# Yaml serialisation of a « Mango DM » view on an asteroid catalog


- François Bonnarel, Mireille Louys, Laurent Michel, Gilles Landais

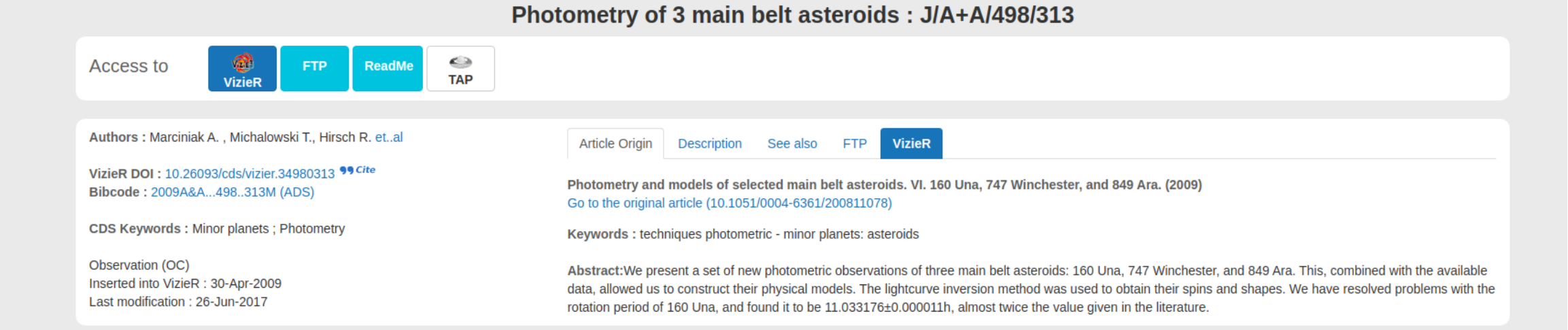

CENTRE DE DONNÉES ASTRONOMIQUES DE STRASBOURG

ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

IVOA

# Vizier use case : Photometry of 3 main belt asteroids

- The catalog is a set of 5 tables
  - Asteroid fondamental parameters
  - 3 light curves
  - 1 aspect table



# Asteroid fondamental parameters joint with asteroid « aspects »

| Ast | Name | H mag | Diam km | i deg | e | a AU | FileName | Orb | LC | Name | Obs s | r AU | delta AU | phAngle deg | Elon deg | Elat deg | Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2000-09-25T02 | 2.5936 | 1.6284 | 7.60 | 22.25 | 0.60 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2000-09-27T21 | 2.5922 | 1.6160 | 6.34 | 21.68 | 0.68 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2000-09-30T02 | 2.5911 | 1.6081 | 5.38 | 21.24 | 0.74 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2001-12-14T04 | 2.6383 | 2.0184 | 19.08 | 143.31 | 4.52 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2002-02-03T00 | 2.6722 | 1.6897 | 2.11 | 137.09 | 4.83 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2002-02-04T00 | 2.6729 | 1.6896 | 1.90 | 136.84 | 4.82 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2002-02-05T02 | 2.6736 | 1.6898 | 1.78 | 136.60 | 4.81 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2005-10-05T02 | 2.5443 | 2.0534 | 21.98 | 84.11 | 3.80 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2005-10-07T02 | 2.5444 | 2.0292 | 21.73 | 84.37 | 3.87 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2005-10-09T00 | 2.5444 | 2.0066 | 21.47 | 84.59 | 3.93 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2005-10-19T02 | 2.5451 | 1.8925 | 19.75 | 85.37 | 4.30 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2007-03-26T02 | 2.8284 | 1.8311 | 0.35 | 185.96 | 0.34 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2007-04-15T21 | 2.8397 | 1.8936 | 8.25 | 181.58 | -0.09 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2007-04-25T21 | 2.8449 | 1.9636 | 11.77 | 180.06 | -0.28 | Bor |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2008-06-05T02 | 2.8786 | 1.9260 | 8.52 | 279.07 | -5.66 | SAAO |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2008-06-07T00 | 2.8780 | 1.9154 | 7.86 | 278.75 | -5.70 | SAAO |
| 160 | Una | 9.08 | 81.2 | 3.823835 | 0.06490120 | 2.72908023 | 160lcs.dat | Orb | LC | Una | 2008-06-15T02 | 2.8749 | 1.8789 | 4.93 | 277.20 | -5.82 | SAAO |
| 747 | Winchester | 7.69 | 171.7 | 18.178812 | 0.34230929 | 2.99789444 | 747lcs.dat | Orb | LC | Winchester | 2002-02-22T02 | 3.8643 | 3.3340 | 13.36 | 215.98 | 20.21 | Bor |
| 747 | Winchester | 7.69 | 171.7 | 18.178812 | 0.34230929 | 2.99789444 | 747lcs.dat | Orb | LC | Winchester | 2002-03-09T02 | 3.8849 | 3.1765 | 11.37 | 215.12 | 21.59 | Bor |
| 747 | Winchester | 7.69 | 171.7 | 18.178812 | 0.34230929 | 2.99789444 | 747lcs.dat | Orb | LC | Winchester | 2002-03-11T02 | 3.8875 | 3.1584 | 11.05 | 214.93 | 21.73 | Bor |
| 747 | Winchester | 7.69 | 171.7 | 18.178812 | 0.34230929 | 2.99789444 | 747lcs.dat | Orb | LC | Winchester | 2002-03-18T02 | 3.8965 | 3.1012 | 9.88 | 214.09 | 22.29 | Bor |

