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Title

Astrophysics at home. Micrometeorites.

Abstract

As stated in P. Rochette et al., “Micrometeorites from the transantarctic mountains”, micrometeorites constitute the main part of the flux of extraterrestrial matter accreting on Earth. They are very important to understanding the composition of the solar system. Micrometeorites have been recovered from a variety of terrestrial surfaces (desert, beach sands etc.), showing that their deposition can be evidenced on any surface, provided that the accumulation time is sufficient, and discrimination from terrestrial particles is feasible.

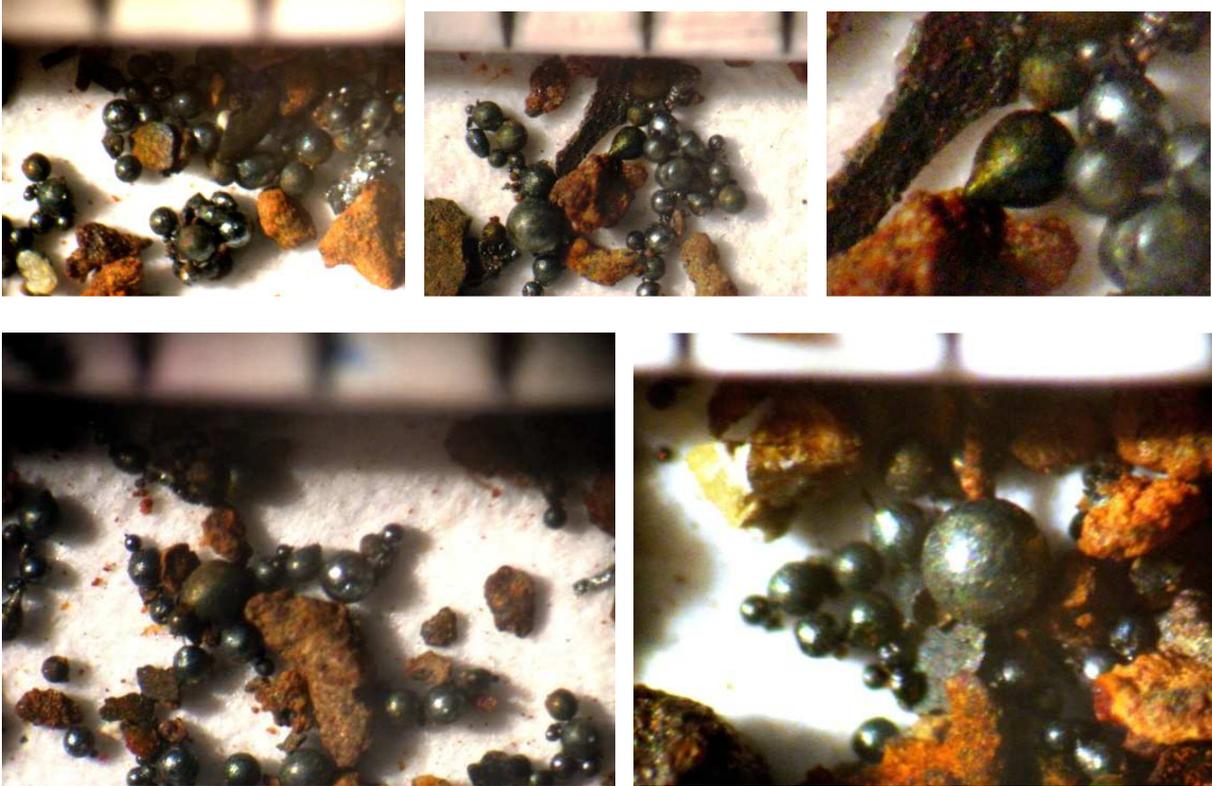
I present here my amateur activity of micrometeorite collector in the backyard and in desert sand. Sahara desert sand brought to me by my friend Silvia Calamity.

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I took these pictures by simply holding my camera up to my microscope.



