A NEO Physical Properties Database @SSDC

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The NEOROCKS project

NEO ROCKS

Near Earth Object Rapid Observation, Characterization and Key Simulations
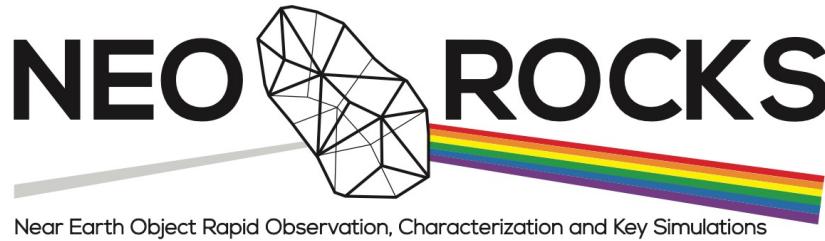
Horizon 2020
Grant Agreement No 870403

NEOROCKS will address the challenge of improving our knowledge on the physical characterization of the Near Earth Objects (NEOs) population and of the implications for their origin and evolution as well as for planetary defense

E. Dotto, M. Banaszkiewicz, S. Banchi, M.A. Barucci, F. Bernardi, M. Birlan, B. Carry, A. Cellino, J. De Leon, M. Lazzarin, E. Mazzotta Epifani, A. Mediavilla, J. Nomen Torres, D. Perna, E. Perozzi, P. Pravec, C. Snodgrass, C. Teodorescu, S. Anghel, N. Ariani, A. Bertolucci, F. Calderini, F. Colas, A. Del Vigna, A. Dell'Oro, A. Di Cecco, L. Dimare, P. Fatka, S. Fornasier, E. Frattin, P. Frosini, M. Fulchignoni, R. Gabryszewski, M. Giardino, A. Giunta, T. Hromakina, J. Huntingford, S. Ieva, J.P. Kotlarz, F. La Forgia, J. Licandro, H. Medeiros, F. Merlin, F. Pinna, G. Polenta, M. Popescu, A. Rozek, P. Scheirich, A. Sergeyev, A. Sonka, G.B. Valsecchi, P. Wajer, A. Zinzi.

The NEOROCKS project – Data management

To date, only 20% of the known NEO population has been characterized.
The percentage rises 30% when considering only objects larger than 1 km (Perna et al. 2018).
The reason is that physical characterization requires availability of large aperture telescopes.

The key issue, which marks a radically different approach, is the early onset, i.e. since discovery, of a direct link between orbital and physical characterization.

The proposed process starts analysing continuously the detections, in order to find out those which deserve attention as potentially hazardous. For each object identified, the astrometric follow-up and the associated orbit improvements are activated in closed loop until the accuracy of the ephemerides enables to successfully attempt an observation devoted to physical characterization.

It appears then desirable that both ground-based and space-based data on NEO physical characterization should be **available through a centralized access able to guarantee their long-term archiving, as well as to ensure the maintenance and the evolution of the corresponding data products**

NEOROCKS Data Model : Methodology

Proposal ambitions → Requirement Analysis → Analysis of HW/SW requirements

Domain analysis →

Correctness →
Completeness →
Readability →
Minimalistic → Conceptual Modelling → E-R diagram   Relational model

