

# Weekly cycles in meteorological variables over large-scales: fact or myth?

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MON TUE WED THU FRI SAT SUN

## Weekly cycles: A brief review

*“Except the lunar phases with a period of 7.38 days, negligible in terms of the day of the week for 44 years, there is no other known natural periodicity that can generate a weekly cycle. Thus, it is plausible to **relate the detected weekly periodicities with the human activity cycle** and consequently it is possible to argue that **the anthropogenic disturbances (such as pollutant emissions) may interact with local or larger scales affecting the atmospheric dynamics.**”*

*(Sanchez-Lorenzo et al., 2008)*

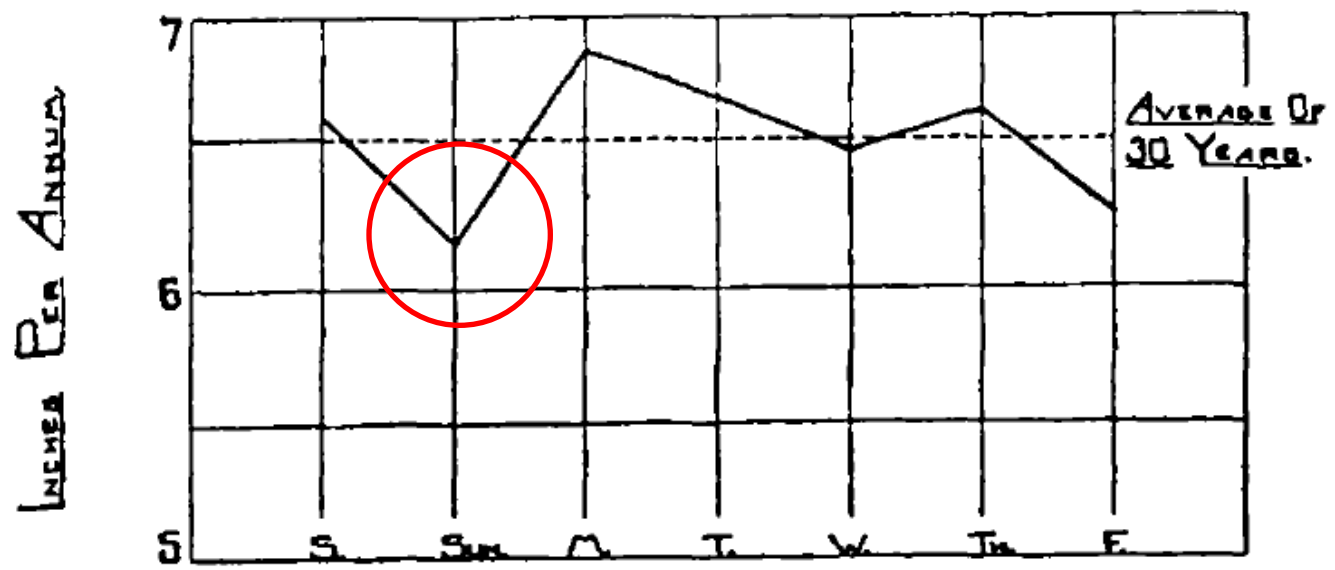
# Weekly cycles in meteorological variables over large-scales: fact or myth?

11<sup>th</sup> International Conference on Meteorology, Climatology and Atmospheric Physics - COMECAP 2012, Athens, 29 May – 1 June

