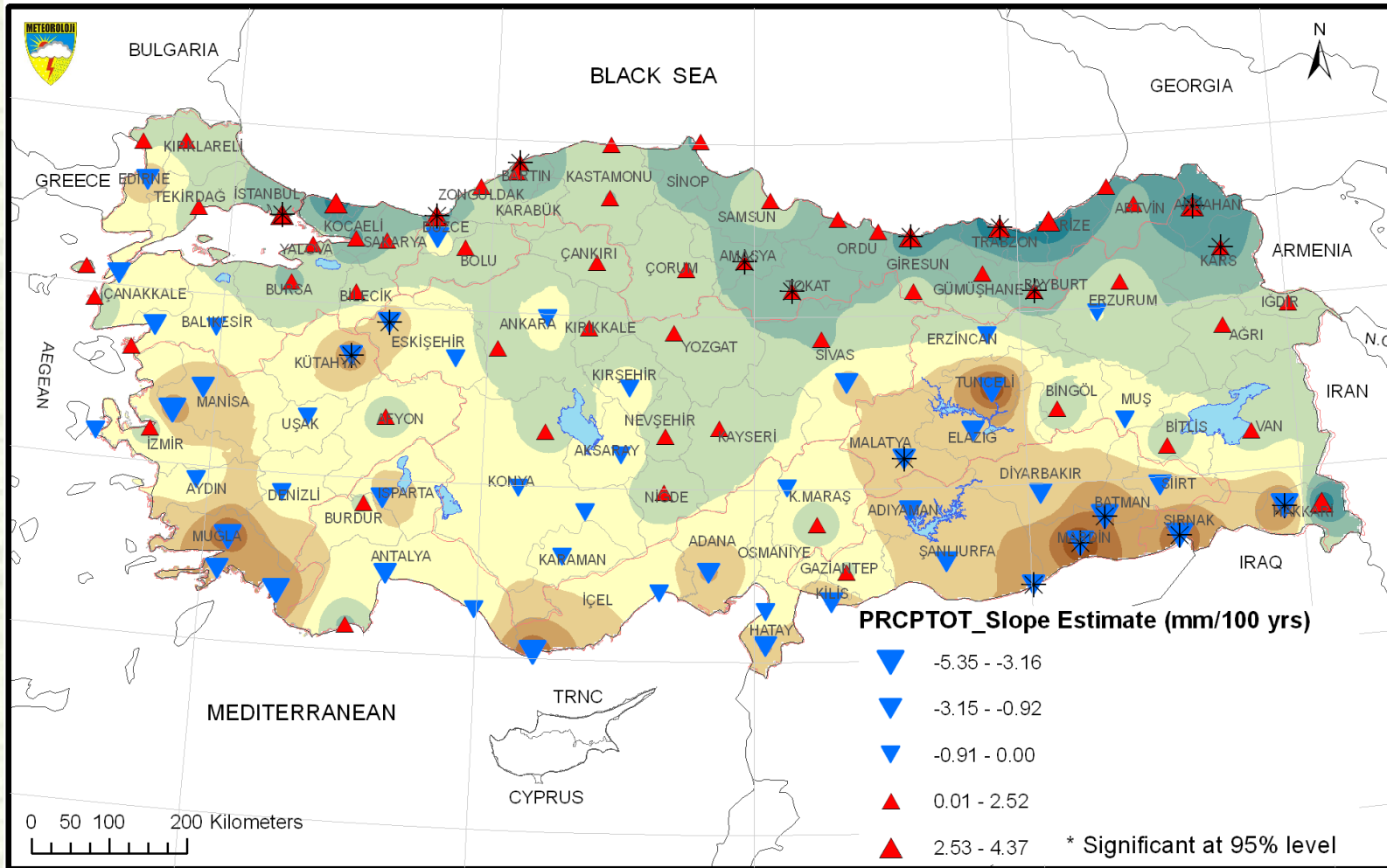
Gözlenme Sayısı



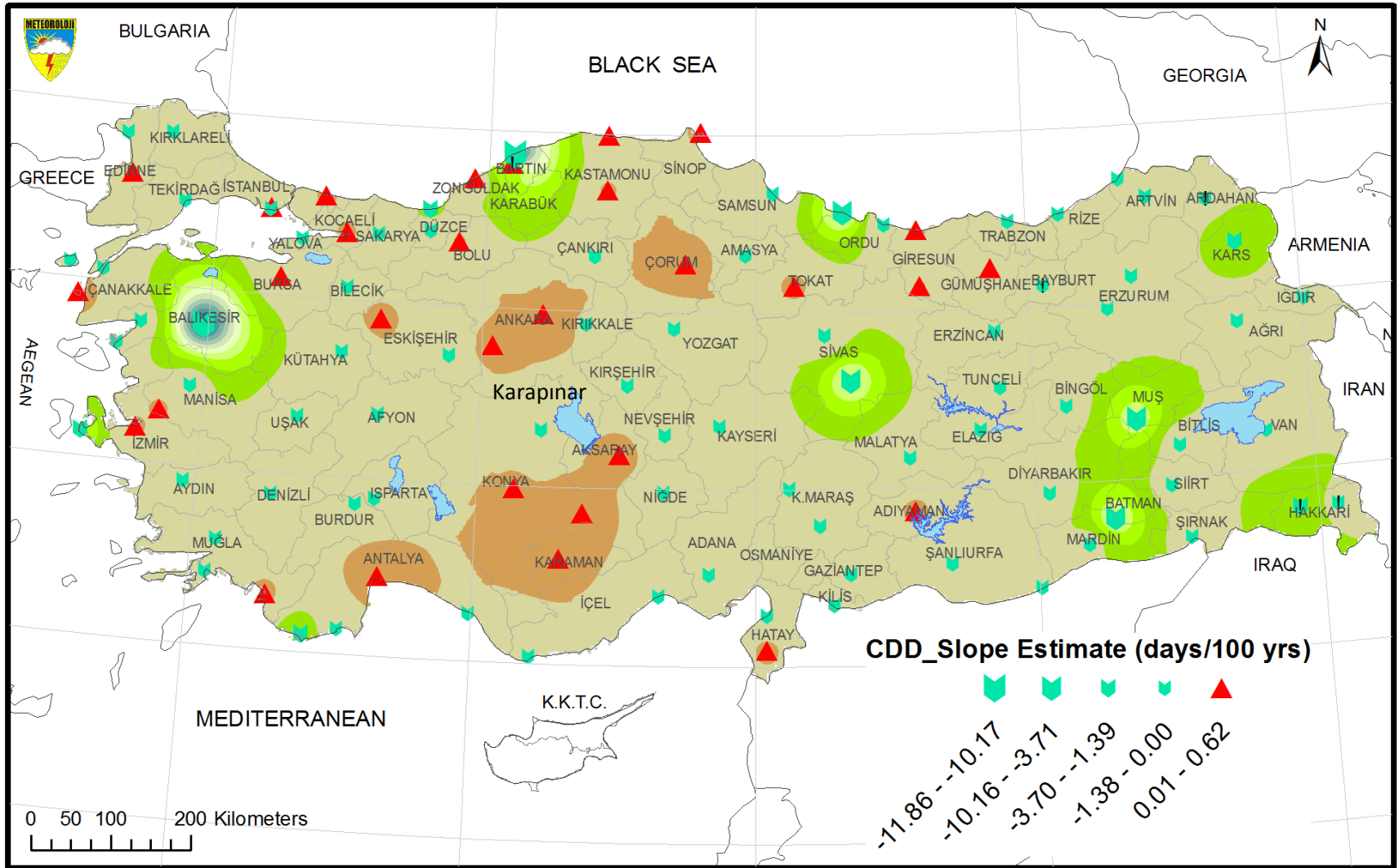
Göller

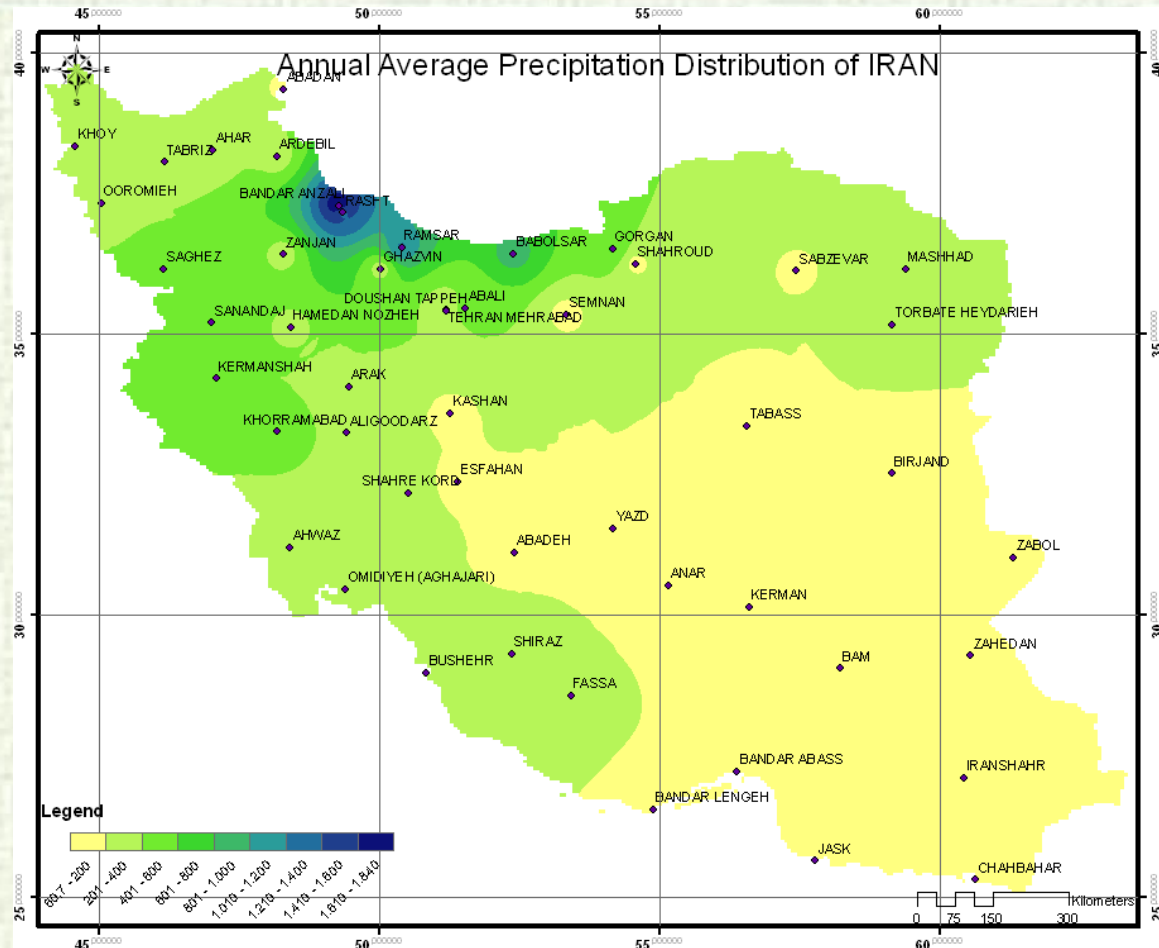


Change in precipitation



Consequitive drought days

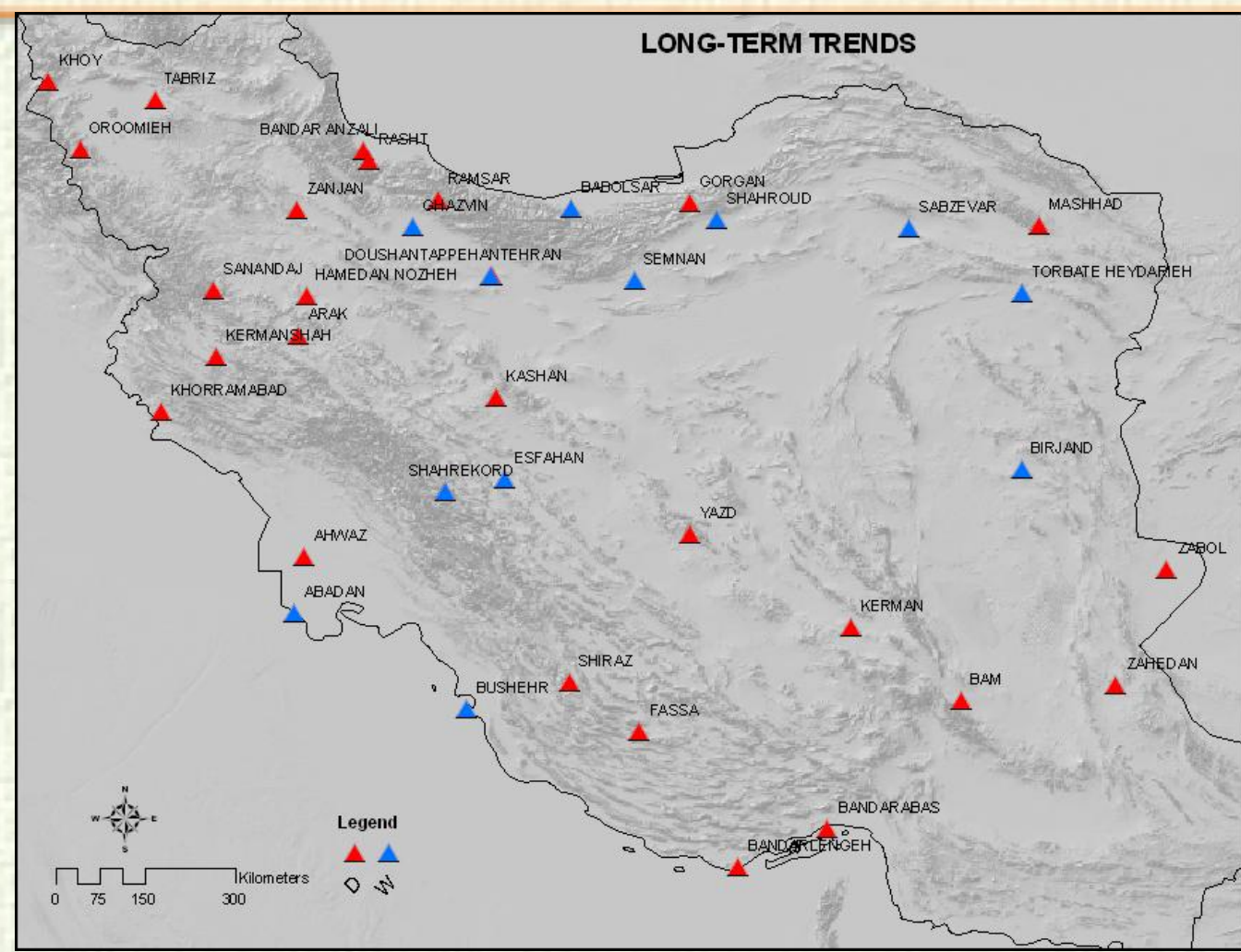




Climate

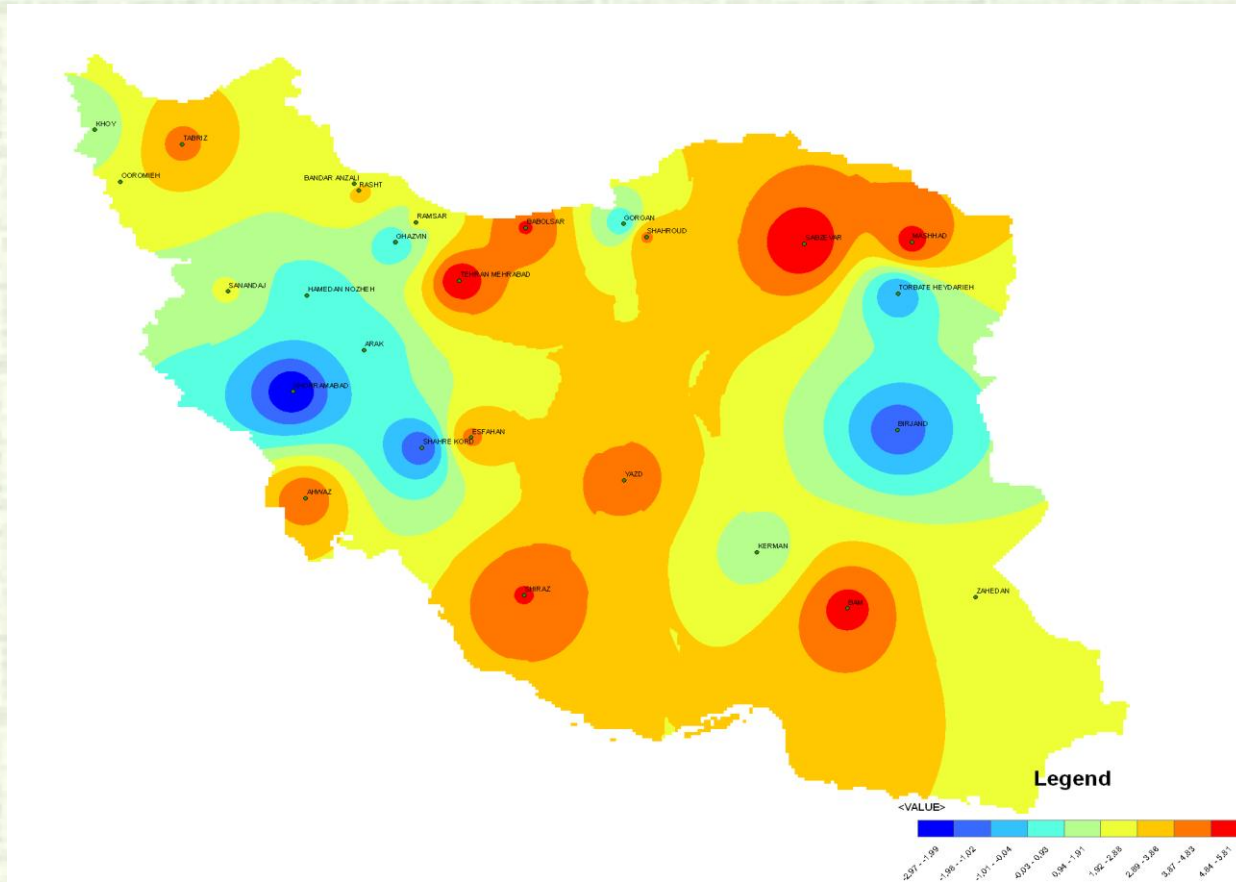
Annual precipitation: varies from about 1800 mm to less than 50 mm- average annual precipitation ~ 250 mm

Long term PDSI trends over Iran



Findings: Statistically significant decrease in precipitation and increase in temperature were observed in the NW parts of the country. This represents a trend towards the drought conditions over the the south and southeast parts of Iran.