Implementation constraints →
Redundancy removal → Logical Modelling → Logical Model diagram
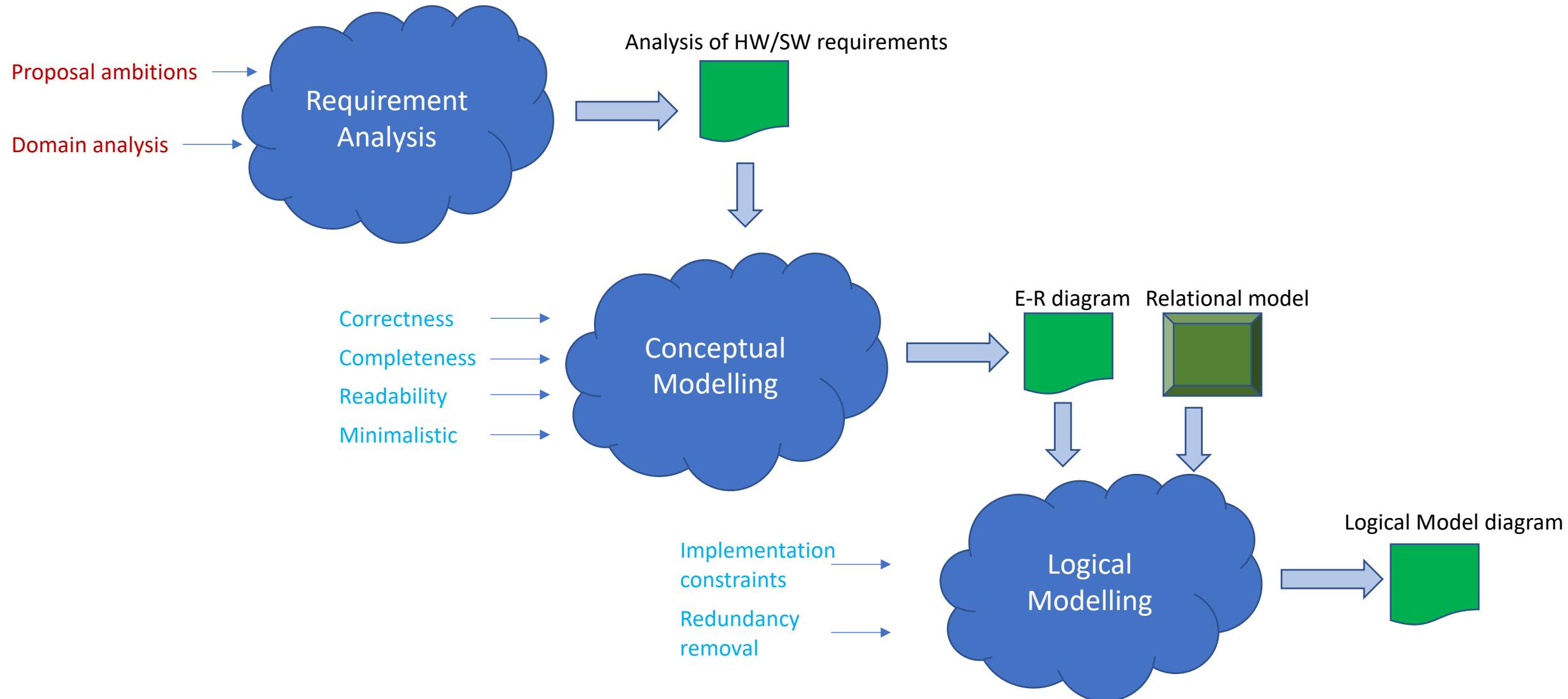
NEOROCKS Data Model – Conceptual Modelling
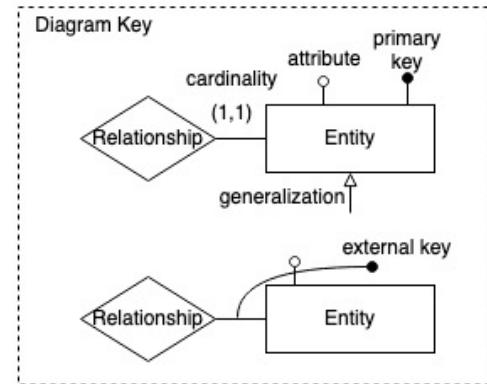