Identification the Effect of Winter Temperature Changes on Cyclone Frequency and Intense in Mediterranean

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Extended Abstract

Introduction

Today, extra tropical cyclones are recognized not only for the important influence they exert on midlatitude weather conditions but also for their integral role in the earth's climate system. (Gary luckmann, 2012). Extra tropical cyclones are fundamental meteorological features and play a key role in a broad range of weather phenomena. They are a central component maintaining the global atmospheric energy, moisture, and momentum budgets. They are on the one hand responsible for an important part of our water supply, and on the other are intimately linked with many natural hazards affecting the middle and high latitudes (wind damage, precipitation-related flooding, storm surges, and marine storminess). Thus, it is important to provide for society an accurate diagnosis of cyclone activity, which includes a baseline climatology of extra tropical storms (e.g., Hoskins and Hodges 2002).

Simulations made using general circulation mod (GCM) suggest that enhanced greenhouse warming will result in a general cooling of the stratosphere and a warming of the lower troposphere. The tropospheric warming is expected to be greater in Polar Regions than in the tropics, greater over continents than oceans, and greater in winter than in summer. This differential warming results in a reduction of the pole to equator thickness gradient in the lower troposphere. Diagnostic studies, e.g., those based on the Sutcliffe–Petterssen development equation (Sutcliffe and Forsdyke 1950; Petterssen 1956) show the relevance of the thickness field on the development of cyclones. The reduced thicknesses expected with warming should lead to fewer extra-tropical cyclones, especially in winter. However, since there is also an expected increase in surface and near surface temperatures this could lead to increased evaporation and elevated levels of atmospheric humidity. This favours increased precipitation in cyclones and the increased release of latent heat would result in increased development of cyclones. Clearly, these two processes tend to oppose each other and it is not clear how the two processes might contribute to changes in the cyclone climatology in a warmer world.

Data and Methodology

For numerical cyclone detection used the ERA-Enterim database, this is last reanalysis of global atmosphere by ECMWF by Dee and etal, 2011 which available in six hours interval and with resolution 0.5*0.5 longitude and latitude in duration of 1980 to 2013. The cyclone positions are defined by local minima of the mean sea level pressure considering the

neighborhood of eight grid points. Additionally, in order to locate intense vortices, the mean vorticity of a minimum point in 300 km radios required. (Blender and Etal, 1999) The threshold of mean vorticity is $1*10^{-5}\ s^{-1}$because in this region there are shallow and thermal low and this is the best threshold for exclude of those. For identify the effect of global warming on cyclone variability we analyzed the temperature trend of 1000Hpa level temperature in winter month. In this paper for identify of cyclone intense we calculated 5 level vorticity intense that shows in tab 1, and then observed the cyclone frequency and temporal spatial variability in this level.

Tab 1. The vorticity intense level

Vorticity intense	Value
Level 1	$\mathbf{1 * 10^{-5} s^{-1}}$
Level 2	$\mathbf{3 * 10^{-5} s^{-1}}$
Level 3	$\mathbf{5 * 10^{-5} s^{-1}}$
Level 4	$\mathbf{7 * 10^{-5} s^{-1}}$
Level 5	$\mathbf{10 * 10^{-5} s^{-1}}$

Temporal and Spatial Distribution of Cyclones

The distribution of cyclones are in tow 17 years duration and the spatial distribution of those in this research are a same previous research (Alpert and etal 1990, Campein and etal 2011, Flocas, 2010). In this research the results show that the frequency of cyclones in Mediterranean decrease from west to east and the most concentration of those located in Genève golf and west of Italia. The cyclone center of Mediterranean don't reach in any vorticity intense to Iran area. The Mediterranean cyclone moved to east based on the movement of westerly wind but the Zagros Mountain in the west of Iran serve as obstacle to reach this cyclone center into central of Iran. The cyclone with vorticity greater than 1 are the most cyclone that created in central of Iran. As well as greater in vorticity intense the cyclone frequency on the Iran area were decreased and in vorticity greater than 7, almost there aren't any cyclone center located in Iran. One of the most high frequency cyclone center located in Lot plain in January month. The maximum frequency of cyclone occurred in January and the number of those decreased in February and March.

Temporal trend of cyclone in Mediterranean

The temperature variability in winter month in 1000 hPa level showed that mean temperature have ascend trend and the maximum of trend occurred in march. Whereas the trend of cyclogenesis only increased in January but in the February and march the frequency of cyclone have decreased the result of this research show that as well as the temperature increased the center of cyclone have decreased. The strongest cyclone with vorticity greater than 10 in this region had decreased and in any month in winter the frequency of those don't increased.

Conclusion

The result in this paper show that in any level of vorticity the center of cyclone don't across from Zagros Mountain. The cyclone center in Lot plain is center that occurred in many frequency. Also the trend of temperature in winter month have increased, that in January gradual increased to march. The frequency of cyclone had inversely correlation with temperature so that when temperature increased the cyclone frequency decreased. In the winter the temperature variability mostly occurred in March and center cyclone of those reduction. As the temperature increased in winter the reduced the gradient of pressure and

this situation cased that the speed of westerly wind slowly diminished because this wind transferred the cyclone center to Middle East.
Keyword: Algorithm Cyclongenesis, Mediterranean Sea, Vorticity