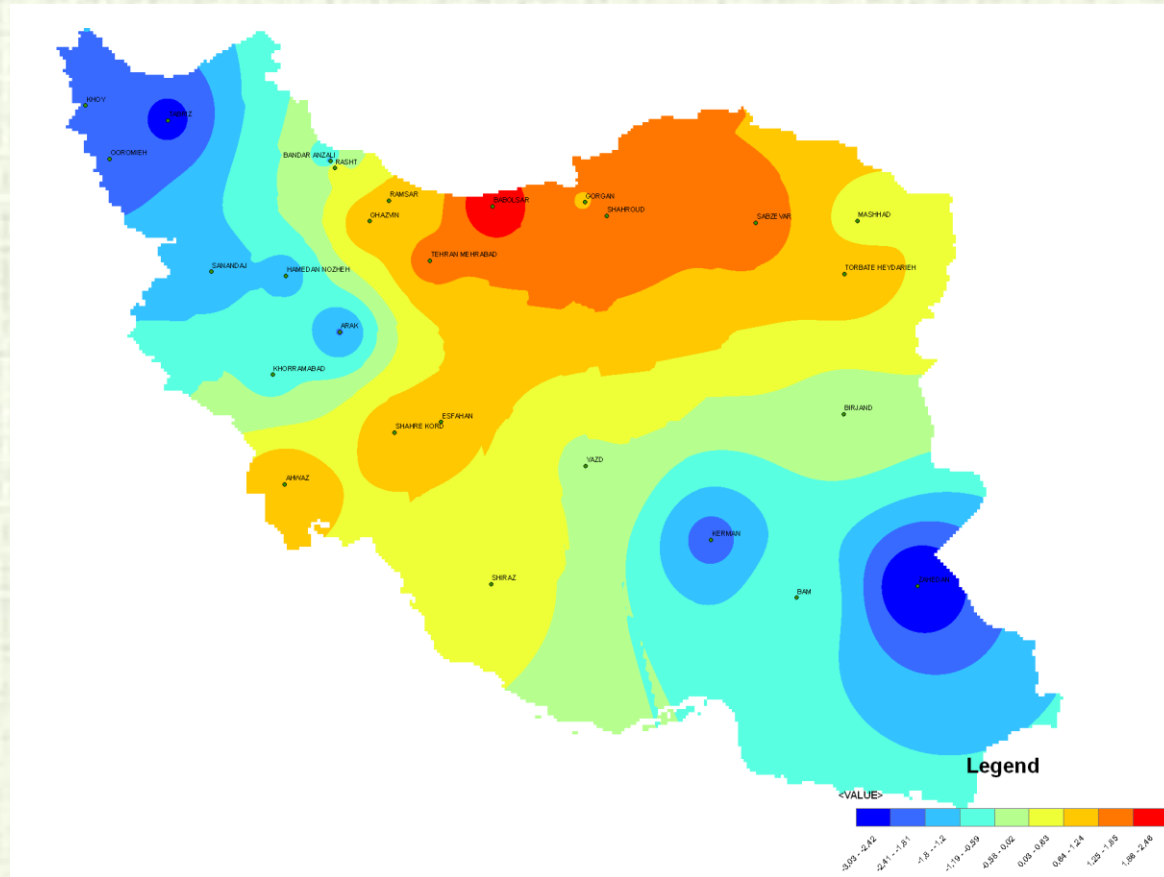
Spatial distribution of temperature trends



Temperature: Significant increase in temperature in the N, NE and SE, Significant decrease in temperature observed in the W and E astern regions, In the Central and NW northwestern there is an increase but not statistically significant.