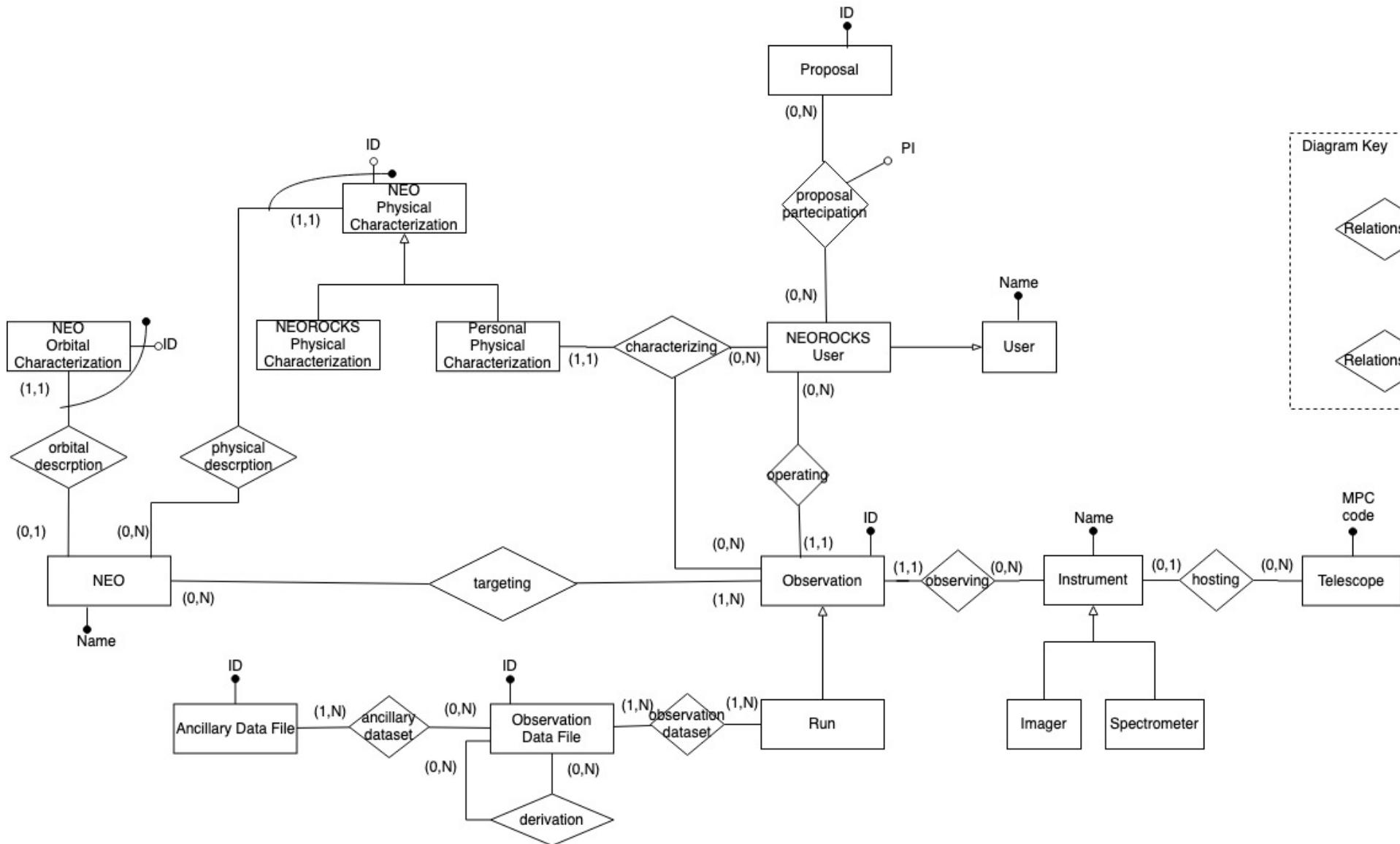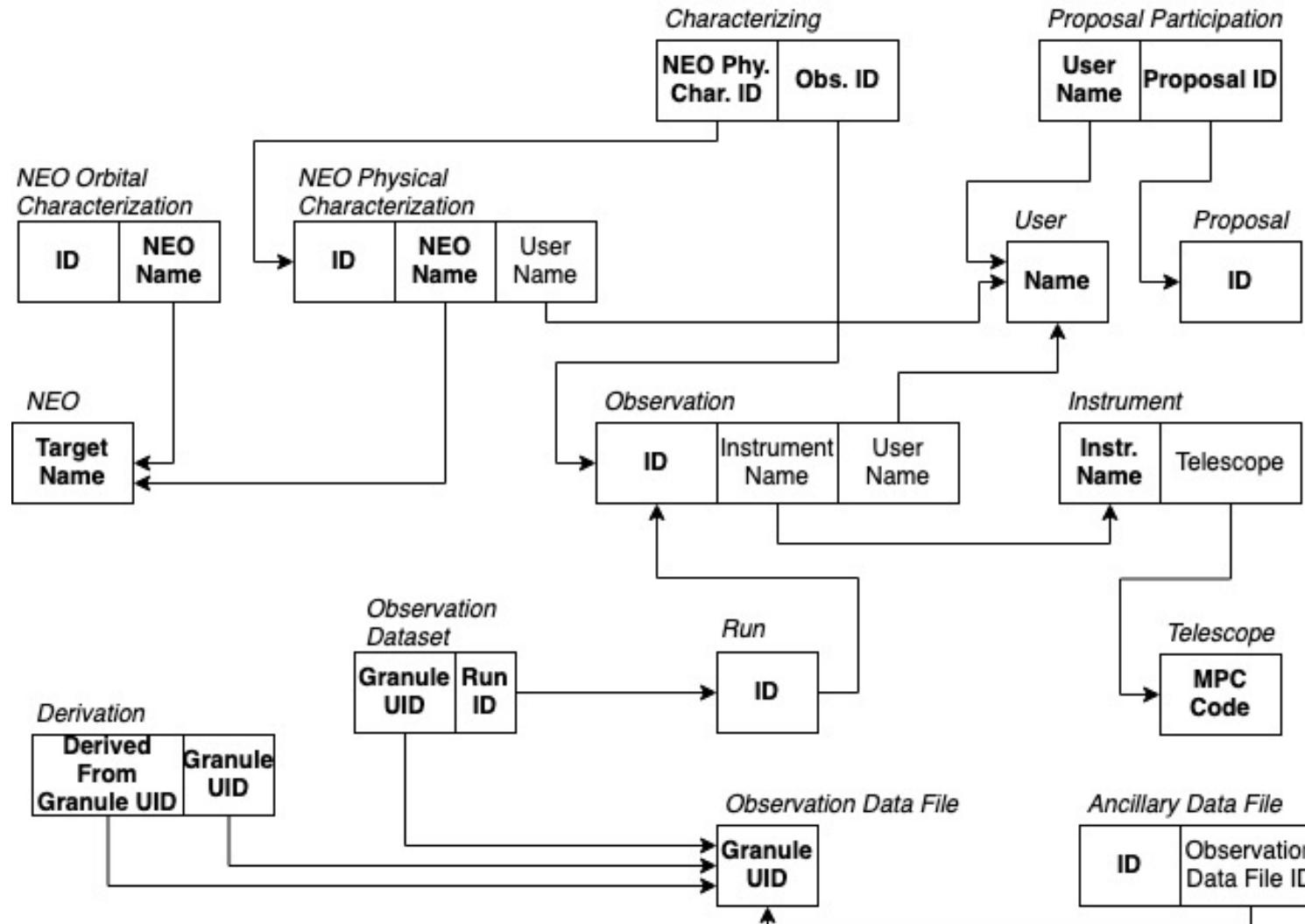
NEOROCKS Data Model – EpnCore Coverage

