

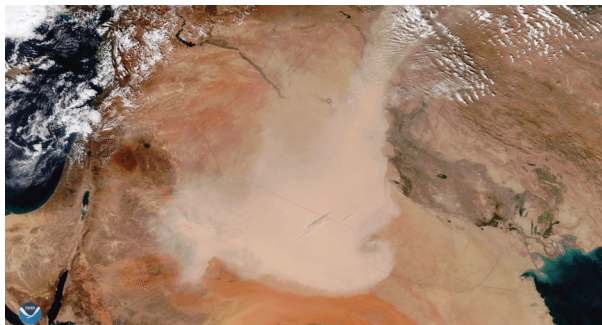
Sand and Dust Storms: Acute Exposure and Threats to Respiratory Health

Sand and dust storms are lower atmosphere events that occur when strong winds pass over dry loose sand or soil. Sand and dust storms, also known as a haboob (Arabic for strong wind) are caused by airborne organic and inorganic debris, ranging from large sand particles to small dust particles, lifted from the surface of the land. This phenomenon excludes other sources of dust such as indoor environmental dust, cosmic dust, volcanic dust and smoke particles. Sand and dust storms can cause respiratory problems for people who are exposed, particularly those who have lung disease. As an example, in early July 2018, Arizona experienced strong winds resulting in the first big dust storm of the 2018 monsoon season.



Dust storm. Image from NOAA

Winds caused blowing sand and dust to fill the air, severely limiting visibility and bringing traffic to a halt. Sand and dust storms are associated with increases in emergency department visits, hospital admissions, as well as increases in asthma and respiratory disease exacerbations (flare-ups). Semi-arid and arid areas with limited vegetation are most susceptible to sand and dust storms. This fact sheet describes the possible health effects following exposure to sand and dust storms.



Large dust storm over the Persian Gulf on May 13, 2018. Image from NOAA National Environmental Satellite, Data, and Information Service (NESDIS)

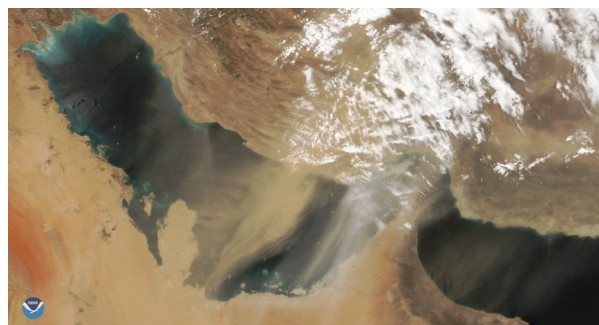
What is a dust storm and what are the symptoms following exposure?

Dust storms can occur when strong winds fill the air with small dust particles (less than 60 microns) clouding the air over a large area. Dust from storms can be carried by winds hundreds to thousands of miles and can reach elevations of 10,000 feet. Depending on weather conditions and particle size, dust can stay in the atmosphere for a few hours up to ten days. Coarse particles ranging in size from 2.5 to 10 microns can be breathed deep into the lungs. Smaller particles that are less than or equal to 2.5 microns in diameter may even be able to enter the bloodstream. Outdoor

environmental dust has been linked to numerous health problems. Fine dust particles can also carry a range of other harmful things including bacteria, virus, fungi, pollutants and allergens.

Dust storm exposure may cause or worsen:

- Coughing and wheezing
- Lower respiratory tract infections (viral, bacterial and fungal including coccidioidomycosis)
- Obstructive airway diseases (asthma, bronchitis, COPD)
- Lung fibrosis (sand and dust storm-associated silicosis)
- Interstitial lung disease
- Cardiovascular diseases



A massive sandstorm over Saudi Arabia and Iraq on October 29, 2017. Image from NOAA National Environmental Satellite, Data, and Information Service (NESDIS)

What is a sandstorm and what are the symptoms following exposure?

A sandstorm is created when strong wind lifts sand particles (60 microns or greater) from the ground into the air. Sandstorms are generally up to 10 feet above the ground, but may exceed 50 feet above the ground. Due to the heavy weight of sand particles, sand will not reach as high in the atmosphere and will fall out of the air faster than dust particles. Sand particles may be inhaled, but are generally

trapped in the upper airway and are often too large to be deposited deep in the lungs. As a result, upper airway and mucus membrane irritation is the most common health effect. However, sandstorms often have small particle components of dust storms as well.

Sandstorms with large particle exposure may cause or worsen:

- Irritation of the eyes, nose and throat
- Coughing and wheezing
- Pre-existing health conditions (asthma, bronchitis, COPD)

How do sand and dust storms affect me?