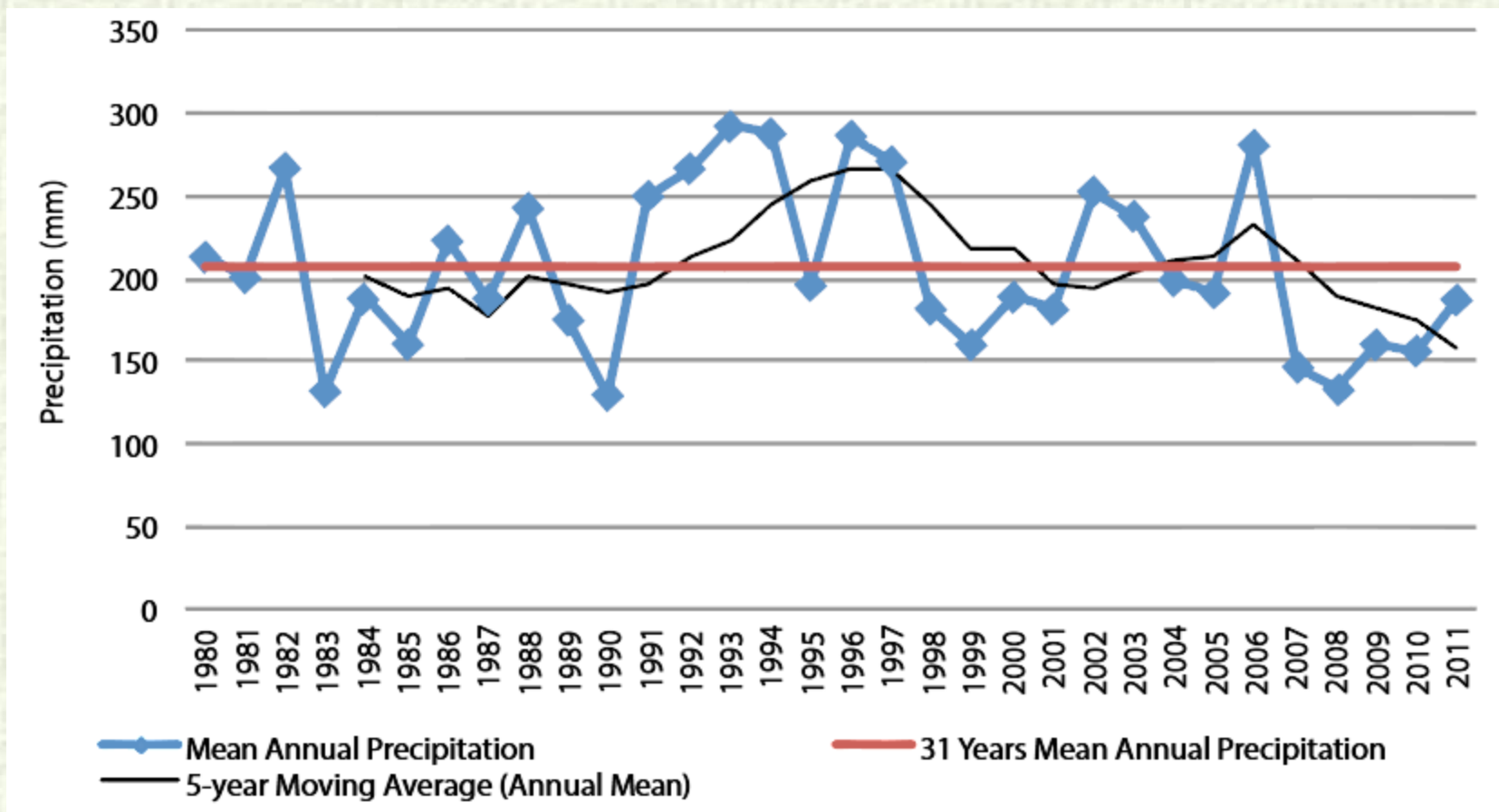


Spatial distribution of precipitation trends

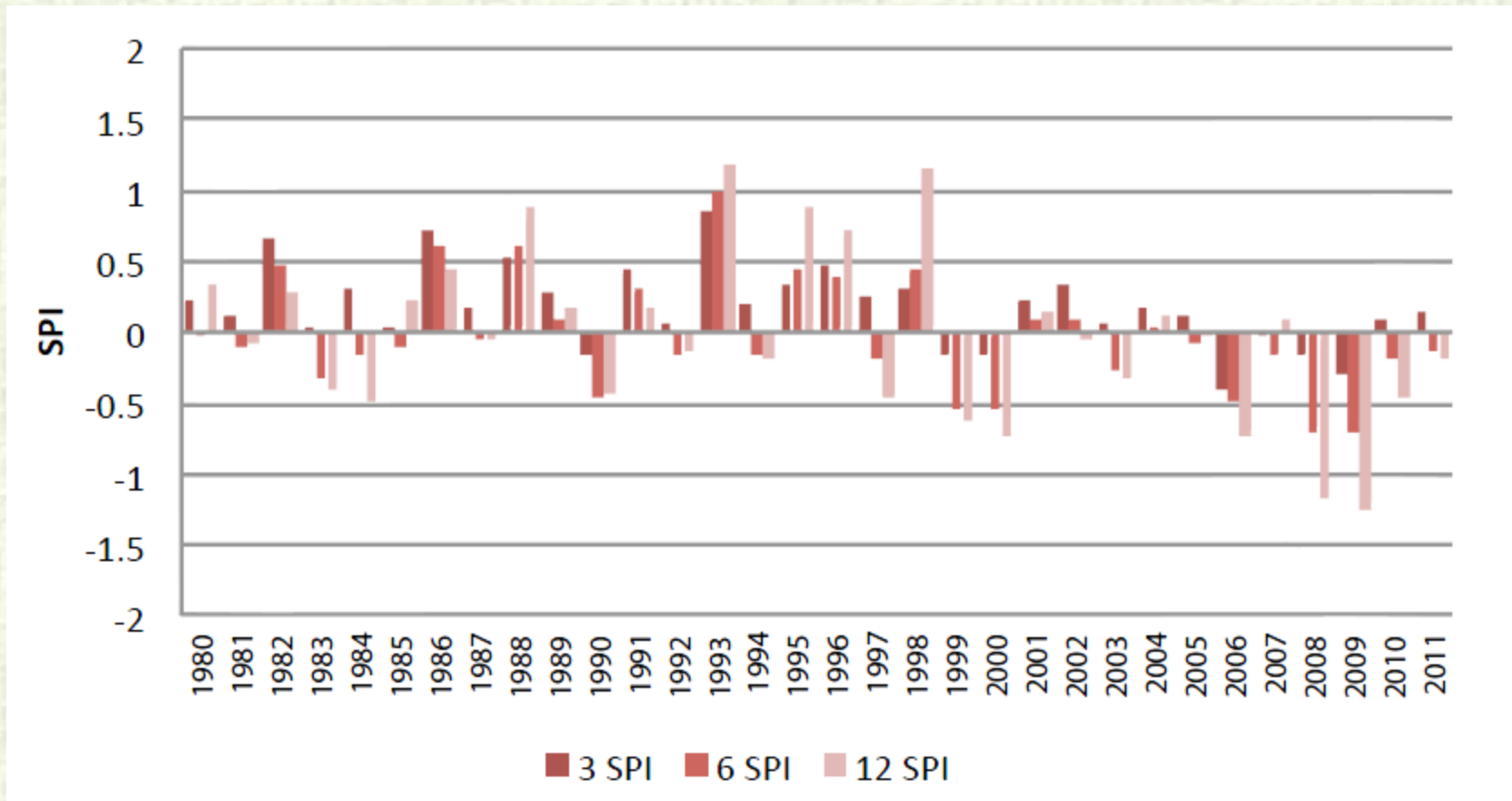


Precipitation: Spatial distribution of rainfall data shows a statistically significant decrease trend observed in SE and NW, Reduction is quite low in the E regions is not statistically significant. This is partially due to dry climate and low precipitation of those parts.

Precipitation five-year moving average in Iraq (1980-2011)

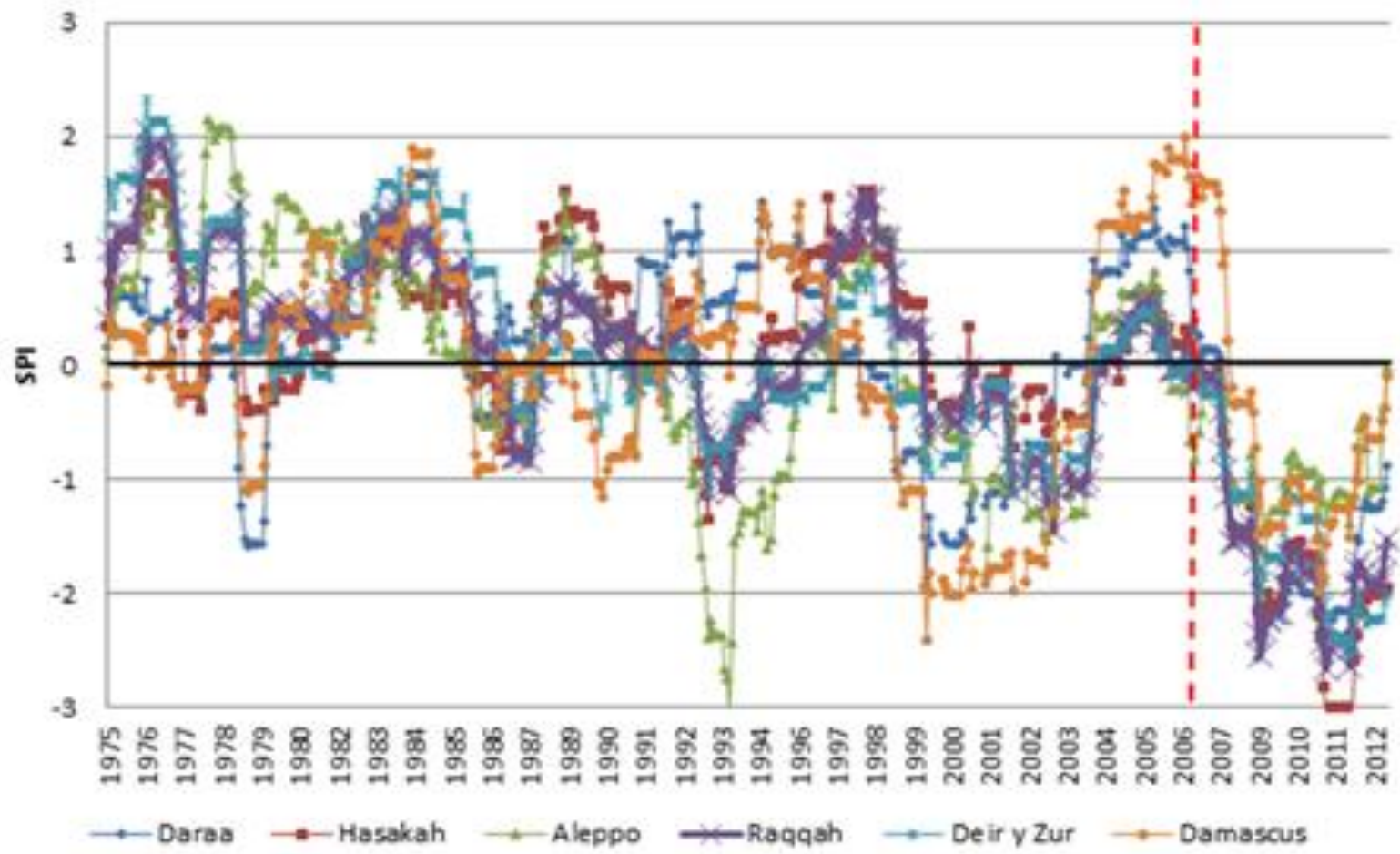


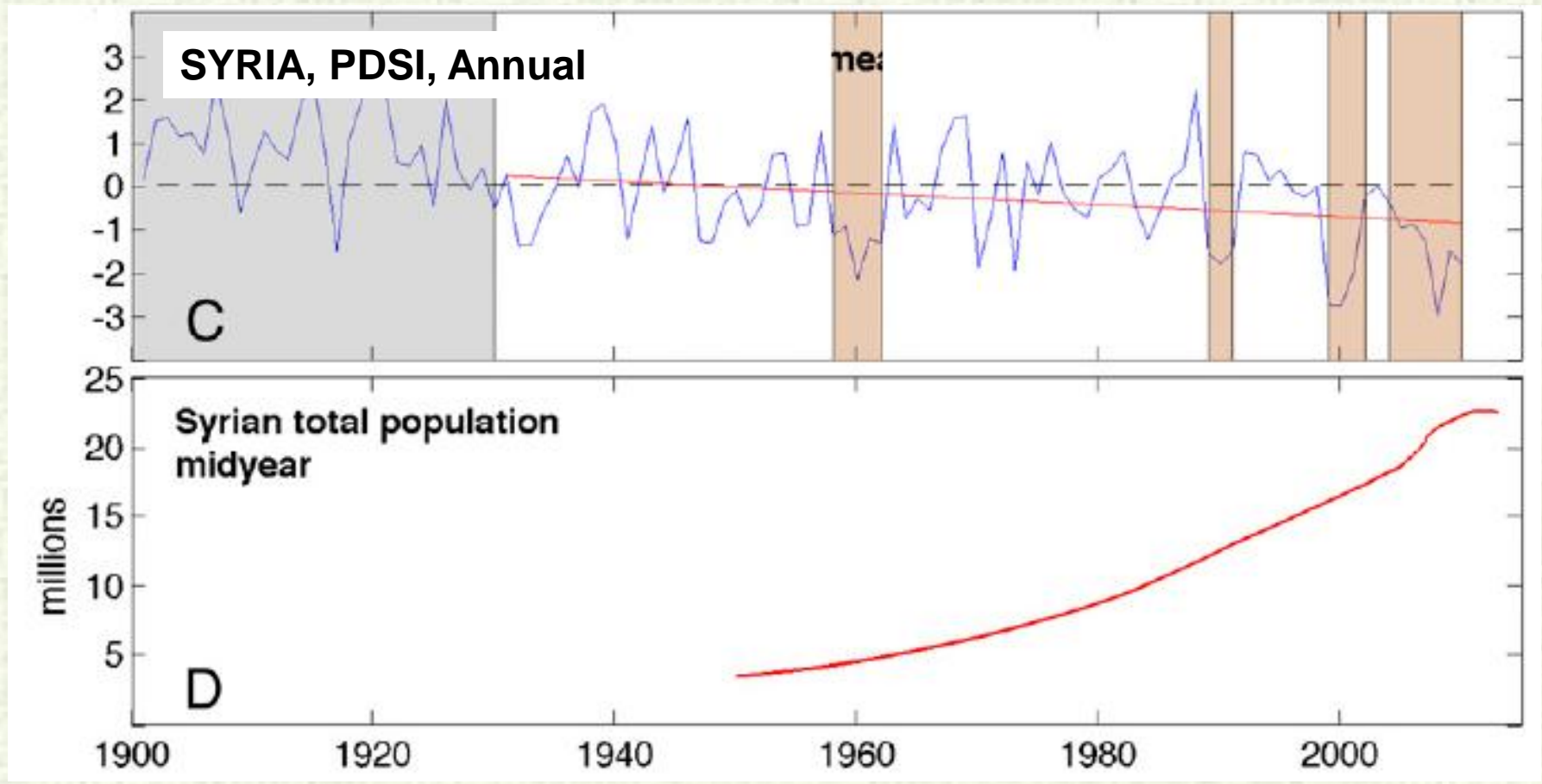
3 SPI, 6 SPI, and 12 SPI values for Iraq (1980-2011)





