

The contribution of naturally-produced transboundary pollutants to the UK ambient air pollution mixture may potentially increase, due to the effects of climate change.

Studies have reported associations of health impacts with desert dust events and volcanic eruptions, however further investigation is needed to assess the future health impacts in the UK.

DISCUSSION

Recommendations

- Within the UK there is limited research conducted during desert dust days. Therefore, further research conducted during these days to assess how desert dust days could increase levels of PM at ground levels, will give a better indication of the potential threats to public health.
- Development of existing monitoring systems to provide data on exposure to various air pollutants and to understand the composition of air pollutants during transboundary pollution episodes.

Next Steps

- To conduct a HIA (Health Impact Assessment), during days of desert dust episodes in the UK to quantify the potential health impacts associated with these natural particles.

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INTRODUCTION

Transboundary air pollution episodes are often driven by weather patterns, which may be influenced by Climate Change [1].

As policies to control anthropogenic emissions become effective it is expected that the contribution of natural origin particles to air pollutant concentrations will become more important [2], and thus understanding the associated health effects becomes crucial.

Here there is a focus on desert dust and volcanic ash particles.

METHODS

A rapid literature review was conducted, the main topic and subtopics researched are depicted in figure 1.

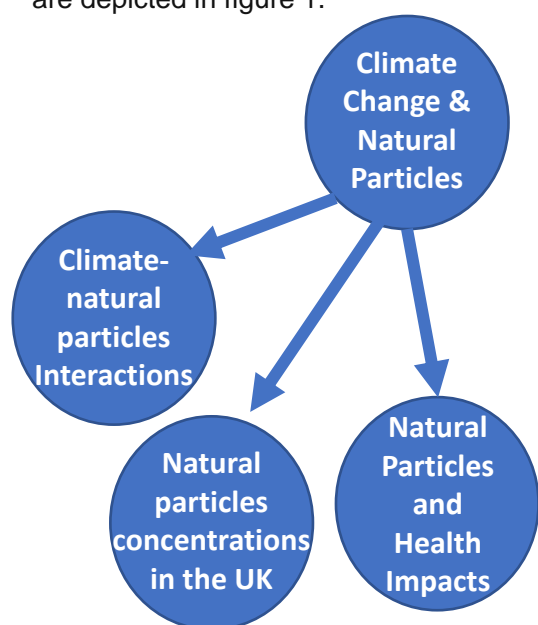


Figure 1. Topics covered in rapid review

RESULTS

Climate-Desert Dust interactions

Warmer, dryer conditions with the addition of deforestation are extending arid lands, which are the largest source of dust, resulting in an increase in dust pollution globally [1,3]. It has been recognised that climate change affects the routes and paths taken by desert dust around the globe [3,4].

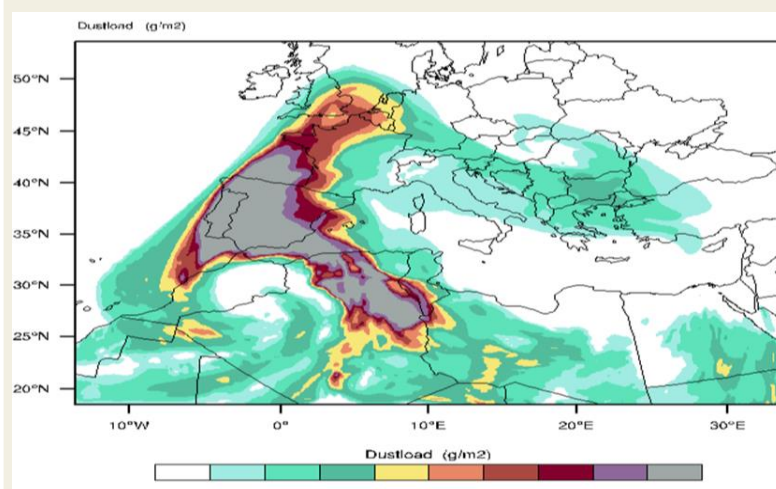


Figure 2. Dust load across Europe on 16th March 2022. (Source: Dr Solomos, personal communication)

Desert Dust and Health Impacts

Toxicological studies have provided support for biological plausibility of epidemiological associations between desert dust particles and events including exacerbation of asthma, hospitalization for respiratory infections, and seasonal allergic rhinitis [5].

In vitro studies showed that the suspended desert dust particles may provide a platform to intermix with chemicals on its surfaces, thereby increasing the bioreactivity of fine particles during dust storm episodes [5].

Climate-Volcanic Ash interactions

Extreme weather events may increase the number of eruptions, heavy rainfall has been linked to several previous volcanic eruptions [6].

There is a link between ice decline and increased volcanic activity in Iceland at the end of the last glacial period [7].

Climate change may affect the volcanic sulphate aerosol life cycle and radiative forcing [6].

Volcanic Ash and Health Impacts

The acute (short-term) effects include asthma attacks and bronchitis, increased breathlessness and coughing, tightness in the chest and wheezing which is caused by irritation of the airways lining [8].

It is strongly suspected that the subgroups with the highest risk of experiencing adverse effects from volcanic ash inhalation are those with pre-existing conditions, in particular respiratory conditions [9].

Natural Particles concentrations in the UK

During spring 2014, there was a period of increased PM concentrations in the UK, which was widely believed to be caused by a Saharan dust plume. However, ground level desert dust mostly occurred towards the end of the air pollution episode [10].

The increased levels were mainly driven from anthropogenic emissions from external sources to the UK [10].

Although the UK doesn't contain any active volcanoes, volcanic ash can travel thousands of kilometres [11]. The UK has seen this long-range transport in recent years. In 2010 the eruption of Eyjafjallajökull in Iceland caused major an ash cloud to sit over the UK [12].

Although during the 2010 eruption ground level UK air quality wasn't impacted [13], future eruptions with favourable conditions could lead to ash transportation and heightened PM levels.

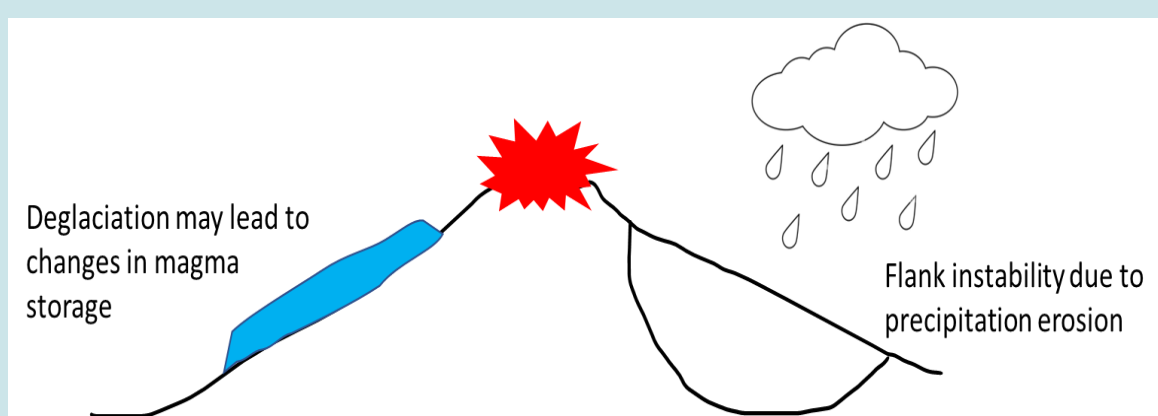


Figure 3. Two potential impacts of Climate Change on Volcanic Eruption Processes