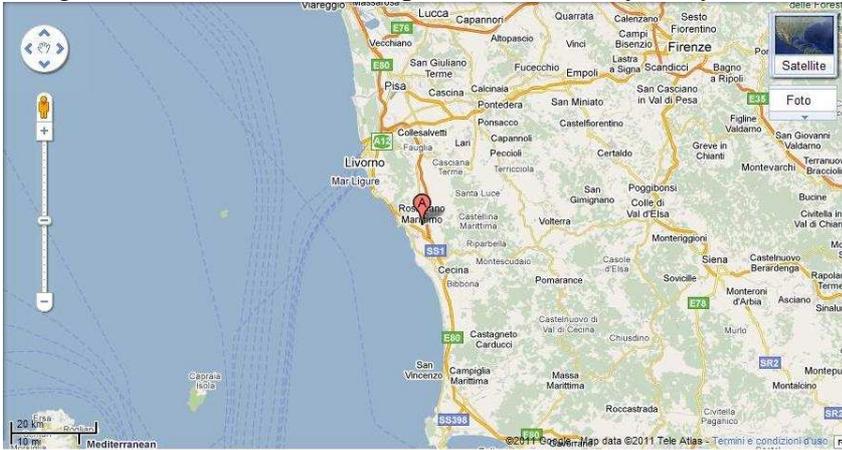
Approximately one tenth of the material recovered by the magnet was composed of these little balls of metal. The rest consisted of irregular fragments.



Site 2 - fountain

Some other specimens I've found in Rosignano Marittimo, dragging the dry bottom of a fountain with my magnet.

Rosignano Marittimo, Livorno province, Tuscany, Italy.



Row sample collected in the fountain contains many small rock fragments from the local bedrock (serpentines, gabbros). Magnetite commonly occur besides serpentine, so small fragments are attracted by magnet. I use a damp toothpick to pick up and manipulate micrometeorites.



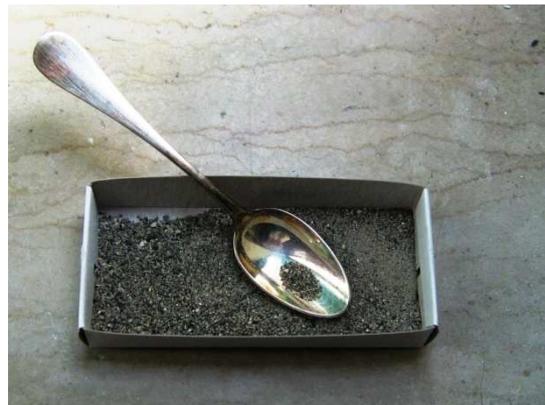
Micrometeorites show signs of their trip through the atmosphere. They are rounded and have small pits on their surfaces.

Max. size of these specimens: 1 mm.



