

EPNcore vocabularies

S. Erard, B. Cecconi, P. Le Sidaner and the VESPA/Europlanet team

IVOA Virtual Interop. April 25-29 2022



Europlanet 2024 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149

EPN-TAP status

- **Mature v2.0 submitted as Proposed Recommendation to DAL WG July 2021**
<https://github.com/ivoa-std/EPNTAP>

Relies on publication of 63 data services worldwide (~ 20 teams)

- **RFC closed 1/2022**

Answered 3/2022

- Some parameters associated to list of values => effort to match these with IVOA vocabularies

Problem: some are similar to existing IVOA vocabularies, but often with significant discrepancies

EPNCore vocabularies

Three types:

- From IVOA vocabularies
- Specific but related to IVOA vocabularies
- Apparently require a different action

Need to distinguish standard parameters and thematic extensions (not always stabilized)

Europlanet VESPA: Data services connected via EPN-TAP / field

Open

Open in test | upgrade required

Drafted

Scheduled 2024 (selection)

- New or upgraded in 2021/22
- New content in 2021/22

Atmospheres

- Titan profiles - CIRS (Cassini, LESIA)
- Venus spectroscopy - VIRTIS (VEx, LESIA)
- Mars & Venus Climate Databases (modeling, LMD)
 - GEM_Mars (modeling, IASB-BIRA)
- Venus profiles - SPICAV/SOIR (VEx, IASB-BIRA)
- Mars profiles - SPICAM (MEx, LATMOS)
 - All MEx derived atmospheric products (via MEx IDS)
 - Venus cloud products (LATMOS)
 - ExoMars/NOMAD (BIRA-IASB)

Small bodies

- M4ast (ground based spectroscopy, IMCCE)
- 1P/Halley spectroscopy (IKS / Vega-1, LESIA)
- BaseCom (Nançay Obs, LESIA)
 - TNOs are cool (Herchel & Spitzer + compilation, LESIA & LAM & Utinam)
- SBNAF (from H2020 prog, Konkoly Obs)
- MP3C: Small body properties (OCA)
 - Vesta & Ceres spectroscopy - VIR/DAWN (IAPS)
- DynAstVO: NEO refined parameters (IMCCE)
- MPCorb: Small bodies orbital cat (MPC/Heidelberg)
 - Rosetta ground-based support (Edinburgh)
 - 67P illumination config (IRAP)
 - Meteor_showers predictions (IMCCE)
 - Occultations predictions, ast & sat (IMCCE)
 - LuckyStar, occultations (ERC prog, LESIA)
 - Natural satellites db (IMCCE)
- VizieR asteroid spectra (CDS / LESIA)

Solid spectroscopy

- SSHADE ices & minerals spectro (IPAG & network)
 - Planetary Spectral Library (DLR)
 - PDS spectral library (LESIA)
 - Berlin Reflectance Spectral Lib (DLR)
 - Hoserlab (Winnipeg U)

Surfaces

- CRISM WCS service (MRO, Jacobs U)
- Mars craters (Jacobs U, + update by GEOPS)
- USGS planetary maps WMS (Jacobs U)
- PlanMap: geol maps (H2020 prog, Jacobs U)
 - M3 WMS service (Chandrayaan-1, Jacobs U)
- HRSC nadir images, WMS (MEx, Frei Univ)
- OMEGA cubes and maps (MEx, IAS)
- VIMS satellites, w/geometry (Cassini, LPG)
- Mars topo preTharsis (GEOPS)
 - Global spectral param of Mercury (DLR)

Magnetospheres / radio

- APIS (HST/Cassini, LESIA)
- NDA (Jupiter & Sun radio, LESIA/CDN)
- AMDA (CDPP / IRAP)
 - MAG data (VEx, IWF Graz)
- MASER & related services (LESIA)
 - RadioJove (LESIA & US amateur network)
 - Iitate HF data of Jupiter (Tohoku Univ, Jap)
 - UTR-2 Juno ground support (Kharkiv)
 - MDISC & JASMIN (modeling, UCL)
 - Cluster & Themis data (IAP, Prague)
 - IMPEX models (from FP7 prog, IWF Graz)
- Hisaki (Tohoku Univ., Jap)
 - Transplanet (CDPP / IRAP)
- LOFAR Jupiter (CBK/PAS, Warsaw)
 - Magnetic field simus (LMSU)
 - ASPERA & MARSIS atm obs (MEx, Iowa U)

Solar

- HELIO AR & 1T3 solar features (FP7 prog, LESIA)
- Bass2000 (LESIA)
 - Radio Solar db (Nançay, LESIA)
- CLIMSO (Pic du Midi, IRAP)
- IPRT/AMATERAS (Tohoku Univ, Jap)
 - Gaia-DEM (SDO, IAS)
 - EIT_syn (SoHO, IAS)
 - e-Callisto (Windisch, Sw)

Generic / interdisciplinary

- BDIP (LESIA)
- PVOL (UPV/EHU & amateur network)
 - Telescopic planetary spectra collection (LESIA)
- PSA complete archive (ESA)
- HST planetary data (LESIA, to CADC archive)
 - Catalogues of planetary maps (Budapest)
- VizieR_planets: Planetary Science catalogues (CDS)
 - Gas absorption cross-sections (Granada)
 - Planets then satellites properties (LESIA/IMCCE)
 - Nasa dust catalogue (IAPS)
 - Stellar spectra, support for observations (LESIA)
 - DARTS (JAXA - currently via PDAP)
 - ESA sky planetary data (ESA)
 - Interface with VAMDC (TBD)

