

Deliberative Learning of Collision of Dust Storm in Northern Africa and Transition to Europe and Mediterranean

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ABSTRACT: The dust storm is having major impacts on all earth as well as ocean also. The study of dust storm on aviation is quite impressive which we have done in our last paper. In this paper, the discussion about collision of dust storm in northern africa and how does it transit to the europe as well as mediterranean sea. The study which has done previously was not much effective with respect to impact of its. This leads us to have deliberative learning of collision of dust storm in northern africa and transition to europe and mediterranean. This study plays pivotal role in execution of prevention methods that any nation can take. The basic objective of this paper is to provide information about the concept of dust storm as well as its impact on northern africa continental upto europe. The another major objective is to draw attention on a series of potential problems that might be associated with the land and sea in dust loaded areas as well as to propose some means to minimize these problems At last, the basic prevention, detection and recovery ways of dust storm in northern africa and europe also included in this study paper.

KEYWORDS: Dust, Dust storm, Collision, Northern Africa, Mediterranean, Europe

I. INTRODUCTION

During the last years there has been an increasing interest in the study of atmospheric aerosols given their confirmed impact on human health. A large number of epidemiological studies demonstrated that atmospheric particulate matter (PM) has a clear correlation with the number of daily deaths and hospitalizations as a result of respiratory, cardiovascular and cardiovascular diseases. However, a limited number of studies have been carried out to establish the health effects due exclusively to the Saharan dust source. For this reason, the objective of this work is to review the literature to determine if Saharan dust particles have a relevant impact on human health. Additionally, this study expresses the need for determining the possible effects of Saharan dust exposure. These effects may depend on temporal variability, frequency and prediction of the Saharan dust events, PM concentration, composition and size, among others. The results of the current review may be considered to establish the objectives and strategies of the new European 2013 directive on atmospheric particle levels.

II. REPORT OF SAHARA DUST INCIDENTS

Dust outbreaks may greatly increase the ambient air levels of PM recorded in air quality monitoring networks. This is especially relevant in Southern Europe (Querol et al., 1998; Rodriguez et al., 2001; Escudero et al., 2005,2007; Kallos et al., 2007; Mitsakou et al., 2008; Gerasopoulos et al., 2006; Kocak et al., 2007), Eastern Asia (Zhang and Gao, 2007) and in some Atlantic islands (Prospero and Nees, 1986; Coudé-Gaussen et al., 1987; Chiapello et al., 1995; Arimoto et al., 1997; Viana et al., 2002). The transport of Saharan dust into Europe has a clear seasonality, being more frequent from February to June, and from late autumn to early winter (Escudero et al., 2005), although dust events can be distributed throughout the year. The Mediterranean countries are mostly affected by Sahara dust episodes (Querol et al., 2009; Kallos et al., 2007). The reason for this is the low precipitation in the Mediterranean basin that favours the long residence time of PM in the atmosphere with the consequent impact on air quality. It should be noted, that >70 % of the exceedances of the PM10 daily limit value (2008/50/CE European Directive) in most regional background (RB) sites of Spain have been attributed to dust outbreaks (Escudero et al., 2007). Similar findings are mentioned in Gerasopoulos et

International Journal of Innovative Research in Science, Engineering and Technology

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al. (2006), Kocak et al. (2007) and Mitsakou et al. (2008) for the Eastern Mediterranean Basin. Figure 1 shows the number of exceedances of the EU PM₁₀ limit value in regional background sites in Europe for the period 2000-2007. Regional background PM₁₀ levels across the Mediterranean show clear increasing trends from the north to south and western to eastern of the Basin. These trends are almost coincident with the PM₁₀ African dust load (Figure 2). Previously, Querol et al. (2009) revealed a higher probability of elevated PM levels (>100 µg/m³) occurrence in the Eastern Mediterranean Basin rather than in the Western Mediterranean Basin owing to the higher occurrence and intensity of African dust intrusions. The particle size of desert dust lies in the coarse mode as 48 % of the total suspended particles (TSP) are particles with an aerodynamic diameter ≤ 10 µm (Goudie and Middleton, 2006), with suspension being the main mechanism of dust transport. Thus, silt is expected to be a dominant component, although clay and sand fractions can also be present, as dust deposits tend to get finer with increasing distance from their source regions. There has been a considerable amount of work in characterising African aerosol chemistry, mainly using major element variations (e.g. Moreno et al., 2006), and on chemical variations linked to particle size fractionation. The chemical composition of dust is mostly dominated by SiO₂ (59.99%), Al₂O₃ (14.13%), Fe₂O₃ (6.85%), CaO (3.94%), MgO (2.60%) and K₂O (2.35%) (Goudie and Middleton, 2006). Mineralogically, this composition relates to dominance of quartz, magnetite/hematite and carbonates. In the finer fractions clays such as palygorskite, illite and kaolinite can also be important (Alastuey et al., 2005), although there are big differences in clays abundance depending on the source area of the dust. Thus, dust from North and West Sahara contains abundant illite, whereas kaolinite is dominant in dust from the South and Central Sahara (Goudie and Middleton, 2006). Saharan dust has attracted increasing attention due to the important influences on nutrient dynamics and biogeochemical cycling in both oceanic and terrestrial ecosystems in North Africa and far beyond, due to frequent long-range transport across the Atlantic Ocean, the Mediterranean Sea and the Red Sea, to the Americas, Europe and the Middle East. Atmospheric dust concentrations may also have considerable climatic significance through a range of possible mechanisms, and the frequency of dust events can change substantially in response to climatic changes over several time scales (Goudie and Middleton, 2001). Finally, dust outbreaks may also cause health impacts due to the high levels of PM and to the transport of anthropogenic pollution (Erel et al., 2006) and also to the possible transport of micro-organisms (Polymenakou et al., 2008).