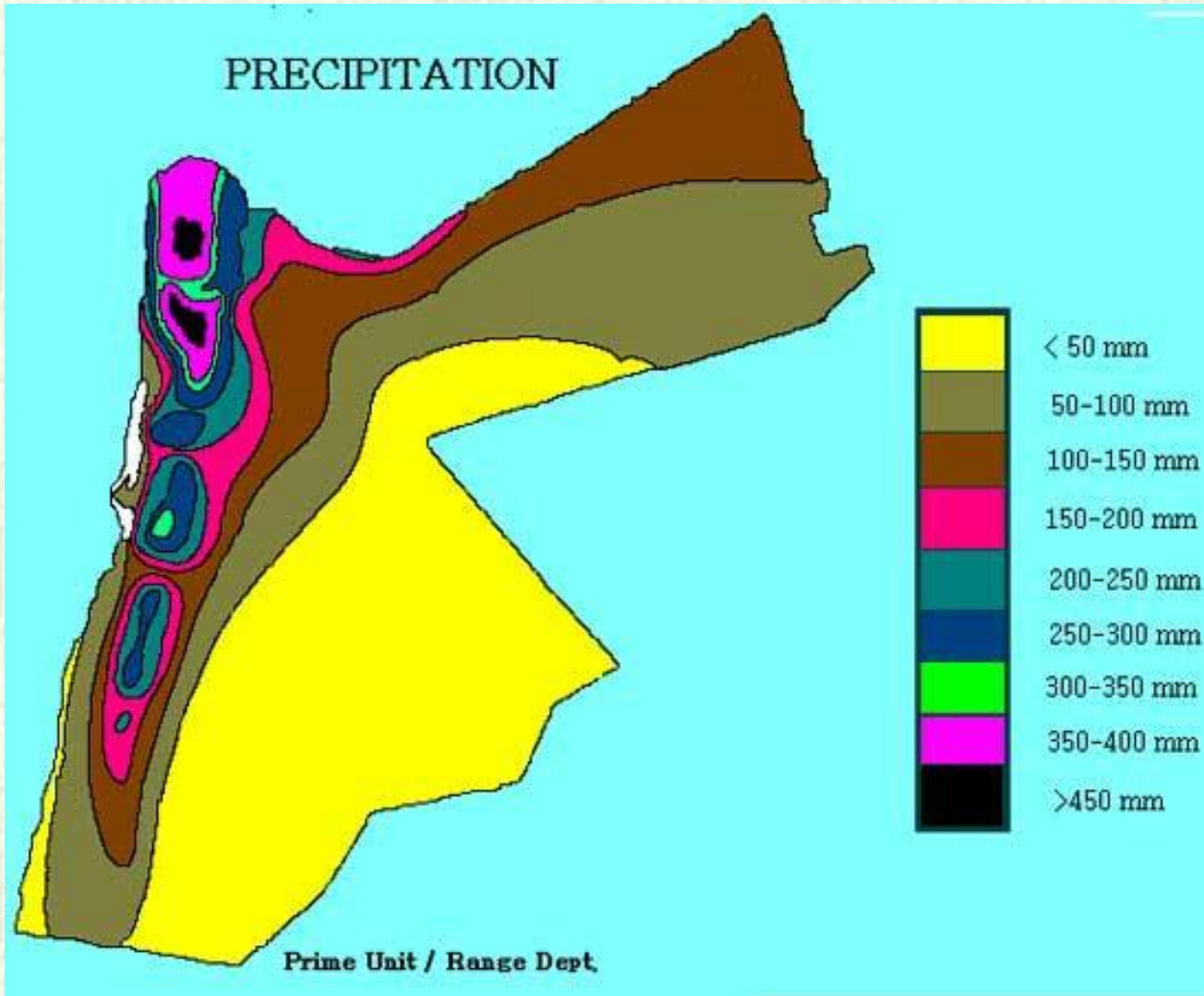
Drought, Five-year Scale, Syria

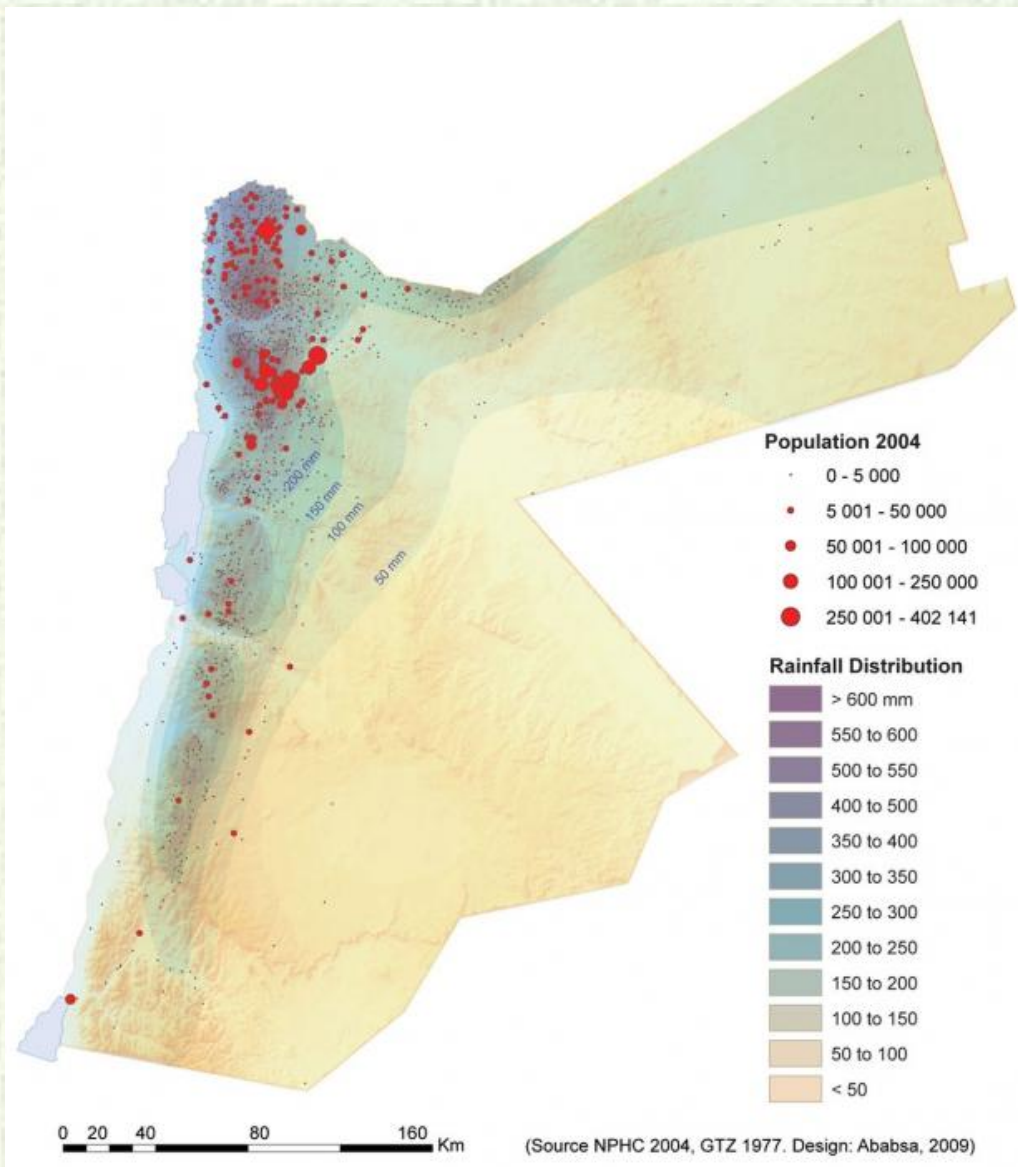




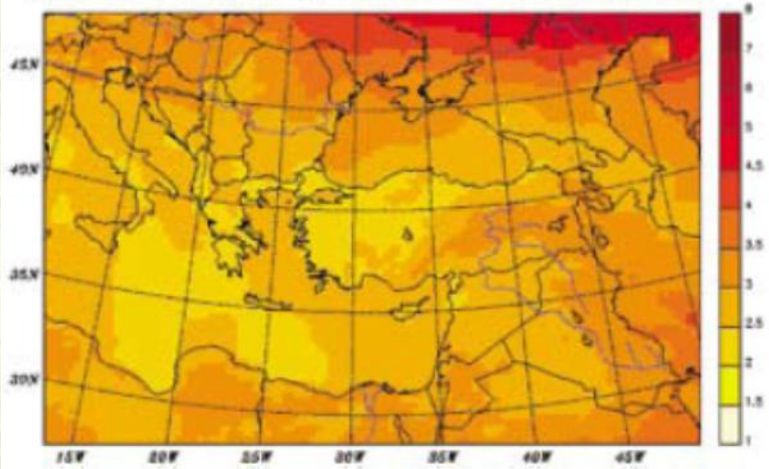


PRECIPITATION

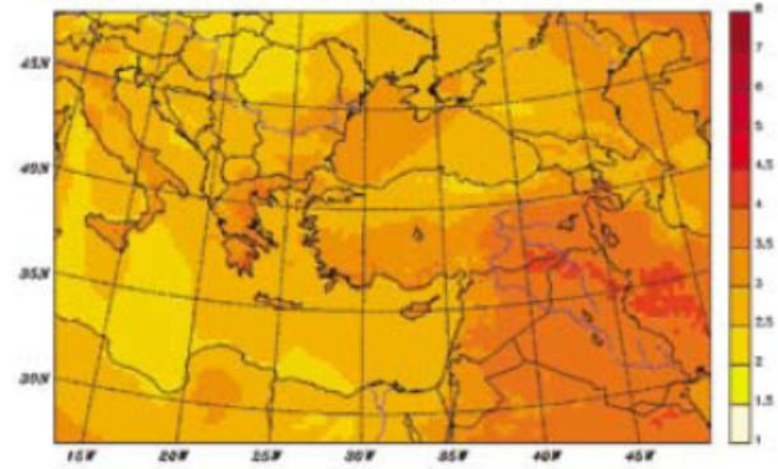




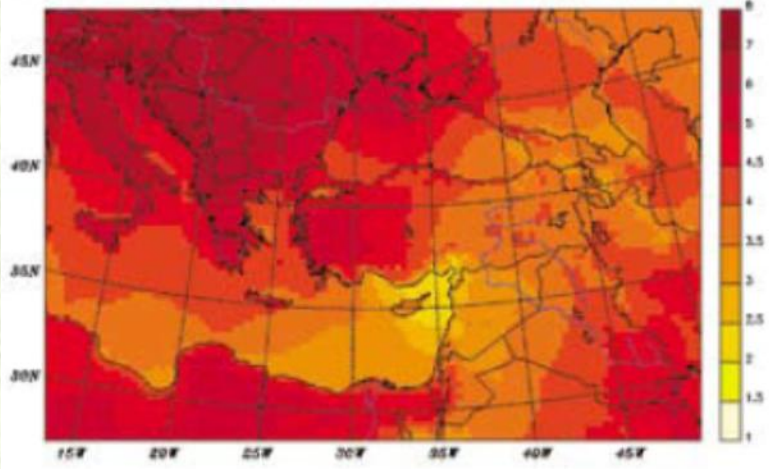
Winter Temperature Diff. (2071:2100–1961:1990; mm)



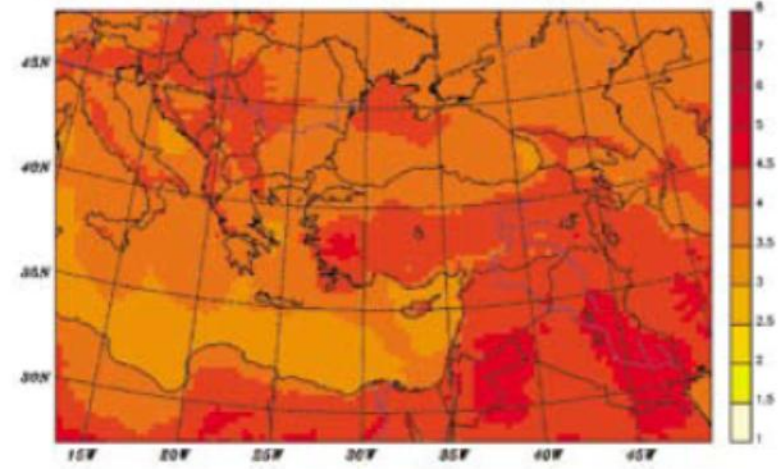