## Day of the week variability: An old idea

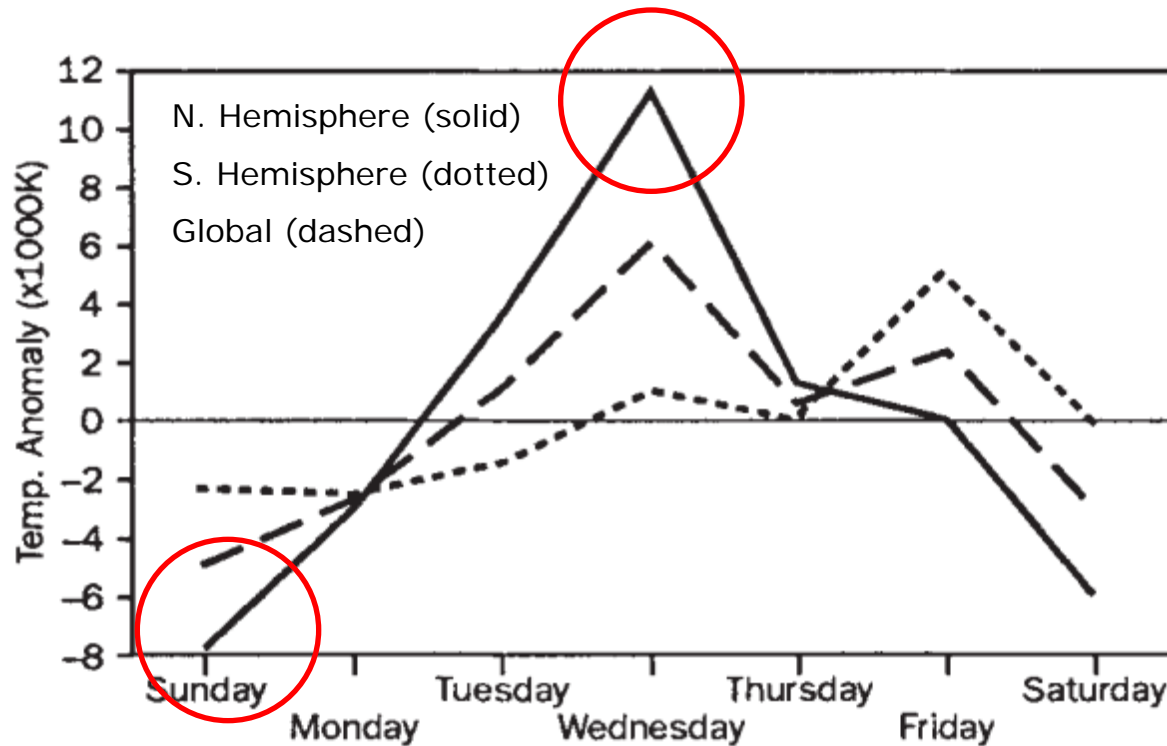
Ashworth (1929) first observed Sunday rainfall minima for a polluted city in England (Rochdale)

AVERAGE RAINFALL  
EACH DAY OF THE WEEK.  
(1898-1927)



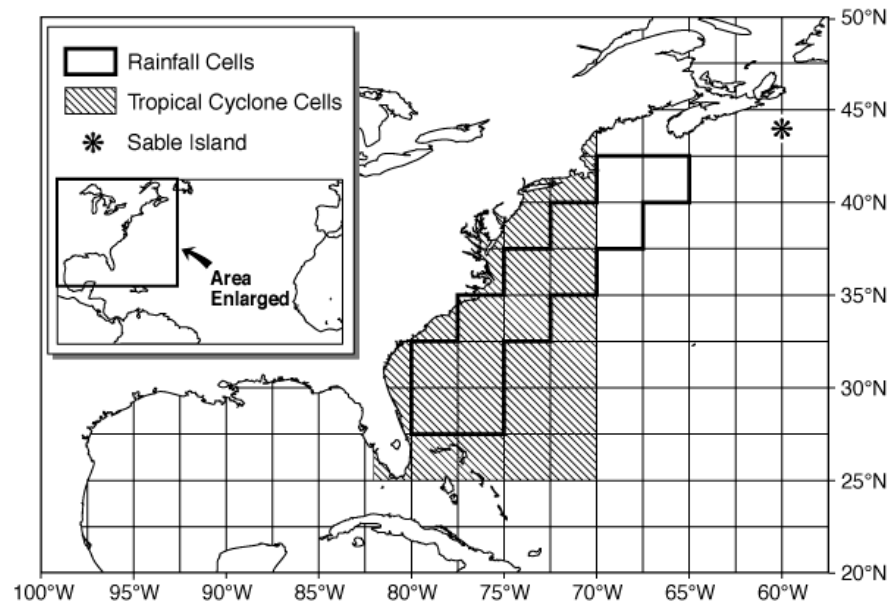
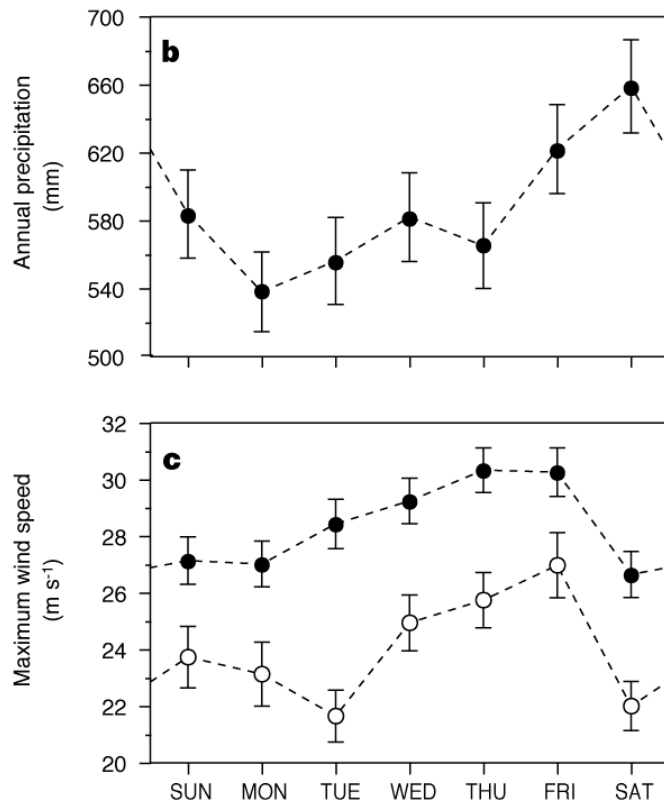
## Large-scale weekly cycles of meteorological variables