III. DUST STORM IN NORTH AFRICA (TIMELY STUDY)

1) Dust Plumes Off North Africa Coast (November 14, 2004)

Streamers of dust flow out over the blue waters of the Mediterranean Sea from the northern shores of Africa's vast Sahara Desert. On November 14, the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this image of rippling dust being swept northeastward across Libya (center) and Tunisia (top left). The winds that whipped up this dust may be part of a large weather system that brought severe storms—including gale force winds—to parts of Croatia, Italy, and Algeria. The dust plumes persisted for several days in mid-November.

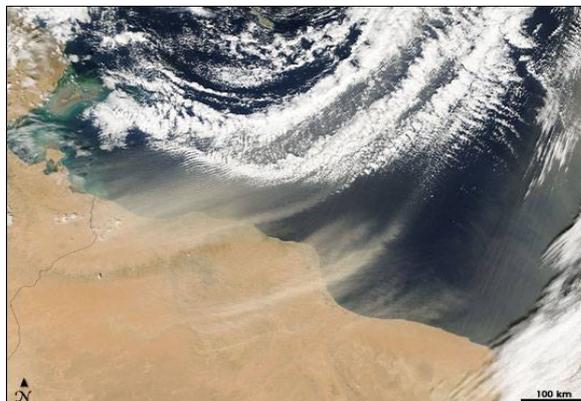


Figure 1 : Dust Plumes Off North Africa Coast (November 14, 2004)

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2) North African Dust Plume (July 14, 2007)

A dust storm crossed the border between Algeria and Mali on July 14, 2007. The Moderate Resolution Imaging Spectroradiometer (MODIS) flying on NASA's Aqua satellite took this picture the same day. In this image, the dust appears as a buff-colored blur. Because the dust plume is diffuse, its origins are not easily discerned in this image. In the south, the dust mingles with clouds, and the clouds could be associated with the same weather system that disturbed the desert dust.



Figure 2 : North African Dust Plume (July 14, 2007)

3) Dust Storm in North Africa (December 15, 2005)

One day after a dust storm in Algeria, Tunisia, and Libya, more dust swept off the north coast of Africa on December 15, 2005. This storm swept northward off the coasts of Libya and Egypt over the Mediterranean. The Moderate Resolution Imaging Spectroradiometer (MODIS) flying onboard the Aqua satellite captured this image the same day. In this image, a pale beige plume of dust merges with a swirling cloud formation over the sea. The dust dissipates toward the east, although distinct plumes can be seen off the coast of Egypt. To the east of the storm is Egypt's lush Nile Delta.

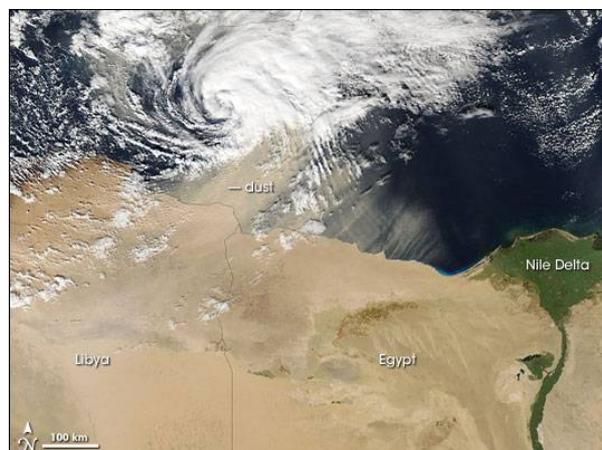


Figure 3 : Dust Storm in North Africa (December 15, 2005)

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4) Dust Storm in Northern Africa (February 23, 2006)

A dust storm several hundred kilometers across struck northern Africa on February 23, 2006. The storm carried Saharan dust across Algeria, Tunisia, and Libya, eventually sweeping over the Mediterranean Sea. The Moderate Resolution Imaging Spectroradiometer (MODIS) flying onboard the Aqua satellite took this picture the same day.