We tried to find the best match for the parameters used by the NEO community to the EpnCore, finding a nice correspondence.
We picked also from the thematic extensions, finally covering 70% of total parameters coming out from the NEOROCKS community.

Parameters Coverage
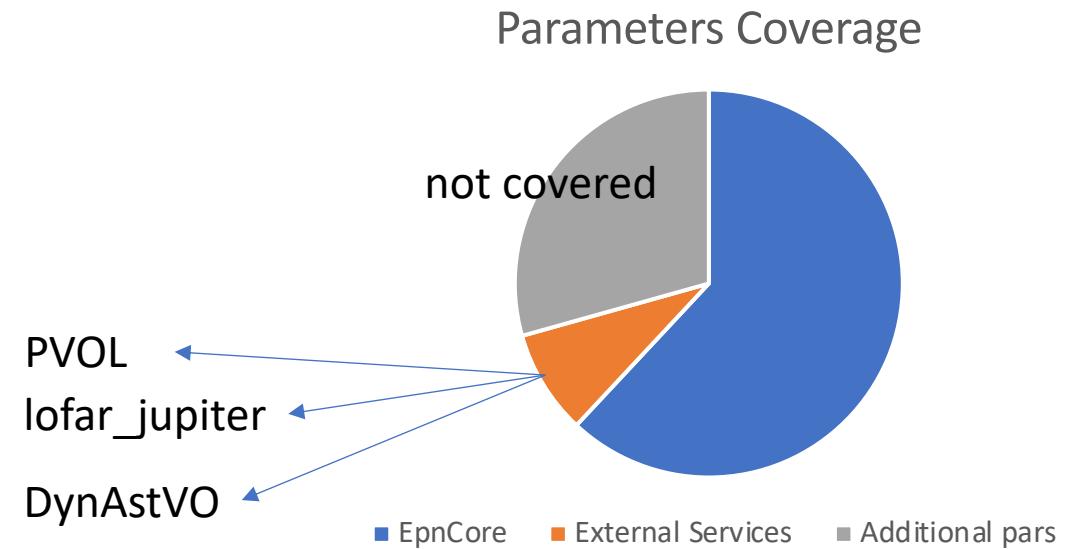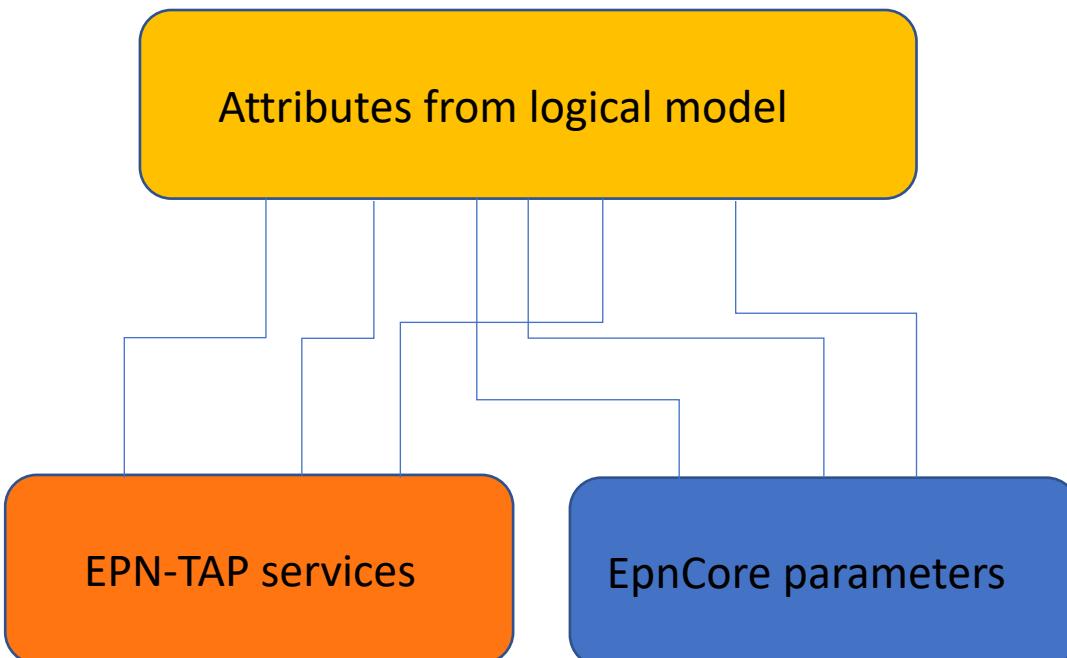
EpnCore derivation