1. Gordon (1994) analyzed lower troposphere temperatures from NOAA satellites (differences between Wednesday and Sunday in the Northern Hemisphere



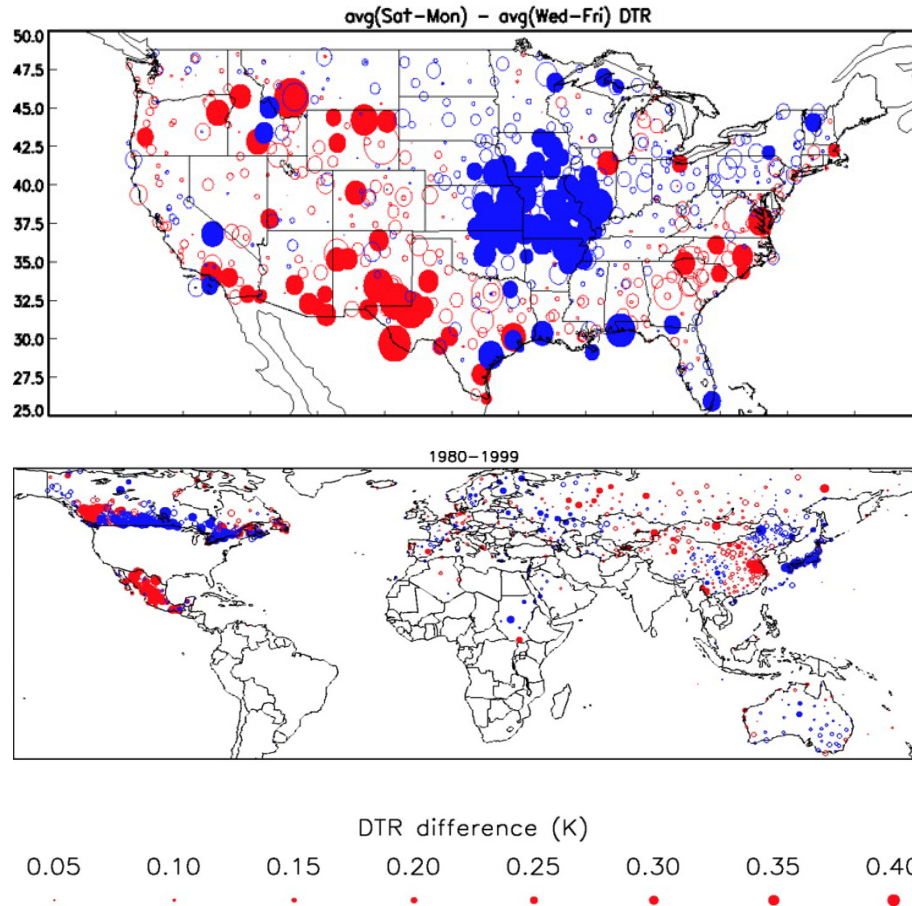
## Large-scale weekly cycles of meteorological variables