In this image, the dust storm appears as tendrils and ripples of pale beige, partially obscuring the underlying land and ocean features. The dust is not uniformly thick, so while part of the Mediterranean is almost completely hidden by a thick band of dust (in the upper right corner of the image), a burnt-orange-colored sliver of land still peeks out from under the dust in eastern Algeria and western Libya. Dust storms often originate from discrete source points, and this image shows several source points, one of which is annotated, in eastern Algeria. Additional dust appears to come from points farther west.

As the world's largest sandy desert, the Sahara produces many of the planet's dust storms. Because the dust travels for hundreds to thousands of kilometers, its effects can be far reaching. According to a news report in The Jerusalem Post, dust storms now blow from Africa into Israel throughout the year, rather than just in the spring and summer, and climate change and desertification could exacerbate such storms in the coming decades.

South of the dust storm, this picture shows part of the Tassili n'Ajjer National Park in southeastern Algeria. The park stands out from its surroundings due in part to its mountainous landscape. This high plateau in the middle of the Sahara sports some of the world's most important groupings of prehistoric cave art, recording climate change and animal migrations over the past several thousand years.

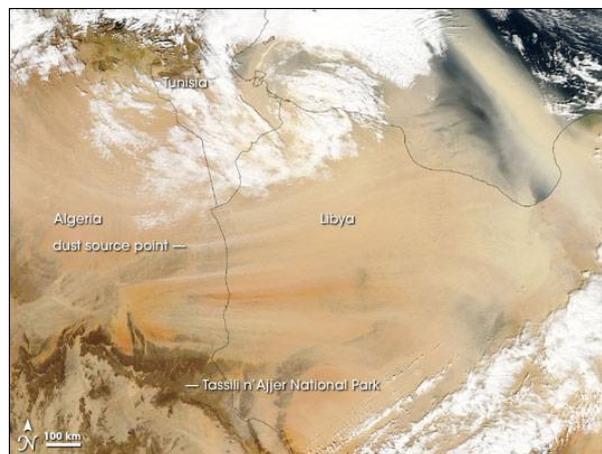


Figure 4 : Dust Storm in Northern Africa (February 23, 2006)

5) Dust over the Central Mediterranean (May 19, 2008)

Dust plumes blew off the north African coast and over the Mediterranean Sea on May 19, 2008. The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite took this picture the same day. In this image, the translucent dust plumes blow off the coast of Libya, only barely obscuring the satellite's view of the ocean. The dust mingles with cloud cover, particularly in the northeast. Clouds are especially thick in the southeast. The clouds could be associated with the same weather system that stirred the dust.

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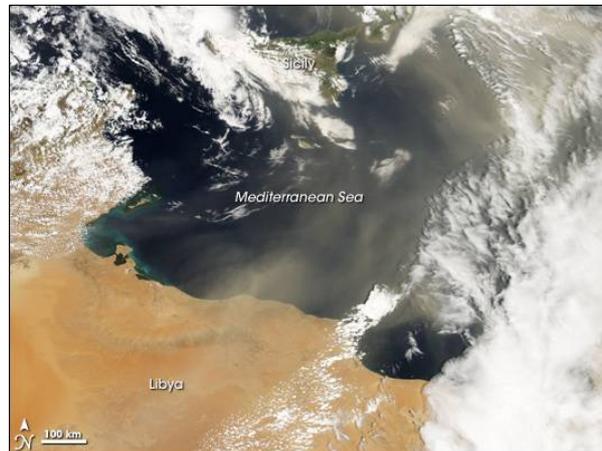


Figure 5 : Dust over the Central Mediterranean (May 19, 2008)

6) Dust Storm off Algeria (December 6, 2003)

On December 6, 2003, a wide plume of dust blew over North Africa and northwestward over the Mediterranean Sea. Tracking dust storms is important for a variety of reasons. Dust injects nutrients, such as iron, into marine ecosystems. Dust also carries bacteria and spores from fungi, which can cause disease far away. Dust storms can cause or worsen breathing problems. Finally, dust in the atmosphere can also influence climate and weather. Numerous dust storms carry Saharan dust across the Atlantic Ocean all the way to the Southeast United States and parts of Central and South America.

The high-resolution image provided above is 500 meters per pixel. The MODIS Rapid Response System provides this image at additional spatial resolutions, including MODIS' maximum resolution of 250 meters.



Figure 6 : Dust Storm off Algeria (December 6, 2003)

7) Dust Storm off West Africa (October 1, 2008)

Dust plumes blew off the west coast of northern Africa for the second consecutive day in late September 2008. The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this image on September 29, 2008.

