Tracing the Elemental Composition and Source of Aeolian Dust and Terrestrial Surface Particles from the Qatar, Arabian Peninsula

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The trace metal geochemistry of atmospheric dust and terrestrial surface deposit particles were studied on the Qatar Peninsula for 22 months, in 2014 and 2015. Terrestrial surface deposits of recent dust accumulation and traffic particulate from roads were also sampled. We included samples of the mega dust-storm event on 01-02 April 2015. Atmospheric dust samples were collected using passive dust traps. All samples were total acid digested and analyzed for major and trace elements using ICP-OES. The concentration of thirteen elements (Ca, Mg, Ag, As, Cd, Cr, Cu, Mo, Ni, Se, Sn, Sr, Zn) were enriched in atmospheric dust samples, relative to Upper Continental Crust (UCC). Ca was especially enriched by up to 435% relative to UCC. About 33% of the total sample mass was $CaCO_3$, reflecting the composition of surface rocks and soils in the source areas. Major elements (Al, Mn, Fe) were depleted (-58%, -35%, -5%, respectively) relative to UCC due to the large dilution effect of the enrichment of $CaCO_3$. Of the elements typically associated with anthropogenic activity, Ag, Ni, Zn were most enriched relative to UCC. Other metals, reflect anthropogenic sources, including Pb and V, were not significantly enriched, with enrichment factors of 25% and 3%, respectively. Back trajectories were determined at the date of sampling for each sample using the NOAA HYSPLIT model. These showed that the source of the dust particles was almost equally divided between northerly and southerly sources, except one sample, which appeared to originate from the west. More variability in particle source locations were observed during the winter months. Samples with northern and southern origins were compared to see if the composition could be used to identify source. Only three elements were observed to be statistically different. Pb and Na were higher in samples from the south, while Cr was higher in those from the north.