Measuring Nanoparticulate and Dissolved Titanium in Urban Recreational Waterways near Phoenix

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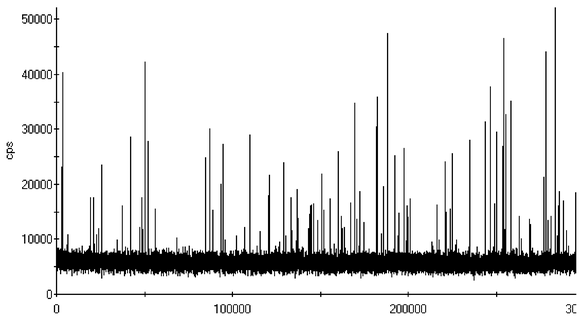
OBJECTIVE

Track nanomaterials through the urban water gradient to identify potential environmental hazards.

Methods

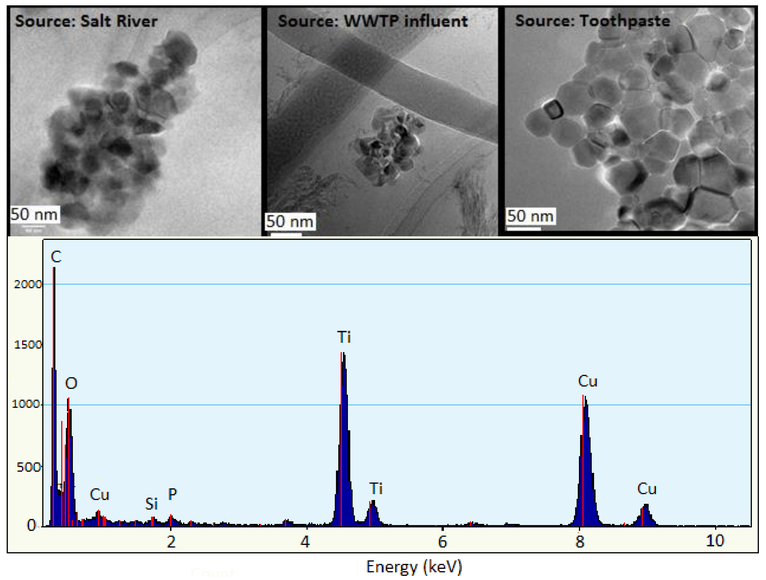
River samples were collected from the Salt River near Usery Pass Road, the exit point for Salt River Tubers. Samples were collected on a Saturday in July when recreational use of this section of river is high. Pool water samples were collected from pools near the ASU campus.

Initial screening of nanomaterials was conducted using TEM with EDX. Nano titanium dioxide concentrations and sizing were measured with ICP-MS. Oxybenzone was measured by LC/MS/MS.

