Investigating S-complex type asteroids with lunar samples and meteorites measurement.

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Introduction: The space environment induces a weathering of airless bodies' surface. The processes involved thus affect the spectra of lunar and asteroidal regoliths. However, while the regoliths of 243 Ida and 433 Eros have been observed to weather differently from the Moon's, only a model of the space weathering for the lunar regolith has been developped and validated [1].

The model developped by Brunetto *et al.* [2] to quantify the influence of the space weathering on silicates was implemented on the on-line application Modeling for ASTeroids (or simply M4AST).

M4AST consists of a spectral database of asteroids and a set of applications for spectral analysis [3]. M4AST allows one notably to obtain spectral analogs using laboratory spectra from the Keck/NASA RELAB, and to consider the spectral modifications induced the space weathering processes according to Brunetto's model.

Methods: Our scientific objectif was to ascertain the influence of the space weathering on the trends of curve-matchings for a sample of 92 S-complex type asteroids (76 NEAs and 16 Mars-crossers).

We compared this sample of weathered and *de*-weathered spectra to the more-than-18,000-spectra-strong database of the RELAB using the modified version of a χ^2 best-fit presented by Nedelcu *et al.* [4], as fitting parameter.

Results: While taking into account the space weathering, it was found that the resulting trend consists in the clear dissociation of matching lunar samples – both soils and rocks – from the *de*-weathered asteroids' spectra.

When considering the weathered spectra, matching lunar samples would represent, in average, one in four results, over the fifty best-fitting spectra. However, when considering the *de*-weathered spectra, the proportion of matching lunar samples decreased thrice over.

In both cases, the remaining results corresponded to meteorites, geological samples, man-made mixtures, among all of which the proportion of ordinary chondrites was second to none.

This result is therefore consistent with the conclusion that the Moon's and asteroids' regoliths are weathered differently.

References: [1] Taylor *et al.* (2001), JGR, 106, 27985–28000. [2] Brunetto *et al.* (2006), Icarus, 180, 546-554. [3] Popescu *et al.* (2012), A&A, 544:A130 . [4] Nedelcu *et al.* (2007), A&A, 470, 1157-1164.