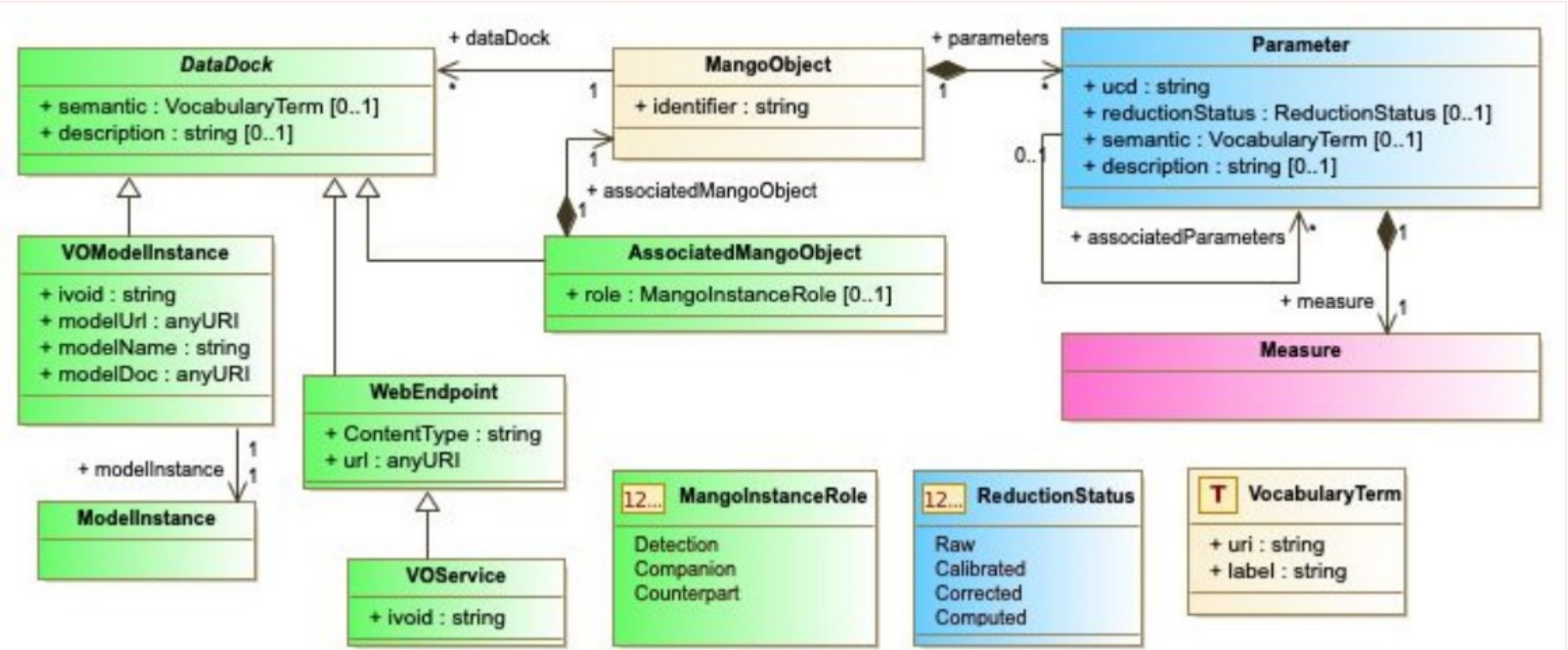
# Photometric measurements (+ positions relative to Earth and Sun)