Children, older adults, and those with chronic lung disease are at higher risk of developing symptoms. If you have respiratory symptoms after exposure, you should contact your healthcare provider. Symptoms may be treated with medications used to reduce irritation of the nose, throat, and airways. Cough or wheezing may be treated with a medicine that can relax airway muscles called a bronchodilator.

How can I protect myself from a wind or sandstorm?

To limit exposure, it is suggested that you:

- stop doing strenuous physical activities,
- remain indoors as much as possible
- keep doors and windows closed,
- use air conditioning, and consider using an air purifier that has a HEPA (PM 2.5) filter.

If you have to go outside, you can consider using a disposable respirator mask. A respirator is effective only if it meets two criteria:

1) it is designed to capture very small particles, and 2) the mask is worn correctly and seals effectively against your face. A fit test is recommended to confirm you have the right size and seal. The National Institute for Occupational Safety and Health (NIOSH) certified N95 masks, meet these criteria. The N95 respirator filters at least 95% of airborne particles at the most penetrating particle size of 0.3 microns. Simple cloth barriers, such as bandanas, do not filter out small airborne particles and the performance of retail masks that have not been certified may be uncertain. Also see ATS Patient Information fact sheet on Disposable Respirators at www.thoracic.org/patients/.

Human impact and global climate change has resulted in increased frequency of sand and dust storms. Risk for sand and dust storms is highest in semi-arid and arid locations with little vegetation cover (Figure 1).

Be aware of wind and dust conditions in your community. People with the conditions listed above should follow the sand and dust storm advisories issued by the National Weather Service. Sand and dust storm forecasts are available online (<https://www.weather.gov/>). The U.S. Environmental Protection Agency has an online air quality guide for particle pollution (<https://airnow.gov/index.cfm?action=airnow.main>). You should use these forecasts to help you reduce your exposure by changing the type and location of your outdoor activity.

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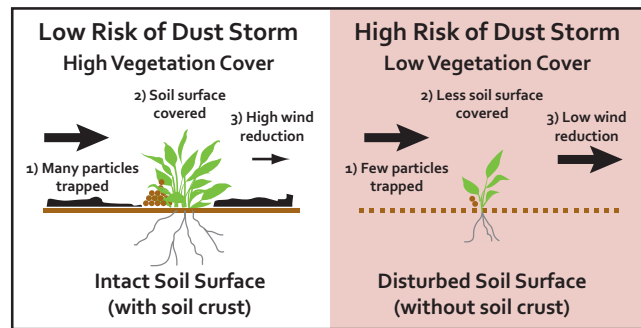


Figure 1. Environmental Risk of Dust Storm Activity. Image from USGS

Rx Action Steps

- ✓ Monitor wind and air quality to know when dust pollution will be a health risk in your location (www.airnow.gov).
- ✓ Keep your indoor air free of environmental dust. Close windows and doors. Remain indoors during sand and dust storms.
- ✓ Avoid any outdoor activity during sand and dust storms.
- ✓ Consider utilizing a filtered air conditioning unit or an air purifier with a HEPA (PM_{2.5}) filter to reduce exposure.
- ✓ Continue to take prescribed medications.
- ✓ Seek medical advice immediately if respiratory symptoms persist despite avoidance measures.
- ✓ Consider obtaining and undergoing fit testing for a NIOSH certified N95 mask if you live in an area at high risk for sand and dust storms. A video of fit testing is available online (https://www.osha.gov/video/respiratory_protection/fittesting.html).

References and Additional Resources:

Global Assessment of Sand and Dust Storms

- https://library.wmo.int/doc_num.php?explnum_id=3083

National Weather Service

- <https://www.weather.gov>

American Lung Association

Particle Pollution

- <http://www.lung.org/our-initiatives/healthy-air/outdoor/air-pollution/particle-pollution.html>

AirNow

- <https://airnow.gov/index.cfm?action=airnow.main>

Centers for Disease Control and Prevention

Climate Effects on Health

- <https://www.cdc.gov/climateandhealth/effects/default.htm#factsheets>

Respirator Fit Testing

- Fit testing facts <https://www.cdc.gov/niosh/docs/2018-129/pdfs/2018-129.pdf?id=10.26616/NIOSH PUB2018129>
- Fit testing video https://www.osha.gov/video/respiratory_protection/fittesting.html
- Cherrie JW et al. *Occup Environ Med.* 2018 Jun;75(6):446-452.

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