



The Role of the Mediterranean Cyclones on Dust Storms in Southwest of Iran

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During the last decades, the number of dust storms has increased considerably and dust hazard is one of the most important environmental crisis in Iran. In this research statistical and synoptic analysis and path simulations are applied. Separation of local and non-local dusts showed that 75% of dust storms are non-local. Also local dust storms didn't have a significant trend while the frequency of non-local dusts increased.

For the synoptic analysis, non-local dust storms were focused in the area comprised between 10-60 N and 10-60 E, during the warm-dry season between March to October. Dust storms which reduced the visibility to less than 1 km, from 1991 to 2016 are analyzed. After cluster analysis, 3 major pressure patterns were identified that bring dust to the studied region. Composite maps of wind velocity, vorticity advection and pressure amounts of 500 and 850 hpa were produced for representative dusty days. The reason for choosing 850 hpa is the special topography of the region because of the Zagros Mountains and average altitude of the studied region.

In the first pressure pattern, which considerably reduced the visibility, a deep trough is formed on the Mediterranean Sea and by eastward movements is located in west of Iraq and westerly winds raise dust particles from Iraqi deserts and spread them in the atmosphere and bring them to Iran. In central areas of Iran there are low pressure cells which act like a dust catcher by cyclonic movements. In the second pressure pattern, a low altitude cell is formed on the Mediterranean Sea and it is stretched to the north of Iraq and northwest of Iran. Existence of low pressure cells near ground level and a trough in mid atmosphere level, leads to the formation of thermal low pressure system in a wide area which intensify the atmospheric instability. Regarding the dry season of the year, the weather instability caused severe dust storms in the region. In the third pressure pattern, a high altitude center is formed on the Caspian Sea and there are anti-cyclonic winds currents. Also a low pressure cell on Pakistan and its stretch is located in south east and south of Iran. So the location of a trough on the Mediterranean Sea leads to the positive vorticity advection and movement of dust particles from west to east, from north of Syria and Iraq to southwest of Iran.

According to the results of the HYSPLIT model for transport and dispersion in the atmosphere, deserts of Iraq and Syria are the major sources of dust particles which enter the studied region that come from northwest, west and southwest directions. In northwest direction, visibility reduced more than other directions. Also in the simulated cases, the altitude of entrance of dust particles is about 1000 meters which means local solutions such as green belt of trees in Iran borders are not efficient and international cooperation is needed to avoid the rise of dust particles in the source areas.