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Evolutions of SSHADE, the European solid spectroscopy database infrastructure

B. Schmitt (1), Ph. Bollard (1), A. Garenne (1), D. Albert (1), L. Bonal (1), O. Poch (1) and the SSHADE Consortium Partners (2) (see https://wiki.sshade.eu/sshade:databases). (1) Université Grenoble Alpes / CNRS, Institut de Planétologie et Astrophysique de Grenoble (IPAG), Grenoble, France. (bernard.schmitt@univ-grenoble-alpes.fr) (2) SSHADE Consortium: IPAG/UGA-CNRS (F), IAS/UPS (F), AIU Observatory (D), IRAP/U. Toulouse (F), LPG/U. Nantes (F), SSDPG/SRC-PAS (PL) CML/IGS-PAS (PL), WP/Unibe (CH), FAME/ESRF (F), PIIM/U. Aix-Marseille (F), DPS/OU (GB), IAPS/INAF Roma (I), LISA/UPEC (F), IEM/CSIC (E), LATMOS/IPSL (F), LGL-TPE/ENS-Lyon (F), Konkoly Astro. Inst./CSFK (HU), PRL (IN), U. Parthenope (I), Univ. Vienna (AU), NSRRC (TW).

Abstract

The SSHADE database infrastructure (http://www.sshade.eu) hosts spectral data of many different types of solids: ices, snows, minerals, carbonaceous matters, meteorites, IDPs and other cosmo-materials,… covering a wide range of wavelengths: from X-rays to millimeter wavelengths. Its Search / Visualization / Export interface is open to the community since February 2018. The v0.9.0 release this year added several new features, and several new databases have been added as well.

1. Introduction

Spectroscopy and spectro-imagery are increasingly used in space missions towards planets and small bodies (e.g. OMEGA/Mars Express, VIRTIS/Rosetta, RALPH/New Horizons, MAJIS/JUICE, …) to study the solid phases at their surface. Infrared, Raman, fluorescence and X-rays micro-spectroscopies are also used to study meteorites and cometary dusts in the laboratory and onboard some space missions for in situ measurements. A major contribution to the analysis of these observations is the measurement in the laboratory of spectra of a variety of materials (ices, minerals, organics, …) expected to be present at the surface of the bodies of the solar system or in their ejected grains. We therefore decided to make available online the data of a number of laboratories in Europe that study the spectroscopic properties of a variety of solid materials of astrophysical interest.

1. What is SSHADE?

SSHADE ("Solid Spectroscopy Hosting Architecture of Databases and Expertise") is an infrastructure that contain a set of databases on solid spectroscopy. It started its development in September 2015 and is open to the community since 5th February 2018 (http://www.sshade.eu).

The SSHADE databases cover laboratory, field, airborne as well as simulated spectral data including various levels of products for many different types of solids: ices, snows and molecular solids, minerals, rocks, inorganic solids, natural and synthetics organic and carbonaceous matters, meteorites, IDPs and other cosmo-materials,… They come from a wide range of measurement technics over a wide range of wavelengths: from X-rays, through UV, visible, infrared to millimeter wavelengths

The SSHADE consortium has currently 23 partner groups in 21 laboratories from 11 different countries. It include 78 researchers. If the next europlanet-2024 RI proposal is accepted, it will be extended to 10-15 new partners around in Europe and the world. Information about this project can be found in the SSHADE wiki (http://wiki.sshade.eu)

2. Addition and improvements in SSDM version 0.9.0

A number of new features, as well as extension and improvements of current ones have been added in the SSHADE datamodel (SSDM) early this year. They will allow new types of data to be included in SSHADE as well as a more complete and detailed description of the data by the data providers. They will be progressively included in the various search/visualisation/export tools for the users. The main new features are:

- Added 'doi' identifier to each database and each experiment: this provides an unique identifier

(and direct link) and data reference (to be cited) to each data set.
- Extension of the spectral range to radio wavelength and their relevant types of data.
- Addition of polarized spectra with two different types of representation
- Addition of particle scattering measurements with different types of representation
- Addition of field and airborne measurements with geolocation. Also natural samples collected in the field, but measured in the lab, can be geolocalized.
- Addition of planetary samples with description an geolocation.
- Better description and homogeneous implementation of multi-angle data (BRDF, ...)
- Improvement of experiment/spectra version management to keep the history track of the data.

3. SSHADE interface

The user interfaces also go a number of major improvements.

- The simple 'Google-style' search tool has now improved search efficiency
- Several new specialized filters have been added to refine the search: DOI, spectral observation mode, X absorption edge element & type (for X-rays spectra), angular observation geometry, mechanical pressure, irradiation particle energy, sample grain size, as well as a new search mode by chemical bond or function (type, chemical formula), ...
- A number of features in the visualisation of the spectrum and associated metadata have been improved or refactored for better user experience. And most bugs fixed.
- The export tool has now a number of options to format your exported data by selecting spectralrange and unit, number formats, data and metadata file formats, archive format, ...
- The user dashboard features has been extended with the history of exports and an export parametters setting.

The data provider and database manager interfaces also get a large number of improvements to facilitate data preparation and ingestion as well as database management.

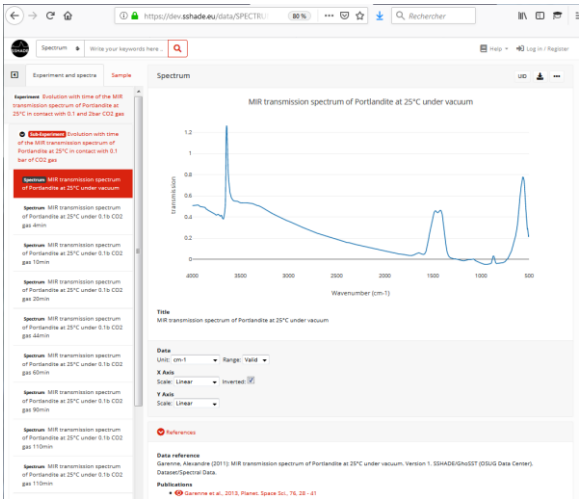

Figure 1: Display of spectrum (dynamic), with the metadata below (left: experiment and sample structures).

4. Databases implementation

We are progressively implementing in the SSHADE infrastructure the 20 databases of the partners of the SSHADE consortium. 15 databases are already active in SSHADE and 5 starting with over 1500 spectra online (+ 500 in preparation, by april 2019) covering a wide range of samples, spectroscopic techniques and spectral ranges. Tutorials on the use of the SSHADE database infrastructure will be organized during the conference.

5. SSHADE in Virtual Observatory

SSHADE will be soon a service of the VESPA Virtual Planetary Observatory. In particular part of the SSHADE databases will be accessible via the EPN-TAP protocol, which will allow comparison with observational data and mass processing in the VESPA environment through a series of dedicated spectroscopy plotting and analyzing tools.

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