Solar System UCDs: Assessment Study of Unified Content Descriptors (UCDs) for the Solar System Resources (Planetary sciences and Heliophysics)

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Study Documentation

- Currently in v0.5.
  Document will be posted on IVOA Interop page.

- Participation/inputs from:
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Cases Studied

- Comets and Asteriods
- Samples (e.g. meteorites)
- Space Physics (i.e., plasma measurements in space)
- Imaging and Spectroscopy
- Solar and Heliophysics

Notes for the following section tables
- Bold face UCDs are new UCDs proposed for evaluation to the IVOA semantics group.
- "Suggested UCDs" are the initial propositions by the study groups, before discussion.
- "Proposed UCDs" are the proposition after internal discussion and comparison between the various cases studied.

Comets and Asteroids

Suggested UCD	Proposed UCD	Note
phys.mol.elecband	phys.atmol.transition	electronic band of the transition
phys.mol.species	meta.id;phys.atmol	chemical species
phys.reflectance	phys.albedo	reflectance of the body
src.orbital.smajAxis	phys.size.smajAxis;src.orbital	«angSize» implies sky observation, not 3D measurement
src.orbital.Tisserand	**src.orbital.Tisserand**	Tisserand parameter
src.orbital.TissJ	**src.orbital.TissJ**	Tisserand parameter respect to Jupiter
em.line.FeKalpha	**em.line.FeKalpha**	Fe K alpha line at 6.4 keV
em.molecline	em.line	Designation of molecular lines
em.molecline.C2	meta.number;**em.line.C2**	number of C2 lines in the observed range
em.molecline.C3	meta.number;**em.line.C3**	number of C3 lines in the observed range
em.molecline.CH	meta.number;**em.line.CH**	number of CH lines in the observed range
em.molecline.NH2	meta.number;**em.line.NH2**	number of NH2 lines in the observed range
em.molecline.CN	meta.number;**em.line.CN**	number of CN lines in the observed range
src.asteroid	src.class	related to asteroids (1)
src.asteroid.family	meta.code.class;meta.id.parent;src.class	family or group to which an asteroid belongs, e.g.: 'Hygiea', 'Themis'...
src.asteroid.specclass	meta.code.class	spectral class of the asteroid, e.g.: 'B', 'C', 'S' ...
src.asteroid.dynclass	meta.code.class	dynamical class of the asteroid, e.g.: 'NEO', Trojan', 'Main Belt'....
src.comet	src.class	related to comets (1)
src.comet.dynclassLev	meta.code.class	dynamic class accorting to Levison, e.g.: 'External', 'Encke'...

(1) The link to asteroid class or the comet class should be made somewhere else. For instance, in a GROUP of the VOTable header, where a PARAM element with ucd="src.class" has a value="asteriod" or "comet". The table column should then refer to that header parameter.

Samples

Suggested UCD	Proposed UCD	Note
phys.sample	meta.code.class;src.sample	related to samples collected within the solar system on Moon, Earth, Mars...
phys.sample.alt	pos.earth.alt;src.sample pos.bodyrc.alt;src.sample	altitude of the finding location
phys.sample.approxloc	meta.note;pos;src.sample	approximate location of the finding in the case that a precise coordinate is unavailable, e.g.: 'Mare Serenitatis', 'Sahara desert'...
phys.sample.cluster	meta.id.parent;src.sample	Eventually indicates the cluster to which the sample belongs
phys.sample.color	meta.code.class;src.sample	color of an object, generally assigned at eye, NOT USABLE for spectral type of stars NOR for the color index, e.g.: 'black', 'reddish'
phys.sample.composition	meta.note;phys.composition;src.sample	rough description of the sample's composition, e.g.: 'olivine, magnetite and glass', 'plagioclase feldspar and anorthite'...
phys.sample.dusttype	meta.code.class;src.sample	'Cosmic dust', 'Artificial terrestrial contamination'...
phys.sample.lat	pos.earth.lat;src.sample pos.bodyrc.lat;src.sample	latitude of the finding location
phys.sample.location	meta.id;pos;src.sample	retrieval location of the sample, e.g.: 'Moon, Mare Serenitatis', 'Earth stratosphere, above Sahara desert', 'Interplanetary medium at 2 AU'...
phys.sample.long	pos.earth.lon;src.sample pos.bodyrc.lon;src.sample	longitude of the finding location
phys.sample.luster	meta.code.class;src.sample	luster of an object, e.g.: 'pearly', 'metallic', 'vitreous'... mineralogical property, generally assigned at eye