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In this image, the dust plumes form an arc that stretches from Senegal in the south to Western Sahara in the north. The thickest plumes of dust are concentrated west of the Senegal-Mauritania border, and extend westward to Cape Verde, where a combination of dust and clouds obscure the satellite's view of the archipelago.

The source points for this dust storm don't appear in this image, but vast sand seas stretch from Mauritania north- and eastward into Mali and Algeria. At least some of the dust likely arose in that region.

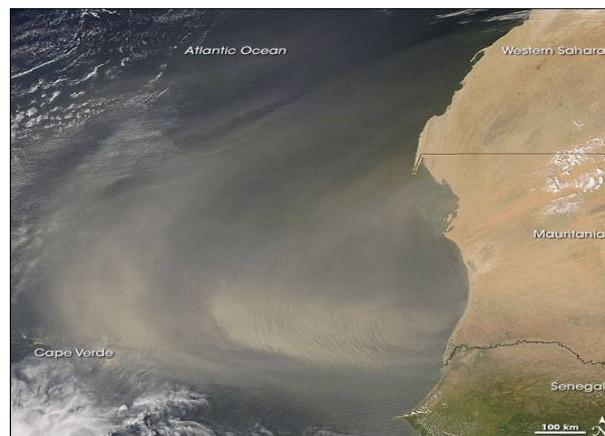


Figure 7 : Dust Storm off West Africa (October 1, 2008)

8) Dust Storm in Northern Africa (February 24, 2006)

Dust still lingered over northern Africa on February 24, 2006, a day after a massive dust storm swept over Algeria, Tunisia, and Libya. The Moderate Resolution Imaging Spectroradiometer (MODIS) flying onboard the Aquasatellite captured this image on February 24.

In this image, a cloud of dust several hundred kilometers across extends from Libya and Egypt over the Mediterranean Sea. Faint tendrils of dust reach as far as the east as Israel. Although the dust hides many land features in northern Africa, the lush, green Nile Delta still stands out from its surroundings.

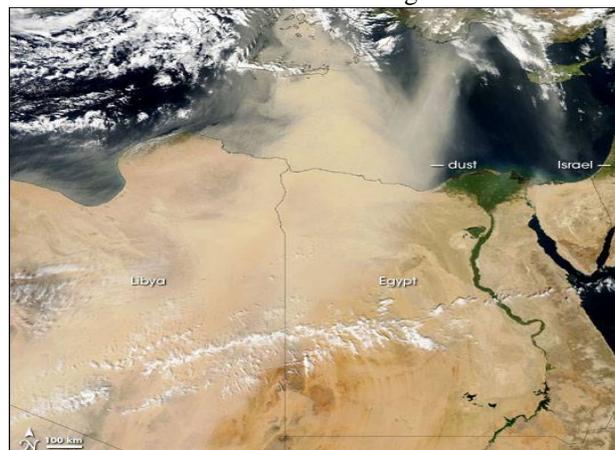


Figure 8 : Dust Storm in Northern Africa (February 24, 2006)

9) Gobi Dust Storm (November 10, 2010)

A dust storm that blew through Asia's Gobi Desert on November 10, 2010, quickly intensified as the day wore on. When the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this image at

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1:50 p.m. Beijing time (5:50 UTC), the dust plumes were considerably thicker than they had been just two hours earlier. Smaller dust plumes also appeared north of the Mongolia-China border. The dust forms an arc that curves to the southeast and then northeast and occupies an area of clear sky between two cloudbanks. The clouds could be related to the weather system that stirred the dust. A sand sea in north-central China provides plentiful material for dust storms. Although the Gobi has long ranked as one of the world's top dust-producing regions, its dust storms have historically occurred most often in March and April, according to the University Corporation for Atmospheric Research.

IV. CONCLUSION AND FUTURE WORK

The specified study of above dust storm is having various velocity. The main conclusion of this review is that the health impact of Saharan dust outbreaks needs to be further explored, especially in Southern European areas, the most impacted by these episodes using comparable methodologies. Given that some evidence exists for the health risks of coarse particles, PM_{2.5-10} during Sahara dust events, future studies should focus on the chemical characterization of the coarse particle mode during these episodes. The toxic effects of coarse particles when they originate from desert sources should be further investigated. The outcome of this paper may be considered to establish the objectives and strategies of the new European 2013 directive on atmospheric particle levels. The Sahara dust outbreaks, which are beyond control from the Member States, mostly affect Mediterranean countries. An implication for public policy in Europe is that to protect public health, anthropogenic sources of particulate pollution need to be more rigorously controlled in areas highly impacted by Saharan dust (Perez and Kunzli, 2011).

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