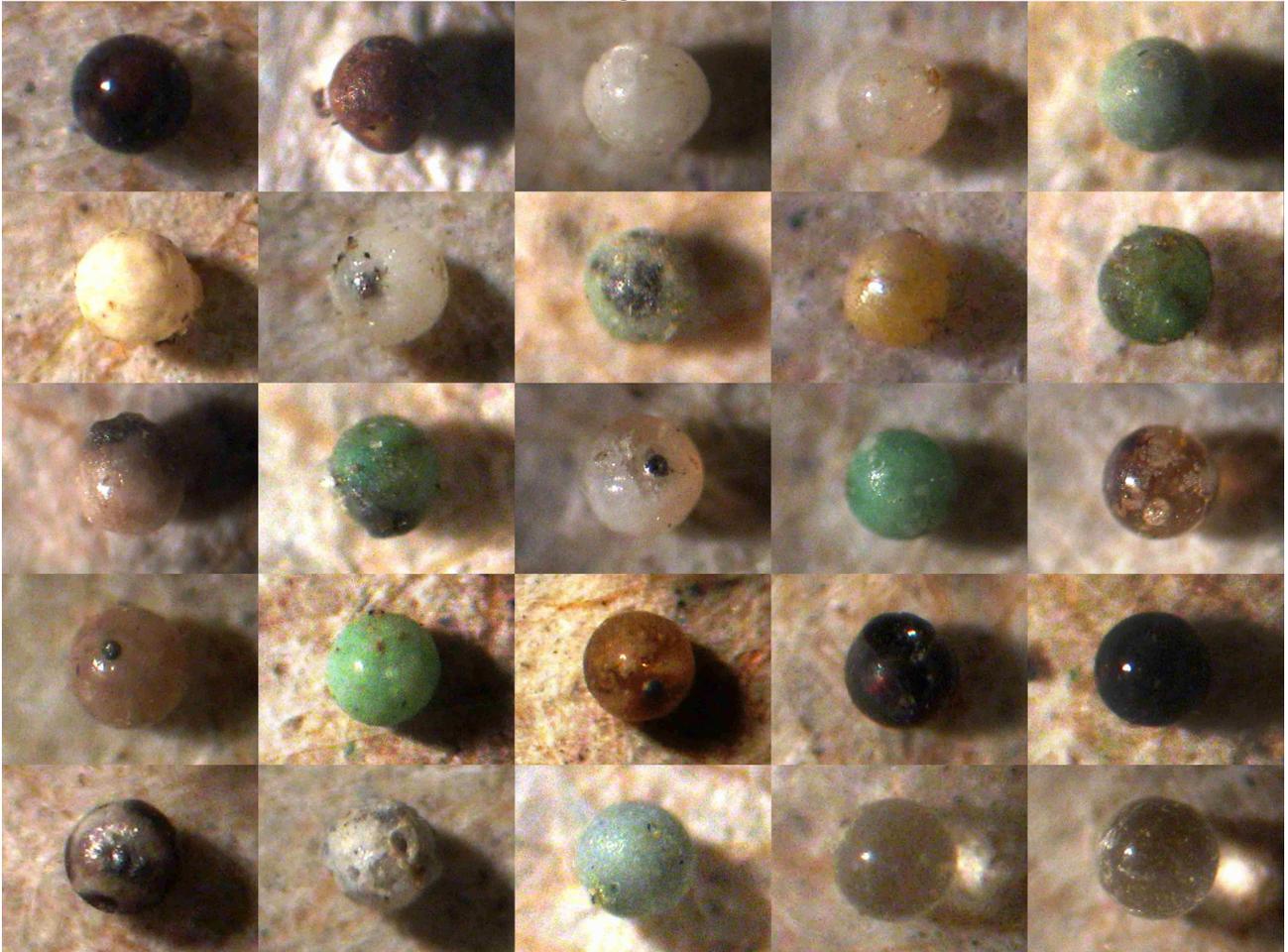
Site 3 - terrace

Other non iron specimen I've found without a magnet, looking at the "cosmic sand" (?) in the border of a wide terrace (see photo) here in Rosignano Marittimo. Here below a sketch of the method.



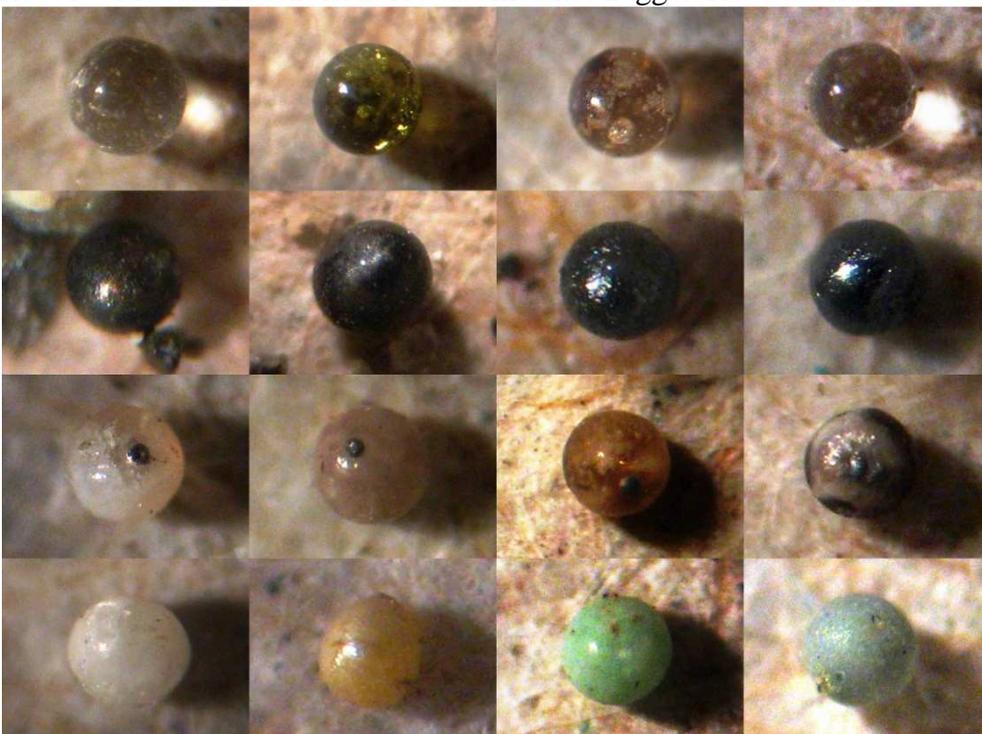
Samples were collected by hand, then washed, cleaned and once evaporated they were examined step by step with a stereo microscope. Many non iron were found (and also some irons). I show some photos.