Exoplanets

- Encyclopedia of exoplanets (LUTH/LESIA)
 - Catalogue of exo disks (LESIA)
 - Interface with DACE (Geneva)
 - ARTECS climate simulations (AOTS/INAF)
 - Atmospheric studies (UCL)
- Exotopo: exoplanet surface simulations (GEOPS)

EPNCore vocabularies

From IVOA vocabularies:

measurement_type => UCD list from IVOA: <https://raw.githubusercontent.com/ivoa-std/UCDList/v1.4-EN/ucd-list.txt>
We're proposing new UCDs when needed

messenger: => uses <https://www.ivoa.net/rdf/messenger>

time_scale: => uses <https://www.ivoa.net/rdf/timescale/>
~ always UTC (default)

time_refposition: => uses <http://www.ivoa.net/rdf/refposition>
~ always TOPOCENTER (default)

access_format: any MIME type + existing list of preferred values/formats

=> Can use std vocabularies

EPNCore vocabularies

Specific but similar - but specific:

dataprodect_type: {im, ma, sp, ds, sc, pr, pf, vo, mo, su, ts, ca, ci, sv, ev}

Larger and slightly different meanings than <https://www.ivoa.net/rdf/product-type/> (and encoded)

processing_level => 1 to 6, integer (4 not used) - CODMAC-based

target_class: {asteroid, dwarf_planet, planet, satellite, comet, exoplanet, interplanetary_medium, sample, sky, spacecraft, spacejunk, star, calibration}

Could be included in <https://www.ivoa.net/rdf/object-type/> — but there are incompatibilities with current definitions (e.g., planet explicitly refers to exoplanets only)

Plus, EPNCore doesn't need / want to support all object_types

spatial_frame_type: {celestial, body, cartesian, spherical, cylindrical, none}

Could be included in IVOA reframe? <https://www.ivoa.net/rdf/reframe>

"Celestial" may be an issue (coupled with spatial_coordinate_description)

filter ~ SVO service, other values need be allowed

=> Need dedicated vocabularies?

EPNCore vocabularies

Specific, and difficult:

instrument_host_name & instrument_name:

Current project of IVOA observatory/spacecraft list (name resolver required)
Need to also handle laboratory/facility names

target_name => IAU list of Solar System bodies (TBC), but not only
+ substitute _ to impossible characters (quotes, etc)
Currently several source docs identified; several designations co-exist for small bodies
=> existing name resolver at IMCCE/ObsParis (SSODnet)

target_region from IVOA thesaurus, other values may be allowed

spatial_coordinate_description

Should at least accept IAU style and Hare et al (OGC-compliant) acronyms for body-fixed frames (TBC)
Provides the type of celestial frame (~ IVOA reframe)

=> Need specific vocabularies?

EPNCore vocabularies

In thematic extensions:

particle_spectral_type: {energy, mass, mass/charge} — (no actual use case currently)

dynamical_class: {JFC (*or Jupiter-family*), Halley-type, long-period, *interstellar?*, NEO, MBA, Trojan (*associate with primary?*), Centaur, TNO}

Subdivision of target_class - Preliminary

dynamical_type: {Athen, Apollo, Amor, Atira, Hungaria, Phocaea, Hilda, Cybele, (*other families*), *Mars-crosser?*, resonances (*or Resonant*), Plutino (= *res 2:3?*), Hot classical, Cold classical, Scattered Disk object, Detached object}

Subdivision of dynamical_class - Preliminary

taxonomy_code: TBC (related to spectral type, several taxonomies exist)

=> **Specific vocabularies?** These will most certainly evolve with new discoveries

Event-related: (may be adapted, will grow with new projects)

event_type: {meteor_shower, fireball, lunar_flash, comet_tail_crossing, occultation, transit}
+ TBC... *eclipse, egress, ingress?*

event_status: {prediction, observation, utility, test} — as per VOevent role

event_cite: {followup, supersedes, retraction} — as per VOevent cite

EPNCore vocabularies

In extensions, spectral: (mostly related to reflected light)

geometry_type: {direct, specular, bidirectional, directional-conical, conical-directional, biconical, directional-hemispherical, conical-hemispherical, hemispherical-directional, hemispherical-conical, bihemispherical, directional, conical, hemispherical, other geometry, unknown}

spectrum_type: {raw, transmission, absorbance, normalized absorbance, optical depth, absorption coefficient, optical constants, ATR transmission, ATR absorbance, complex admittance, complex impedance, relative complex permittivity, dielectric loss tangent, relative complex permeability, magnetic loss tangent, bidirectional reflectance, bidirectional reflectance distribution function, radiance factor, reflectance factor, normalized reflectance, albedo, normalized Stokes parameter Q, normalized Stokes parameter U, normalized Stokes parameter V, polarization contrast, degree of linear polarization, polarization position angle, degree of circular polarization, thermal emission, thermal radiance, thermal emittance, thermal emissivity, scattering intensity, differential scattering cross section, normalized differential scattering cross section, scattering cross section, absorption cross section, extinction cross section, scattering efficiency factor, absorption efficiency factor, extinction efficiency factor, single scattering albedo, Raman scattering intensity, normalized Raman scattering intensity, Raman scattering coefficient, Raman scattering efficiency, fluorescence emission, normalized fluorescence emission, fluorescence emission efficiency}

=> Specific vocabularies, ready