Sample (cont'd)

Suggested UCD	Proposed UCD	Note
phys.sample.magnetized	meta.code.class;phys.magField;src.sample	'yes', 'no', 'partially'
phys.sample.mass	phys.mass;src.sample	mass of the sample
phys.sample.meteorclass	meta.code.class:src.sample	meteorite class: 'stony', 'iron, 'stony-iron'
phys.sample.meteorclass.stony	meta.code.class;src.sample	stony sublcass: 'chondrite', 'achondrite'
phys.sample.parentbody	meta.id.parent;src.sample	Parent body of the sample, it can be generic or specific, very hard to recognize for dust, e.g.: 'Itokawa', 'asteroid', 'Moon'...
phys.sample.shape	meta.code.class;src.sample	shape of an object, e.g.: 'irregular', 'spherical'...
phys.sample.transparency	meta.code.class;src.sample	transparency of a solid, e.g.: 'opaque', 'translucent', 'transparent' mineralogical property, generally assigned at eye
phys.sample.type	meta.note;src.sample	Cosmic dust', 'Artificial terrestrial contamination', 'Lunar basalt'...
phys.porosity	meta.code.class;src.sample	porosity percentage of the body
phys.size.smedAxis	**phys.size.smedAxis**	for 3d objects a third axis is necessary. linked to phys.size.smajAxis and phys.size.sminAxis
src.id	meta.id;src.sample	Identifier of the object, e.g.: 'alpha CMa', 'Jupiter Sol-4', '2P/Encke', 'NGC 2683', it can coincide with src.name
src.name	meta.id;src.sample	Name of the object, e.g.: 'Sirius', 'Jupiter', 'Encke', 'NGC 2683', it can coincide with src.id
src.group	meta.id.parent;src.sample	group, family or dynamical class of the object, e.g.: 'Halley type comet', 'AGNII', 'Themis family asteroid'

Plasma

Suggested UCD	Proposed UCD	Note
phys.count	**phys.count**	Same as *phot.count*, but not restricted to photometric measurements.
phys.particle	**phys.particle**	relative to particle physics. This UCD does not exist, although *phys.particle.neutrino* does.
phys.particle.aerosol	**phys.aerosol**	SPASE Particle.ParticleType.Aerosol defined as: A suspension of fine solid or liquid particles in a gas.
phys.particle.alpha	**phys.particle.alpha**	SPASE Particle.ParticleType.Alpha defined as: A positively charged nuclear particle that consists of two protons and two neutrons.
phys.particle.atom	phys.atmol	SPASE Particle.ParticleType.Atom defined as: Matter consisting of a nucleus surrounded by electrons which has no net charge.
phys.particle.dust	**phys.dust**	SPASE Particle.ParticleType.Dust defined as: Free microscopic particles of solid material.
phys.particle.electron	phys.electron	SPASE Particle.ParticleType.Electron defined as: An elementary particle consisting of a charge of negative electricity equal to about 1.602 x 10^(-19) Coulomb and having a mass when at rest of about 9.109534 x 10^(-28) gram.
phys.particle.ion	phys.atmol.ionstage	SPASE Particle.ParticleType.Ion defined as: An atom that has acquired a net electric charge by gaining or losing one or more electrons.(Note: Z>2).
phys.particle.molecule	phys.atmol	SPASE Particle.ParticleType.Molecule defined as: A group of atoms so united and combined by chemical affinity that they form a complete, integrated whole, being the smallest portion of any particular compound that can exist in a free state.
phys.particle.neutron	**phys.particle.neutron**	SPASE Particle.ParticleType.Neutron defined as: An elementary particle that has no net charge and is a constituent of atomic nuclei, and that has a mass slightly large than a proton (1.673 x 10^(-24) gram.)