2. Cerverny and Balling (1998) used satellite-derived precipitation estimates from MSU aboard TIROS-N satellites over the East coast of the United States (midweek-weekend differences)



## Large-scale weekly cycles of meteorological variables

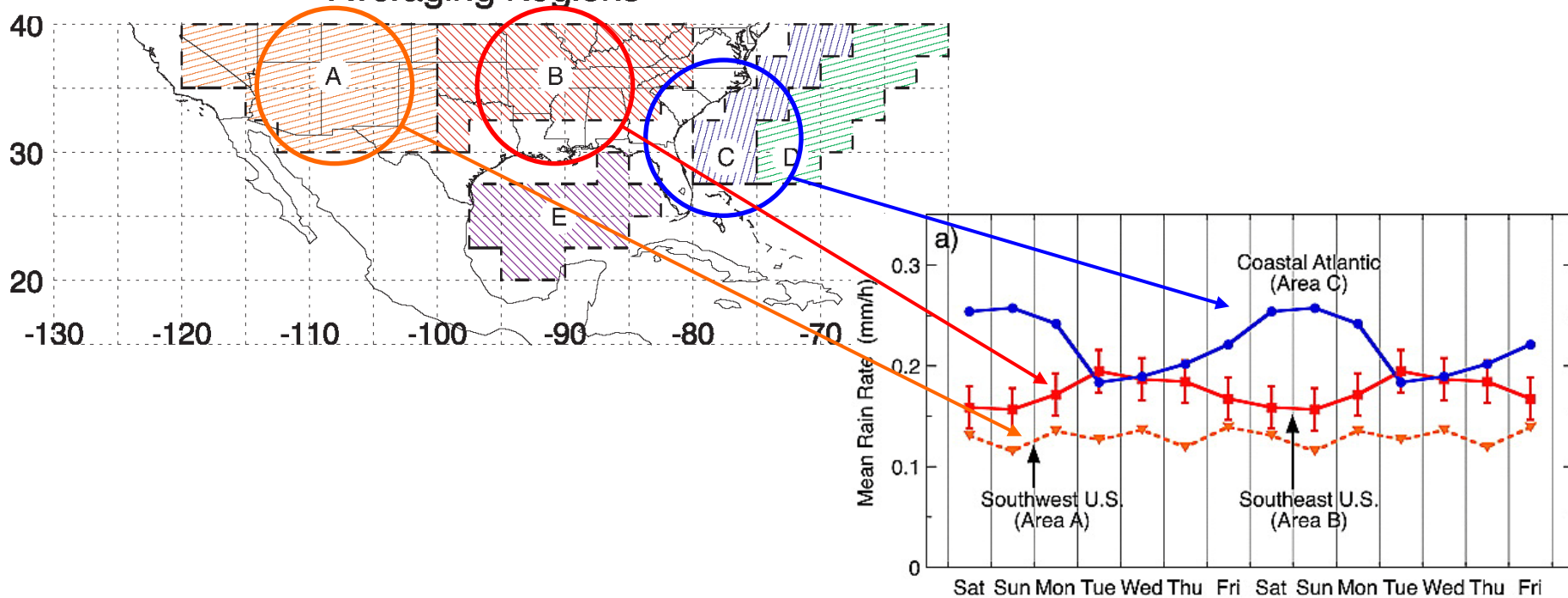
3. Forster and Solomon (2003) examined the “weekend effect” in diurnal temperature range (DTR) for many stations worldwide