EpnCore

Mandatory parameters

target_name
target_class
dataproduct_type
processing_level
measurement_type
creation_date
modification_date
release_date
granule_uid
access_url
time_(min/max)
c1(min/max)
c2(min/max)
spatial_frame_type
time_sampling_step_(min/max)
time_exp_(min/max)
spectral_range_(min/max)
spectral_sampling_step(min/max)
spectral_resolution_(min/max)
phase_(min/max)
instrument_name
instrument_host_name

= 31

Optional parameters

alternative_target_name
file_name
access_format
access_md5
bib_reference
waveband

= 6

Thematic extension parameters

semi_major_axis
inclination
eccentricity
long_asc
arg_perihel
mean_anomaly
dynamical_class
dynamical_type
sideral_rotation_period
diameter
albedo
magnitude
taxonomy_code

Solar System Obj

north_pole_position
filter
acquisition_id
proposal_id
proposal_pi
proposal_title
campaign

APIS

= 20

External services parameters

id_mpc
moid
pha
slope
Epoch

Dynastvo

observer_lat
observer_lon

PVOL

beam_linear_polarization   **LOFAR_jupiter**

= 8

Additional parameters

primary_body
perihelion
aphelion
asc_node_earth_separation
desc_node_earth_separation
orbital_period
period_quality
spin_vector_direction
bond_albedo
g1_slope
g2_slope
lightcurve_amplitude
color_index_(j-k)
snr $j, \kappa \ \epsilon \ \{U,B,V,R\}$
spectral_slope_vis
spectral_slope_nir
absorption_depth_band_(b)
center_band_(b)
minimum_band_(b)
area_band_(b) $b \ \epsilon \ \{0.7, 1.0, 2.0\}$
polarization_slope
polarization_pmin
polarization_inversion_angle
polarization_pmax
polarization_Ψ
cometary_activity
satellite_number

= 27

IVOA Interop meeting 2021– Solar System IG

NEOROCKS *(or "My FAIR Planetary Defense")*
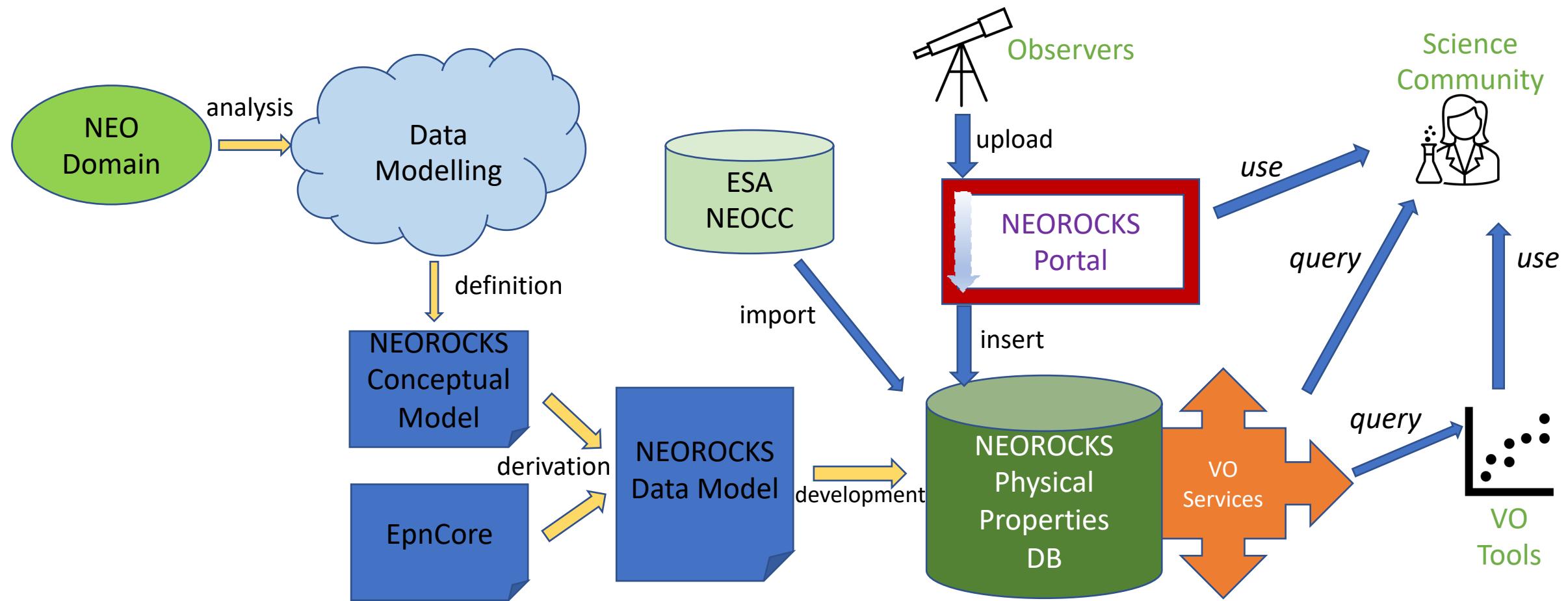
# Open Questions – NEO designation