Plasma (cont'd)

Suggested UCD	Proposed UCD	Note
phys.particle.proton	**phys.particle.proton**	SPASE Particle.ParticleType.Proton defined as: An elementary particle that is a constituent of all atomic nuclei, that carries a positive charge numerically equal to the charge of an electron, and that has a mass of 1.673 x 10^(-24) gram.
em.pw	**em.pw**	Plasma wave part of the electromagnetic spectrum. These waves are measured locally. They are trapped below their cutoff frequencies, and cannot escape toward free-space.
phys.energy.flux	**phys.flux;phys.energy**	To be used instead of *phot.energy.flux*, when not referring to photometry (e.g., for particles).
phys.flow	**phys.flux**	Relative to flow or flux of particle or matter or any quantity
phys.gyrofrequency	em.freq;phys.magField	The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.
phys.plasmafrequency	em.freq;phys.density;phys.atmol.ionStage	A number-density-dependent characteristic frequency of a plasma.
phys.heatflux	**phys.flux;phys.energy**	Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.
phys.phasespacedensity	**phys.density.phaseSpace**	The number of particles per unit volume in the six-dimensional space of position and velocity.
em.radio.50-100MHz	**em.radio.50-100MHz**	Radio between 50 and 100 MHz
em.radio.10-50MHz	**em.radio.10-50MHz**	Radio between 10 and 50 MHz
em.radio.below10MHz	**em.radio.10MHz**	Radio below 10 MHz

Imaging & Spectrocsopy

Suggested UCD	Proposed UCD	Note
em.UV.EUV	**em.UV.EUV**	next to *em.UV.FUV*
em.band	**em.line**	similarly to em.line, but for molecular bands
em.band.CH4	**em.line.CH4**	relative to CH4 molecular bands
em.band.H2O	**em.line.H2O**	relative to H2O molecular bands
em.band.CO2	**em.line.CO2**	relative to CO2 molecular bands
meta.id.coPI	**meta.id.PI**	Name of Co-Principal-Investigator NB: PI = meta.id.PI;meta.main
meta.processed	N/A	obtained through a processing pipeline
meta.derived	N/A	obtained from a combination of observation and/or models
em.molecline.rotation	em.line;phys.mol.rotation	
em.molecline.vibration	em.line;phys.mol.vibration	
obs.calib.dark	**obs.calib.dark**	next to *obs.calib.flat*
phot.radiance	**phot.radiance**	
phot.reflectance	phys.albedo	
pos.occult	**obs.occult**	to be completed with a primary keyword specifying time or location of occultation phenomenon
src.orbital.smajAxis	phys.size.smajAxis;src.orbital	
src.orbital.sminAxis	phys.size.sminjAxis;src.orbital	
src.orbital.number	meta.number;**time.period.revolution**	number of the current revolution
time.period.number	meta.number;**time.period.rotation**	number of the current rotation, e.g., day number on Earth

Solar and Heliophysics

Suggested UCD	Proposed UCD	Note
time.period.number	meta.number;**time.period.rotation**	number of the current rotation, e.g., day number on Earth, or the number of Carrington rotation of the Sun
instr.obsty.experiment	**instr.experiment**	relative to the instrument suite (experiment) in which the instrument is place. This is a usual description in space borne instrumentation.
pos.heliographic	pos.bodyrc	centered on the center of the sun as seen from observer

Other studies

- We tried to set UCDs to non-IVOA data model dictionaries.
  - done with SPASE «Measurement Type». Mapping is not always possible
  - ongoing with NASA/PDS

- «Reverse listing»:
  - For the AMDA tool (several hundreds of physical parameters from various missions and experiments in space plasma physics): list all the UCD used, and there associated parameter name, unit and description
  - Other planetary data repositories ?