Spring Temperature Diff. (2071:2100–1961:1990; mm)



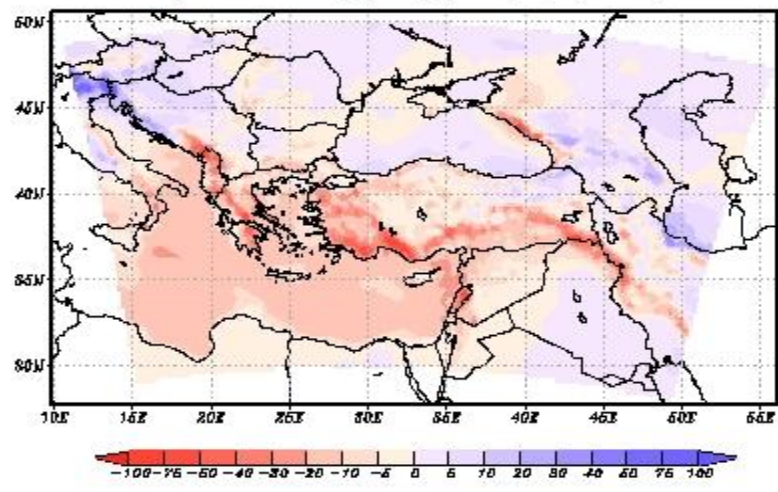
Summer Temperature Diff. (2071:2100–1961:1990; mm)



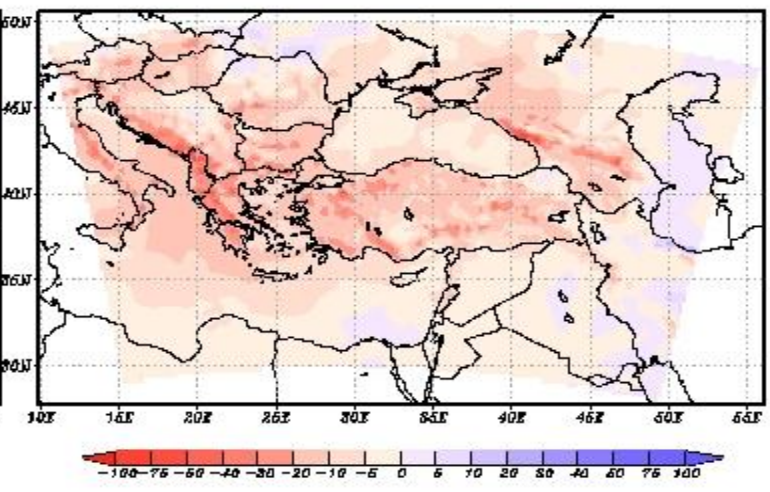
Autumn Temperature Diff. (2071:2100–1961:1990; mm)



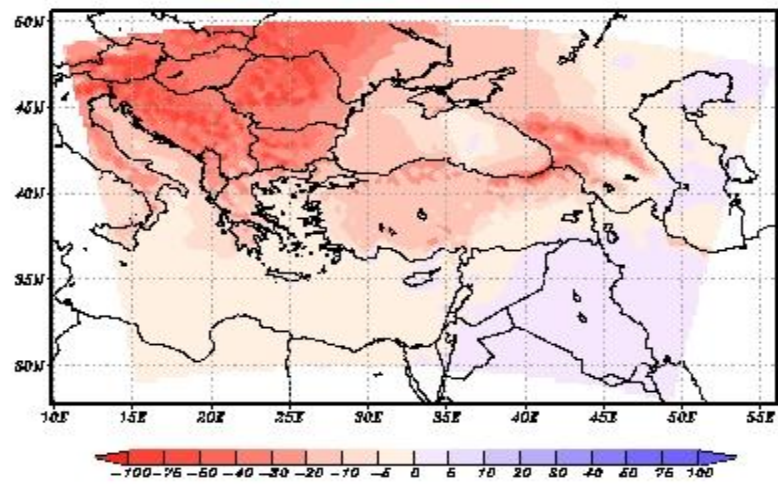
Kış Mevsimi Yağış Değişimi (%) (A2-RF)