| Full | JD d | br | Sx AU | Sy AU | Sz AU | Ex AU | Ey AU | Ez AU |
|---|---|---|---|---|---|---|---|---|
| 1 | 2445254.691110 | 1.0218 | -2.411595 | -0.916291 | -0.034912 | -1.467316 | -0.593324 | -0.034899 |
| 2 | 2445254.708700 | 1.0115 | -2.411595 | -0.916291 | -0.034912 | -1.467316 | -0.593324 | -0.034899 |
| 3 | 2445254.791400 | 1.0115 | -2.411595 | -0.916291 | -0.034912 | -1.467316 | -0.593324 | -0.034899 |
| 4 | 2445254.895800 | 0.9633 | -2.411595 | -0.916291 | -0.034912 | -1.467316 | -0.593324 | -0.034899 |
| 5 | 2445254.904910 | 0.9921 | -2.411595 | -0.916291 | -0.034912 | -1.467316 | -0.593324 | -0.034899 |
| 6 | 2445255.651660 | 1.0002 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 7 | 2445255.719150 | 1.0179 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 8 | 2445255.752400 | 0.9430 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 9 | 2445255.847510 | 1.0302 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 10 | 2445255.888460 | 1.0021 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 11 | 2445255.926410 | 1.0095 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 12 | 2445255.956850 | 1.0151 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 13 | 2445255.976150 | 0.9820 | -2.407252 | -0.926368 | -0.035626 | -1.468958 | -0.587229 | -0.035612 |
| 14 | 2445256.653750 | 1.0134 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 15 | 2445256.684980 | 0.9537 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 16 | 2445256.726070 | 0.9669 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 17 | 2445256.756180 | 1.0209 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 18 | 2445256.817620 | 1.0116 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 19 | 2445256.854430 | 1.0447 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 20 | 2445256.891760 | 1.0060 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 21 | 2445256.930330 | 0.9822 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 22 | 2445256.963730 | 1.0005 | -2.402868 | -0.936429 | -0.036339 | -1.470839 | -0.581219 | -0.036324 |
| 23 | 2448533.379405 | 1.0268 | -2.461893 | -0.803487 | -0.027106 | -1.477850 | -0.622902 | -0.027101 |