## Large-scale weekly cycles of meteorological variables

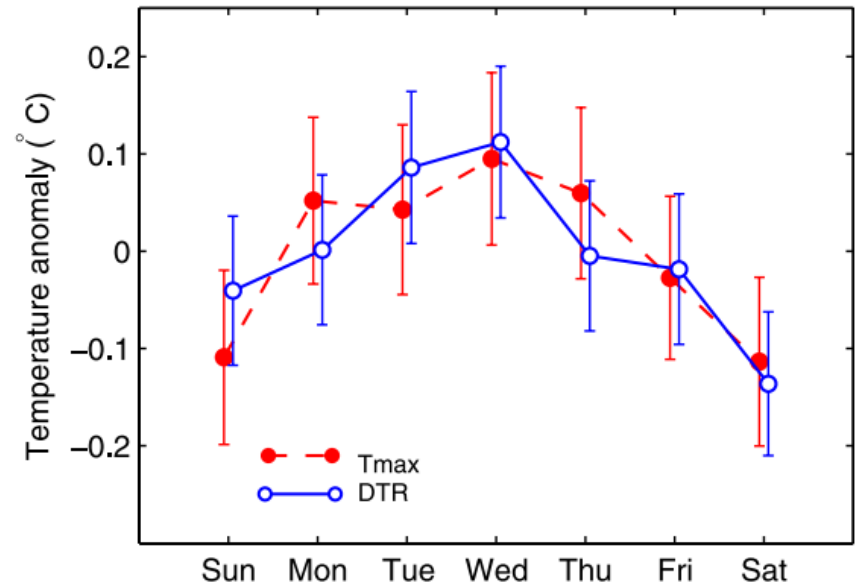
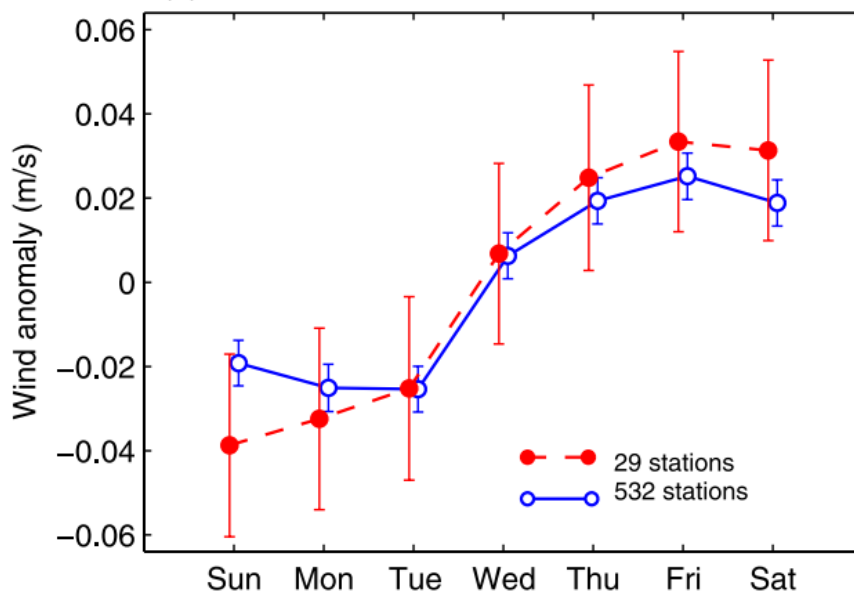
4. Bell et al. (2008) studied the weekly cycle of rainfall over southeast U.S. in summer. Rainfall over B (C) area is higher (lower) during the weekdays (weekends). Explained through a midweek suppression of afternoon storms over C due to convection invigoration over B

Averaging Regions



## Large-scale weekly cycles of meteorological variables

5. Among others, Gong et al. (2007) reported significant weekly cycles in different meteorological variables over China; e.g. wind speed at surface is lower (higher) in the early (latter) part of the week. Opposite cycle is observed in temperature





## Large-scale weekly cycles: uncertainties

- Few studies over Europe with controversies regarding the stat. significance of the results (e.g. Bäumer and Vogel, 2007; Hendricks Franssen, 2008; Laux and Kunstmann, 2008; Sanchez-Lorenzo et al., 2008, 2009; Hendricks Franssen et al., 2009; Quass et al., 2009)
- The existence of a significant precipitation weekly cycle in the U.S. has also been challenged (DeLisi et al., 2001; Schultz et al., 2007 and references therein)
- **Overall**, there are some general shortcomings in the methods used to assess the significance of the weekly cycles; e.g. to neglect the spatial autocorrelation of the data, the assumption of normality in the time series

***For more details see: Sanchez-Lorenzo, A., Laux, P., Hendricks-Franssen, H.-J., Calbó, J., Vogl, S., Georgoulias, A. K., and Quaas, J.: Assessing large-scale weekly cycles in meteorological variables: a review, Atmos. Chem. Phys. Discuss., 12, 1451-1491, doi:10.5194/acpd-12-1451-2012, 2012.***