SEM VIEW OF WORLD'S MOST SIGNIFICANT DUST CLOUD SAMPLED AT CHICHA, THE CHAD, BODELE DEPRESSION, SAHARA

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The Bodele depression is considered to be the world's most active dust source. It is located in northern Chad in the heart of the Sahara. The Bodele produces not only some of the world's largest plumes which extend well beyond west Africa, but does so more frequently than any other dust source on this planet.[1] In 2005 a small multidisciplinary expedition from the UK with support from the Royal Geographical Society ventured to the edge of the depression at a place called Chicha (N 16º 54' 23.7" E 18º 27'42.0").

On March 10th 2005 during a particularly significant dust event, the team mounted a sticky SEM stub on a stationary roof cab of a Toyota Land Cruiser and collected dust material that was captured from the moving plume, which was transporting dust by suspension and saltation. Numerous types of dust particles could be identified.

The samples were placed on a 3 mm pin type stub with a carbon tab. Energy dispersive analysis was done on an EDAX system equipped with a Super Ultra Thin Window (SUTW). The samples were examined in a Phillips XL30 Environmental scanning electron microscope (ESEM).

The particles on the stub were dominated by diatoms from the dry lake bed of the Bodele as demonstrated in Fig. 1. These fragmented diatoms make up between 30 to 50 % of the stub and range in size from 5 – 50 μm. These are essentially fossils which were produced ca 9000 years ago when the depression hosted a lake.

The second set of particles, which dominate the stub, are large quartz particles, which have their origin in the desert pavement of the depression. These frequently form barchan dunes, which tear up the diatoms of the dry lake bed. It is speculated that the crushing forces of quartz grains create much of the diatom dust. The quartz grains are 50 – 250 μm in size and appear to be remarkably sharp edged and angular. This is unexpected. Quartz in such an abrasive environment is supposed to attain relatively rounded characteristics. It is not clear how quartz is able to maintain its fresh and angular shape in this environment.

Other particles identified in small quantities (< 1 %) are minerals such as zircon, titanium, copper, nickel and chrome. These are either derived from detritus produced by conflict, as Chicha was home to a major battle in the 80's or the metals could be from a local upwind source of exposed mineral alteration as identified in satellite imagery. In addition small quantities of organic material, primarily plant litter are evident. Evaporite products such as halite are absent.

References
1. Washington, R., Todd, M., Middleton, N.J., Goudie, A.S. (2003) Ann Ass. of Am. Geogr. 93, 297.

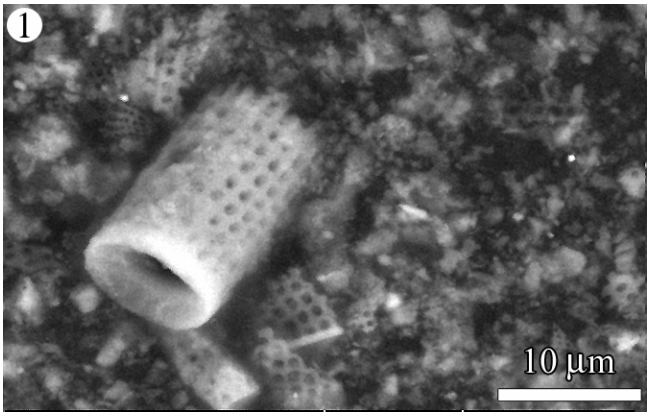

Fig. 1. Crushed diatom fragments from the dry Bodele lake bed caught as dust particles on March 10th 2005. These particles are believed to spread over hundreds of km.

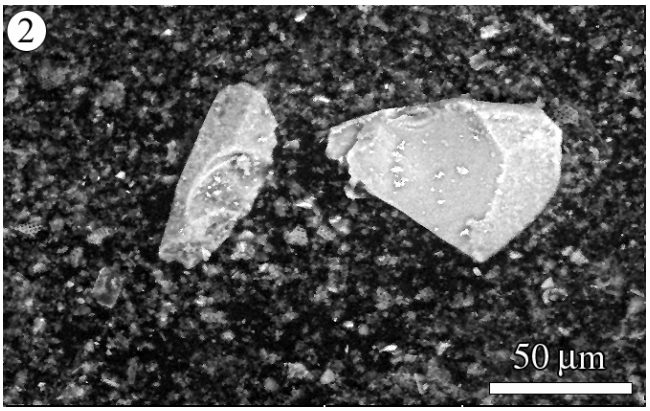

Fig. 2. Angular quartz grains set on a bed of crushed diatoms. These particles were caught more than 2 m above the earth surface during a major storm, which extended the layer of saltating grains up to the roof, of a Toyota Land Cruiser Cab. The source of such fresh quartz is uncertain.

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Bodele expedition webpage:
www.geog.ox.ac.uk/research/projects/bodex/index.html