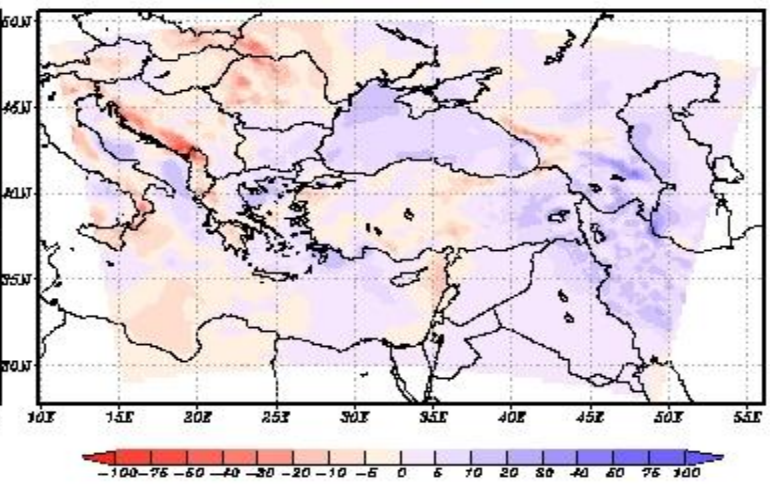
İlkbahar Mevsimi Yağış Değişimi (%) (A2-RF)



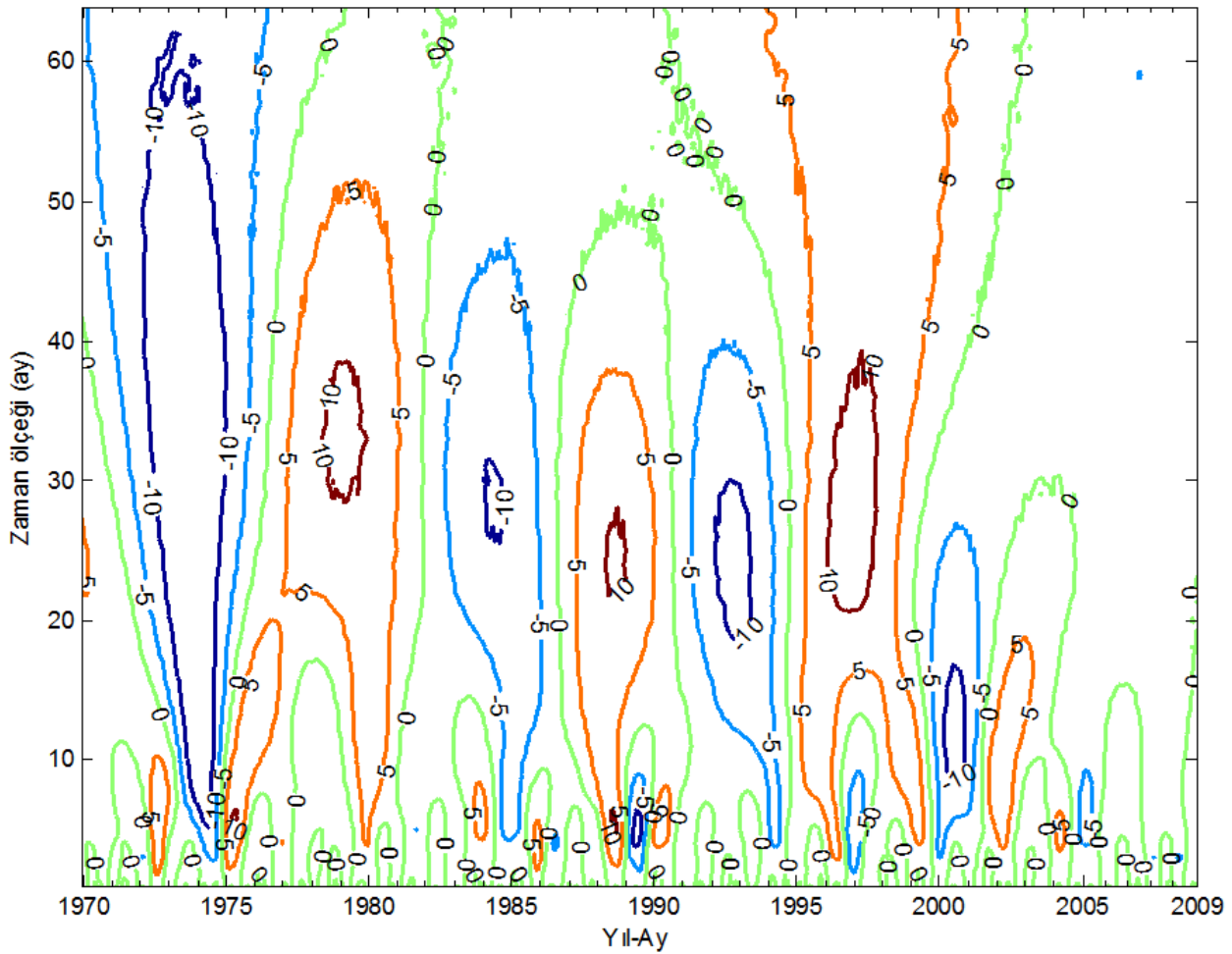
Yaz Mevsimi Yağış Değişimi (%) (A2-RF)



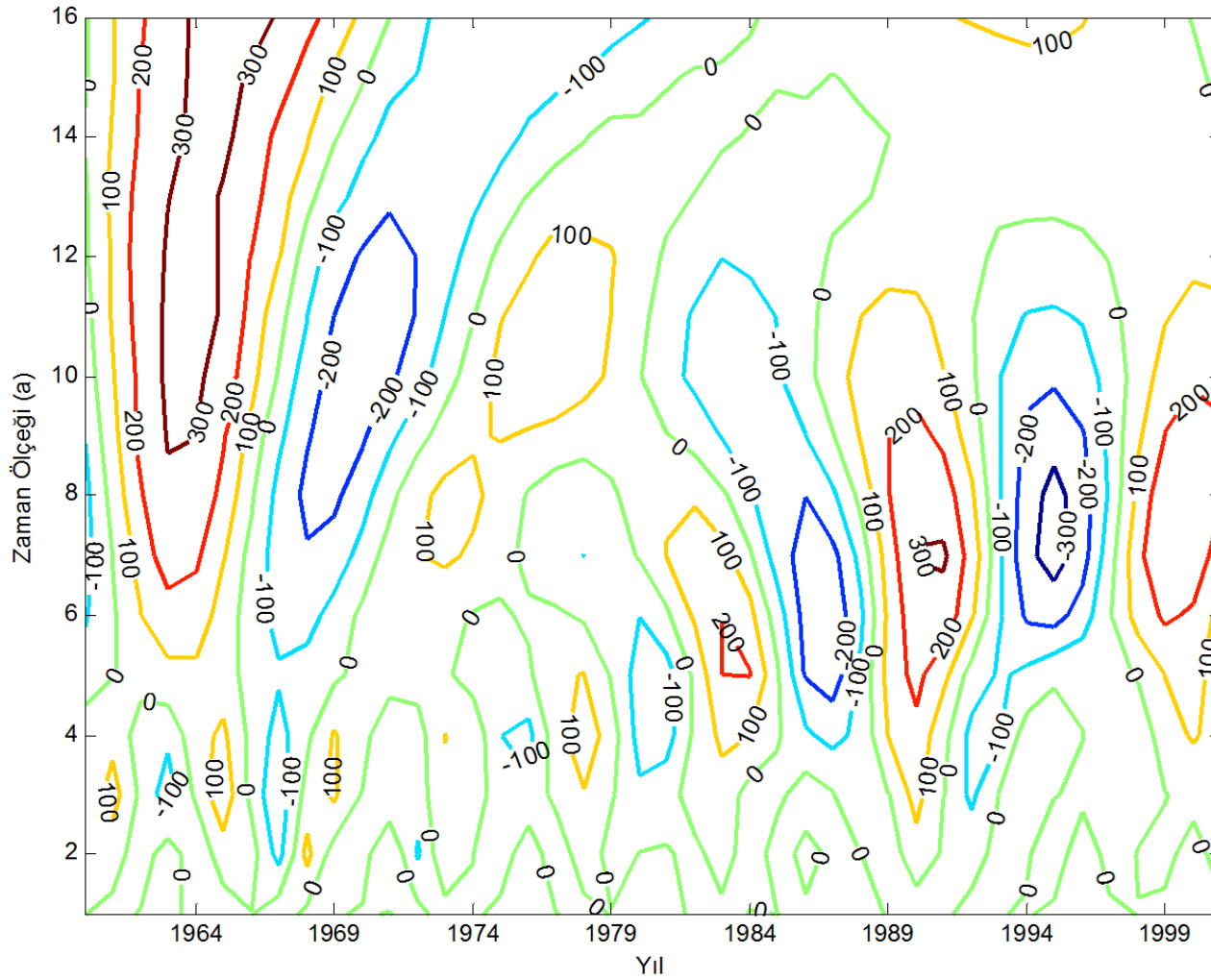
Sonbahar Mevsimi Yağış Değişimi (%) (A2-RF)



Beyşehir-PDSI (Mexican Hat)



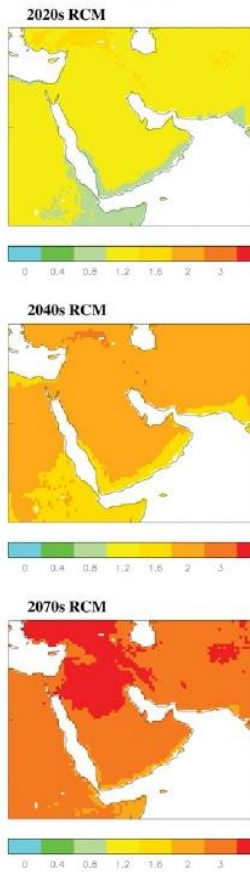
Urumiyeh Yıllık Toplam Yağış





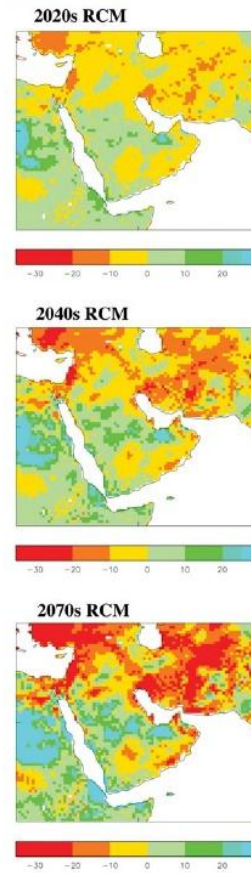
8 | Rising Temperatures, Rising Tensions

Map 2: Regional Climate Model projections of average temperature changes (°C) across the Gulf region for the 2020s, 2040s and 2070s, relative to the 1990s¹¹



Source: Hemming D, Bets R, & Ryall D. 2007.