# Mapping « mango » DM on top of these tables. Why ?

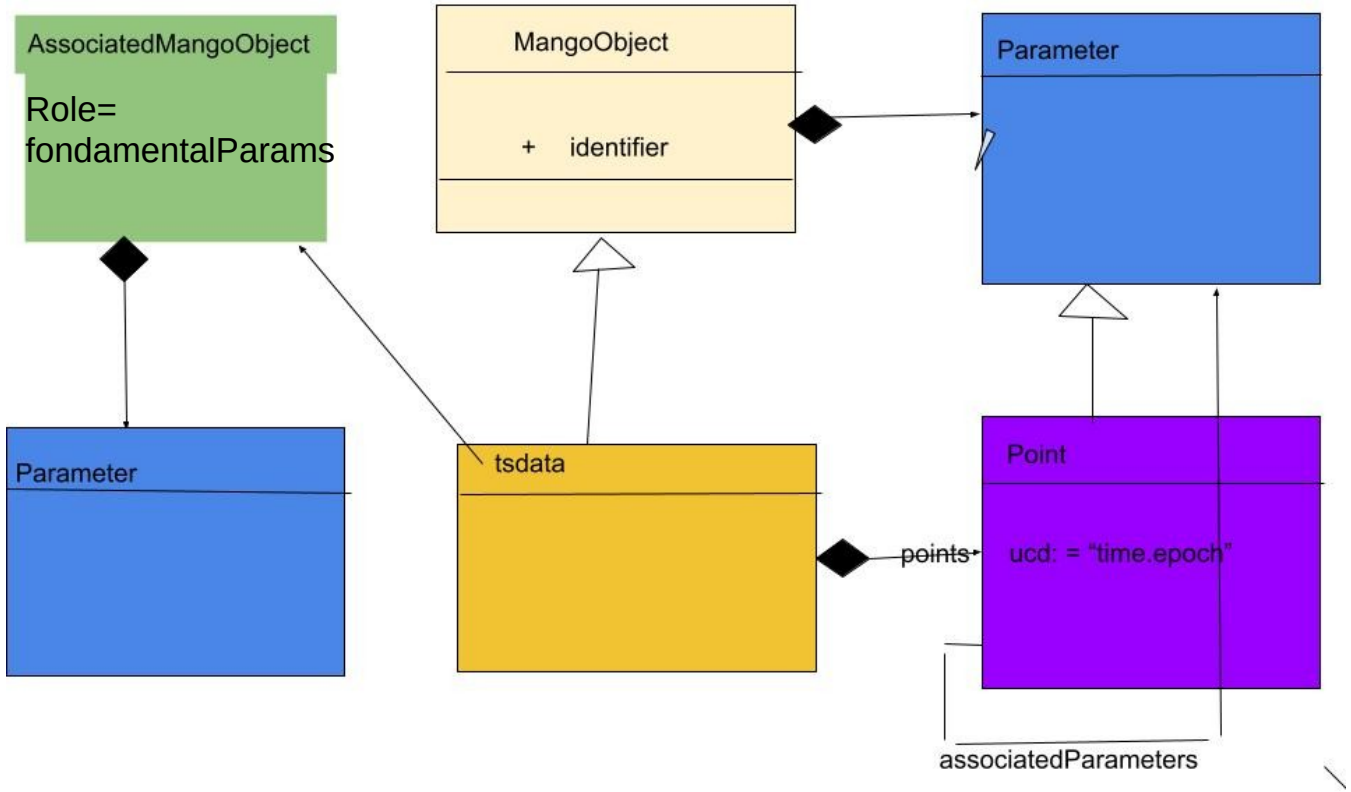
- Low level : reuse MCT and PhotDM . Easilly gathers
  - Measurements, errors
  - Coordinates
  - Coordinate systems
- High level :
  - Separate  fundamental parameters and time variable parameters (=timeseries) within the dame overall instance
- What is « mango » ? : see next slide

# What is mango ?



# Mango extension for TimeSeries

- *Tsdata =*
- *« TimeSeries data »*
- *extends mangoObject and forces composition with Point*
- *Point extends Parameter and forces time.epoch ucd and presence of associatedParameters*



# Yaml serialisation of mango view of photometric measurements tables

- Tsdata instance :
  - Composes « Points » each made of an independant Time Parameter object which associates other Parameters : brighntness, x,y,z distances to earth and
  - Also contains an intances of associatedMangoObject which gathers fundamental source Parameters (mean brightness, orbit parameters)

- Look at the yaml file

# Yaml serialisation
# How and Why ?

- Proposed datamodel annotation of VOTable should make possible to transform VOTables into Yaml files
  (parsing XML → model objects in memory →save in yaml)
- Yaml is :
  - human readable
  - Python code can easily manage and make use of the mango objects :
    - plots
    - combined/computed columns