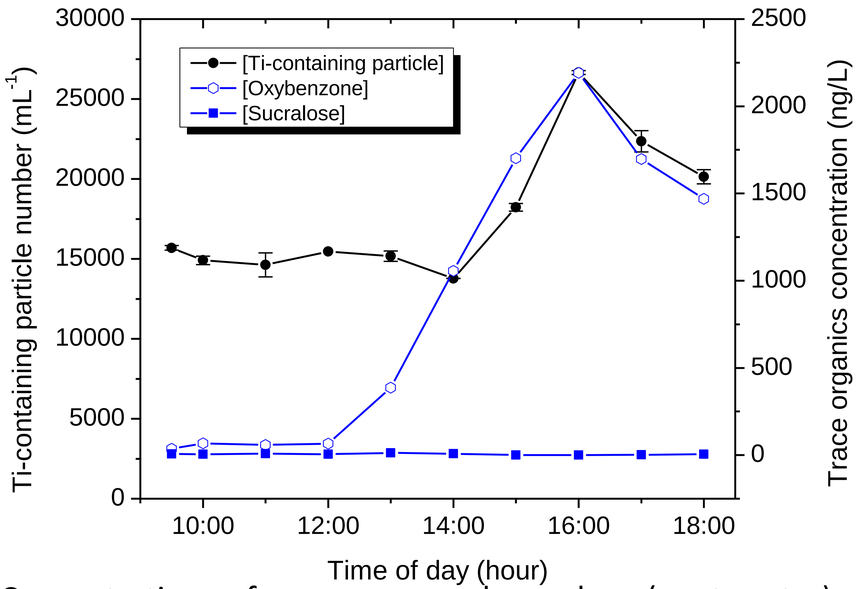


Example of raw single particle ICP-MS data of titanium spikes in a pool sample

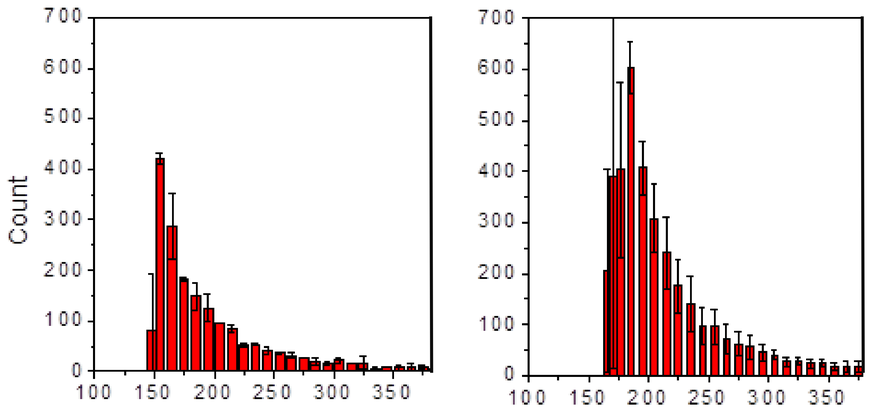
RESULTS



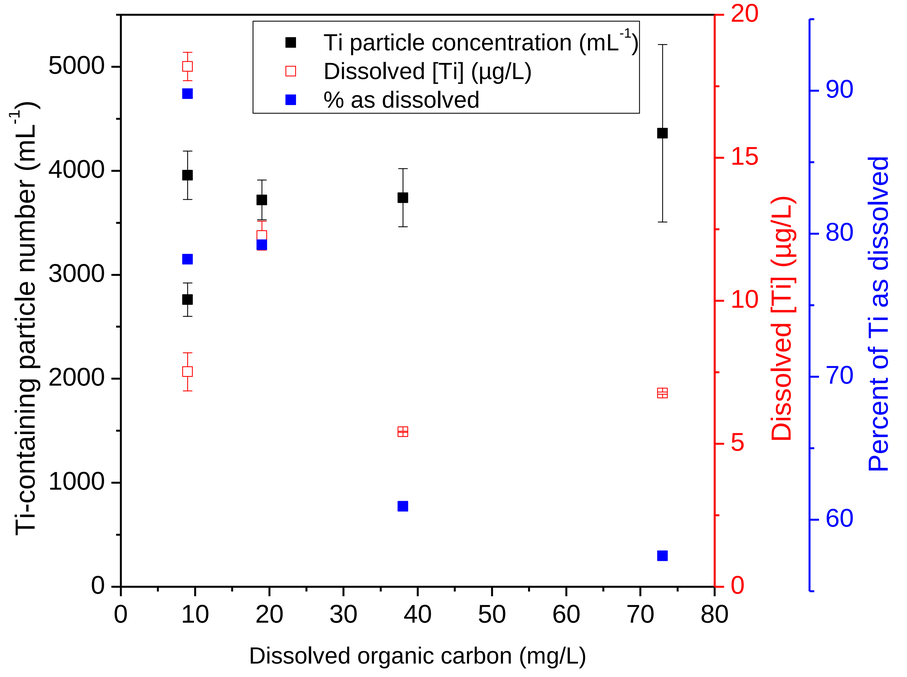
Identification of titanium containing nano particles in the Salt River, Mesa WWTP influent, and toothpaste.



Concentrations of sunscreens and sucralose (wastewater) in the Salt River downstream of "Tubers" during a single day in summer.



Spikes of titanium in the Salt River as they pass through the plasma of an ICP-MS.



Measured titanium and dissolved organic carbon in swimming pools in Tempe.

CONCLUSIONS

Size distributions of titanium nanoparticles in river water are similar to that contained in commercial sunscreens. During high recreational use (weekend summer day downstream of "tubers"), titanium and oxybenzone concentrations in the Salt River increase during the day and decrease back to baseline during the night (low use). The percent of dissolved titanium in pools decreases with increasing organic carbon, indicating greater concentrations of nano titanium coincide with greater recreational use.

ACKNOWLEDGEMENTS

Partial funding was provided by the following
CAP LTER, NSF CBET 0847710, EPA RD835580, EPA RD83558001.