Micrometeorites (?) I've found here, without magnet.



Here an aesthetic classification.

Row 1: vitreous. Row 2: iron. Row 3: metallic nugget. Row 4: colors.

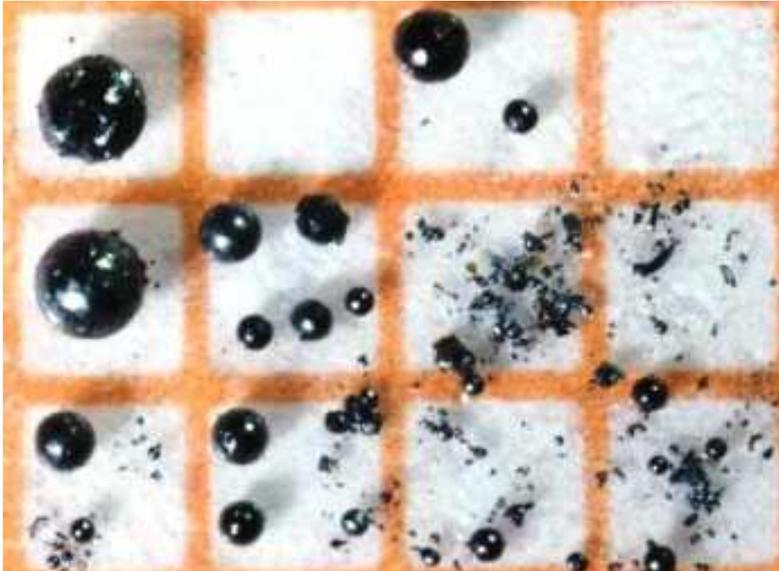


See also beautiful photos by Jon Larsen in [3].

Micrometeorites or Micrometeorwrongs?

However also the human industrial activity, example the grinding wheel treatment, can be considered as the source of spherical particles that were often confused as micrometeorites [4]. Look here.

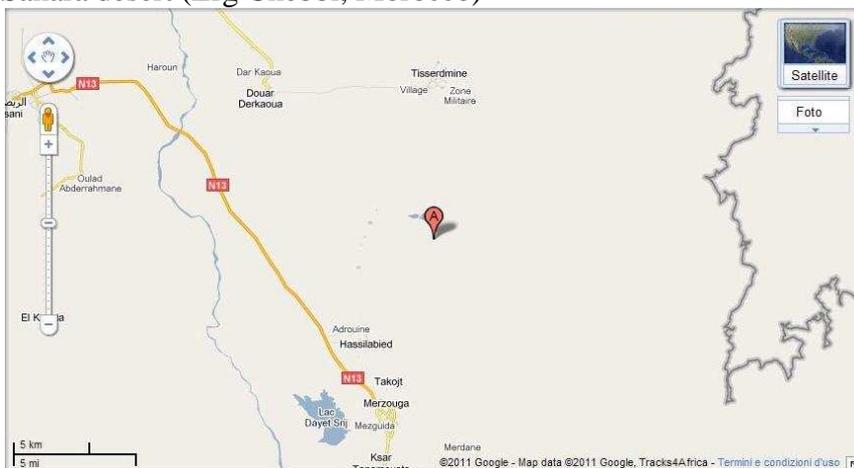
Spherical particles produced as a result of grinding wheel treatment (from [4]). Grid unit corresponds to 1 mm.



Site 4 - Sahara desert

In Sahara desert it's highly improbable that you have human industrial activity.