N : TARGET NAME
I : ID MPC (PERMANENT DESIGNATION CODE)
A : ALTERNATIVE TARGET NAME

provisionally designated
N = "1996 GT"
I = NULL
A = "1996 GT"

discovery

object merging as secondary

identified (primary is "1994 GS")
N = 1994 GS
I = NULL
A = "1994 GS#1996 GT"

permanent designation

secondary merged permanently designated
N = 1994 GS
I = 65804
A = "65804#1994 GS#1996 GT"

object naming

secondary merged permanently designated with name "pluto"
N = 1994 GS
I = 65804
A = "pluto#65804#1994 GS#1996 GT"

object merging as primary

identified (secondary is "1994 GS")
N = 1996 GT
I = NULL
A = "1994 GS#1996 GT"

permanent designation

primary merged permanently designated
N = 65803
I = 65803
A = "65803#1994 GS#1996 GT"

object naming

primary merged permanently designated with name "didymos"
N = 65803
I = 65803
A = "didymos#65803#1994 GS#1996 GT"

permanent designation

new permanently designated
N = 65803
I = 65803
A = "65803#1996 GT"

object naming

new permanently designated with name "didymos"
N = 65803
I = 65803
A = "didymos#65803#1996 GT"

object merging as primary

identification (with "1994 GS")
N = 65803
I = 65803
A = "1994 GS#65803#1996 GT"

object naming

new permanently designated with name "didymos"
N = 65803
I = 65803
A = "didymos#1994 GS#65803#1996 GT"

Is there some VO oriented formalism to correctly represent this information flow?

Open Questions – New data products

Phase curve
- dataproduct_type= ts (time_series)?
- processing_level= 5 (derived)
- measurement_type= phot.mag (Combine phot.mag#pos.phaseAng?)
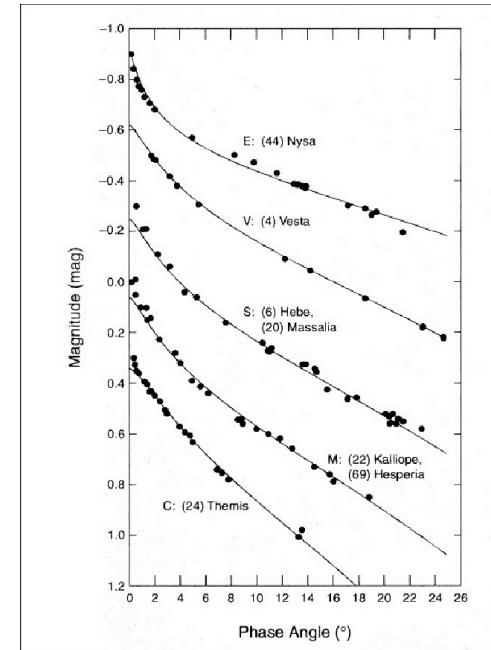
Polarization curve
- dataproduct_type= ts (time_series)?
- processing_level= 5 (derived)
- measurement_type= phys.polarization (Combine phys.polarization#pos.phaseAng?)
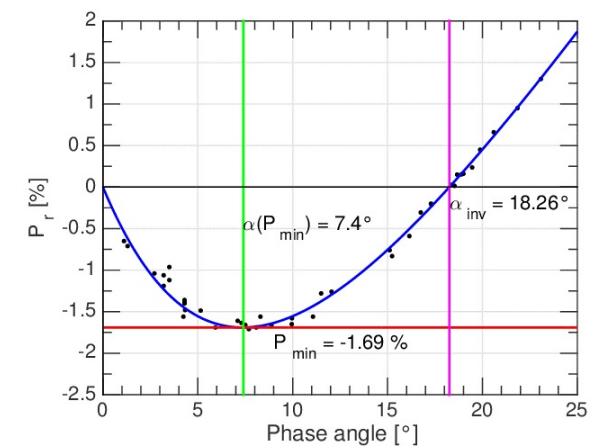
Open Questions

- Reference mapping
  The source dataset for physical properties generally foresee the association of a bib reference for each property.
  How to represent the bibliographic reference for a single physical parameter?

- Observatory Facility Database
  A reference name resolver for observatories would be desirable

THANK YOU