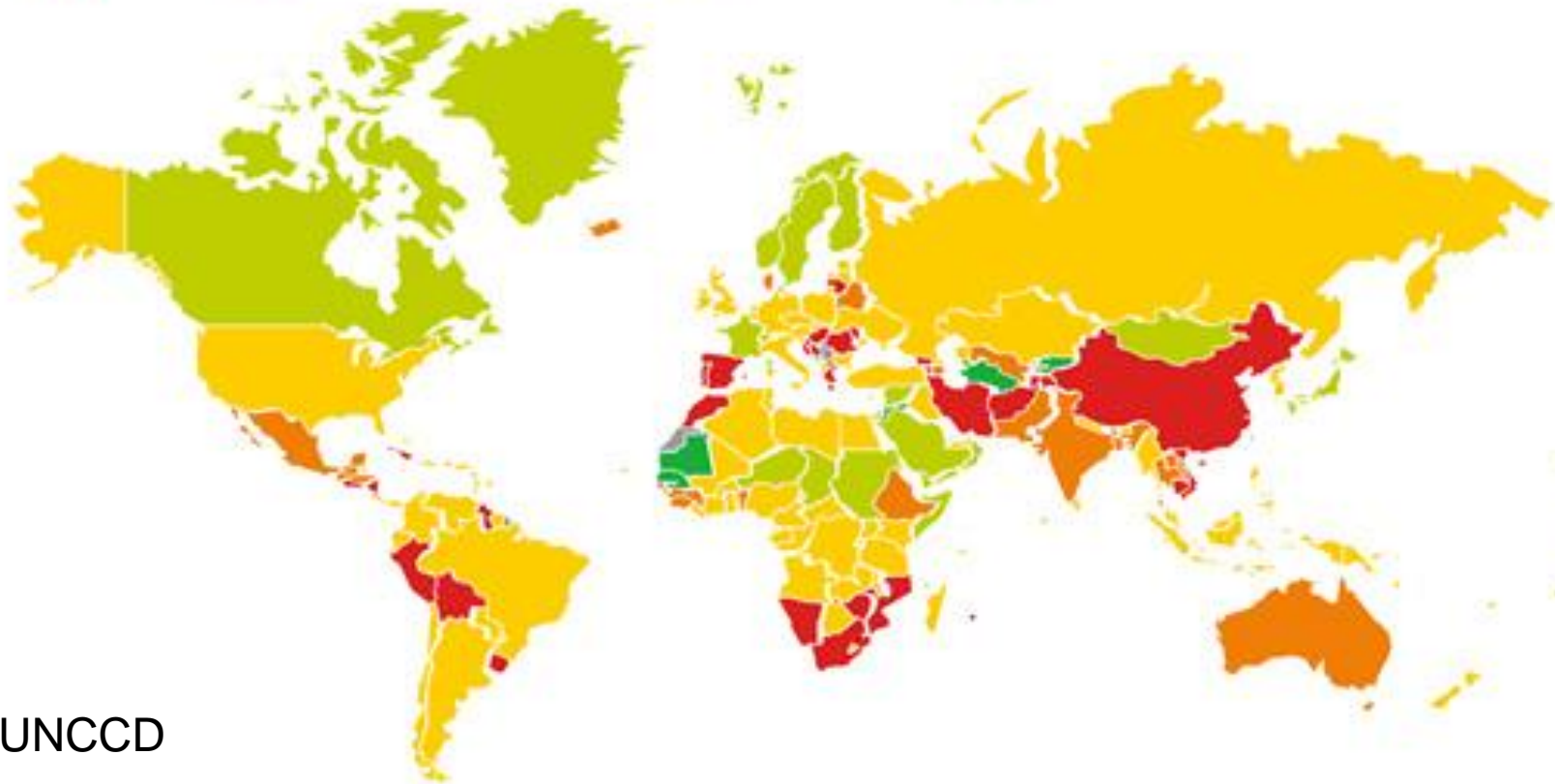
Map 3: Regional Climate Model projections of precipitation changes (%) across the Gulf region for 2020s, 2040s, and 2070s, relative to the 1990s



Source: Hemming D, Bets R, & Ryall D. 2007.

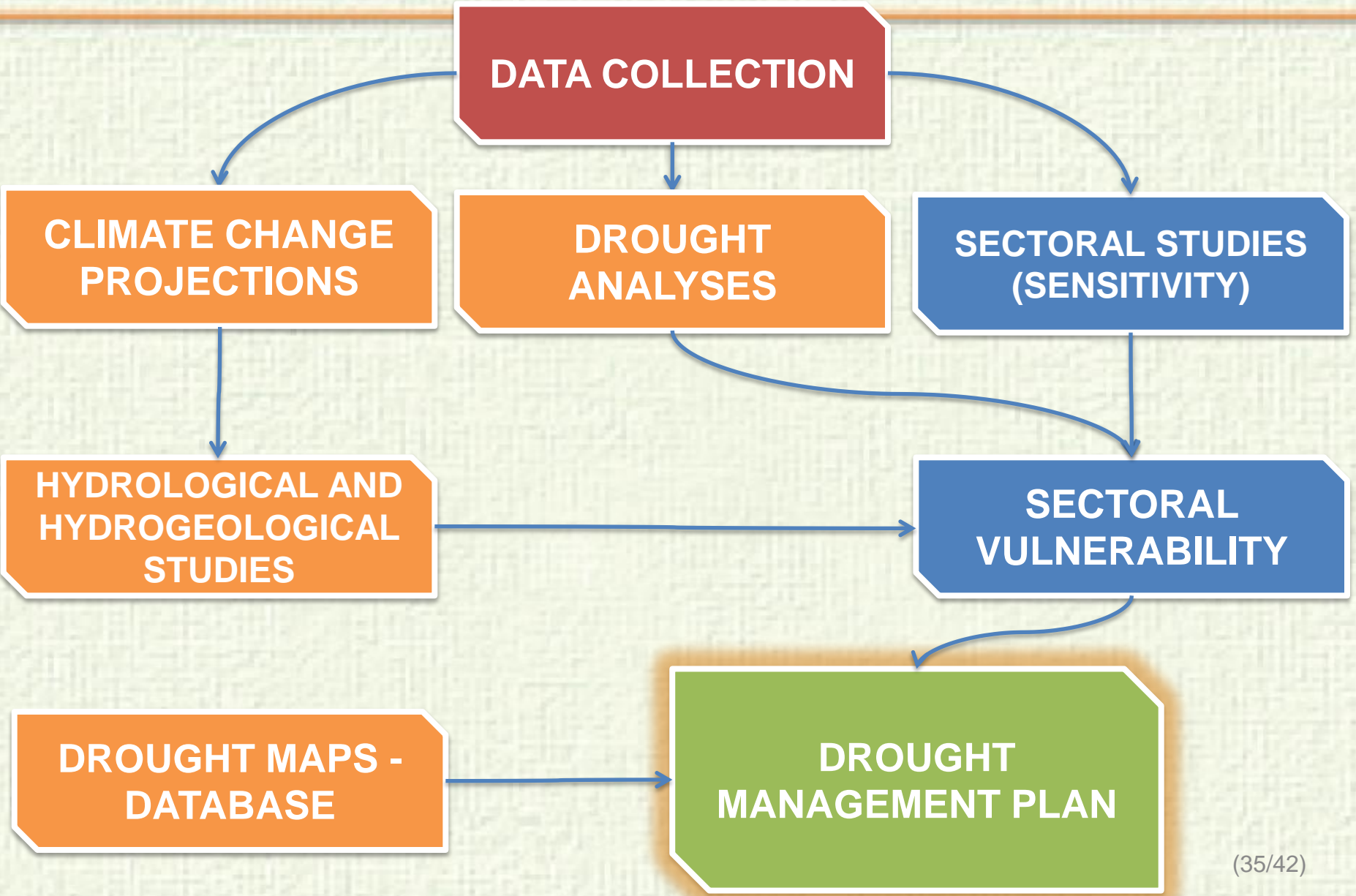
Drought conditions 2030

■ Acute ■ Severe ■ High ■ Moderate ■ Low ■ No data



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