Sahara desert (Erg Chebbi, Morocco)



Sand from Sahara desert (Erg Chebbi, Morocco)



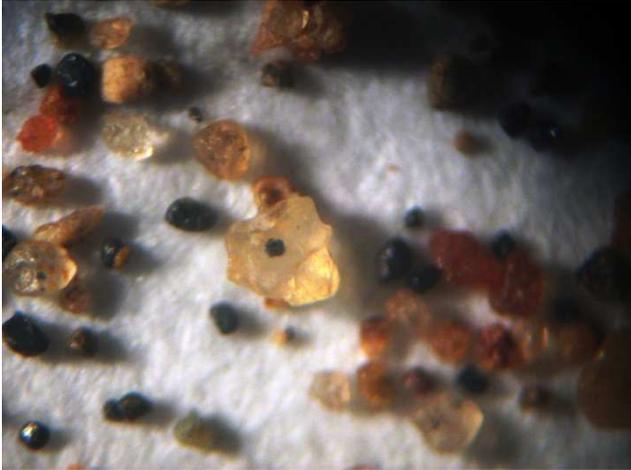
Sand by microscope



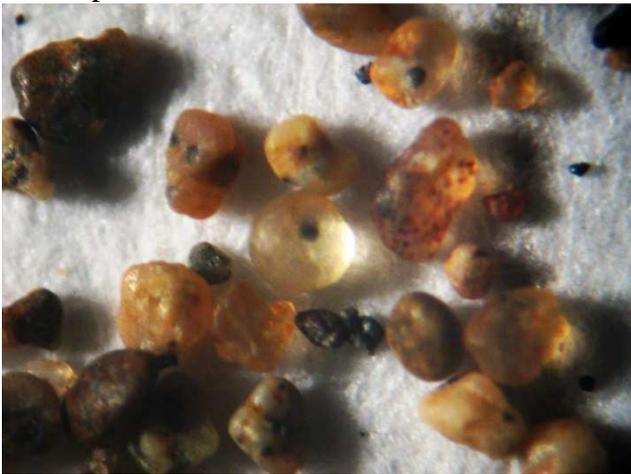
What was picked up by a magnet.



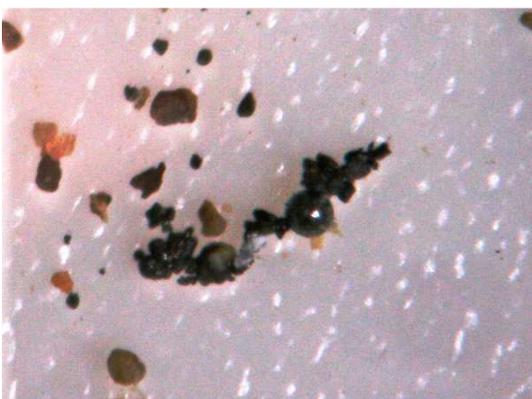
Jagged particle with metallic inclusion



Round particle with metallic inclusion



....and perhaps rounded micrometeorites Here below Silvia Calamity's photos [5].



Conclusion

I just began collecting potential micrometeorites some years ago. I usually collect particles like these, with or without a magnet. Dimensions range from 100 microns to 1 mm.

I suppose they are micrometeorites, according to the description in literature.

But also human activity can be considered as the source of spherical particles that were often classified as micrometeorites. So to make conclusions about the cosmic origin of each individual spherical particle probably one need to perform much more complicated analysis. What I find particularly strange and interesting are specimens (glass spherules and colors) from Site 3, the terrace in Rosignano Marittimo.

References

[1] Rochette P, Folco L, Suavet C, van Ginneken M, Gattacceca J, Perchiazzi N, Braucher R, Harvey RP, "Micrometeorites from the Transantarctic Mountains", Proc Natl Acad Sci U S A. 3008 Nov 25;105(47):18206-11. Epub 2008 Nov 14.

[2] Link: <http://bizarrelabs.com/met.htm>

[2] J. Larsen – Foto – Micrometeorites, www.myspace.com/jonlarsenguitar/photos/51836900

[4] A. Anselmo, "Observation of false spherical micrometeorites", <http://arxiv.org/ftp/arxiv/papers/0708/0708.4276.pdf>

[5] S. Calamity: personal communication.