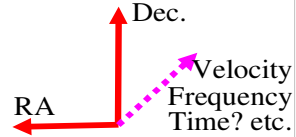


WP7 T7 Radio Cubes

- Bonnarel, Harrison, **Richards**, Rixon
- Start with spectral image cubes
 - Options for 3rd axis depend on available models
 - e.g. need polarization to include NVSS IQU cubes
- Format usually FITS or Measurement Set
 - ~Science ready (can't recalibrate at this stage)
- SAMP tools Aladin, GAIA good for quick looks
 - Need specialised packages for quantitative work



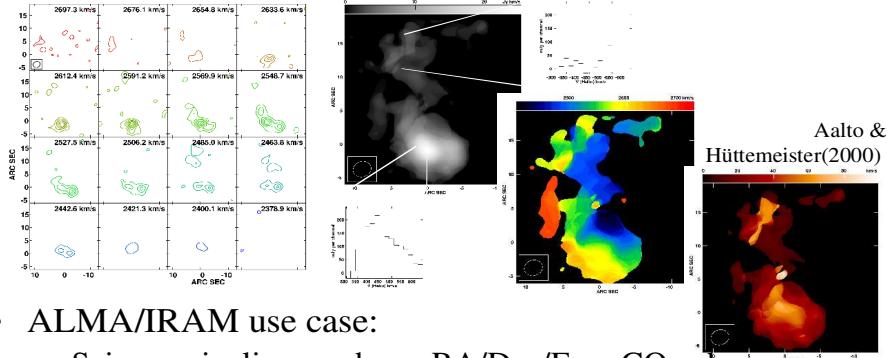
'Cube' can mean any number of axes > 2 but we start with the commonest types currently available.

Radio cubes can be from interferometry or from single dish mosaics. Cubes can be translated, rotated, scaled... but proper recalibration would involve going back to the input visibility data/spectra.

Measurement Sets will be native data format for ALMA and probably EVLA and eventually most? other interferometry data. Can be interconverted with FITS, not always optimally - RadioNet ALBiUS package working on interoperability and preservation of metadata.

Generic visualisation tools don't fully understand radio e.g. Jy/beam, switches to allow sidelobe suppression etc. etc. (and would be too complicated if they did the equivalent for every wavelength).

WP7 T7 Radio Cubes



- ALMA/IRAM use case:
 - Science pipeline produces RA/Dec/Freq CO cube
 - Convert to velocity using line rest freq. (STC)
 - Extract spectra, intensity, velocity, vel. dispersion...



Name and title of the person

Example of common products from an image cube

Use knowledge of line rest frequency to convert to velocity (need to know in which channel, what convention e.g. LSR or Helio, Radio or Optical or Relativistic - covered well by STC)

Select small RA-Dec regions to extract spectra

Make 0th, 1st, 2nd moments (total intensity, velocity, dispersion)

These require suitable smoothins and cutoff levels for noise rejection

WP7 T7 Radio Cubes

- *Finding* spectral image cubes
 - What metadata should publishers provide?
- *Using* spectral image cubes
 - Download, use desktop packages
 - UWS manages i/o to archive-based pipeline services
- SIAP+SSAP = Simple Cube Access Protocol?
 - Combine fields as needed, plus a few extra
- Registry issues - data volume, describing *services*
- Compatibility with e.g. Char IFU model



The same principles as for any data apply to image cube metadata - our job is to define the specific terms needed.

Some science goals may be met simply by using e.g. Aladin to fly through a cube (e.g. what is direction of rotation of a galaxy) but products such as example on previous page need specialised heuristics to produce clean products and meaningful scales (e.g. Jy/beam/channel to Jy.km/s).

Hence, experienced users will want to manipulate cubes themselves. Others may use remotely-steered pipelines set up to produce customised products within the parameter space appropriate for the specific data collection, using UWS etc. to manage the process. Need to return processing history in useful form.

Cubes can be 10s - 1000s MB, so users need to know what they are letting themselves in for, cut-outs are useful.

I propose to fillet SIAP and SSAP documented specifications, and use Char and STC as the basis for any additional parts required for a 'SCAP' standard. The technical experts will ensure that it is feasible and provide the real work. Close liaison with Registry, UWS and SAMP as well as other 3D models is needed.

WP7 T11 Units

- Louys, **Richards** +? (see IVOA team work at www.ivoa.net/internal/IVOA/UnitsDesc/UnitsMir2_10mar.html)
- Requirements discussed at last VOTech
 - Support dimensional analysis, ADQL, reference frame conversions
- Backus Naur approach (Derriere)
- UML model (Louys)
- Draft standard document (Richards)
 - If approved, populate with standards using existing



libraries

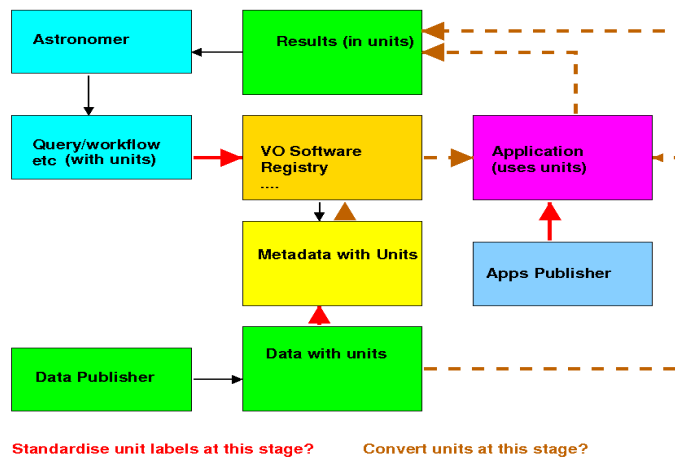
Name and title of the person

No point in duplicating previous discussion, report on IVOA web page

Will produce examples for next Interop and, if approved, I will formalise and expand the suggested conventions in document form. The guiding principle is to maximise consistency with present usage (Vizier, HEASARC, FITS etc).

I hope that the actual xml etc. will be written/adpated by the experts...

WP7 T11 Units



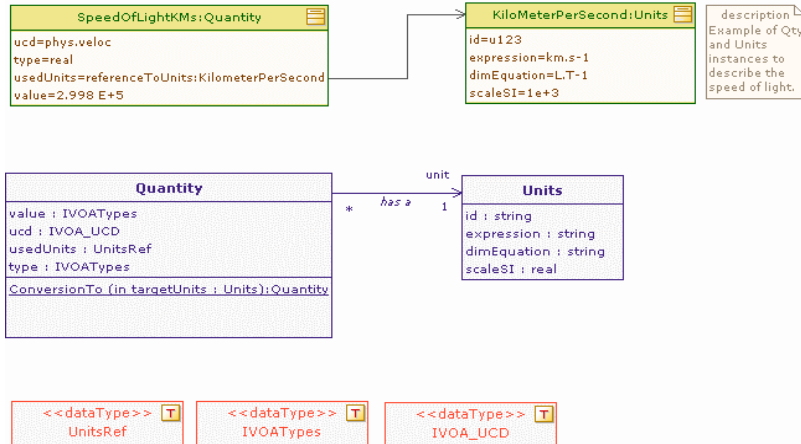
Standardise unit labels at this stage?

Convert units at this stage?

Data publishers and application publishers use a wide range of units. This is OK as long as the unit labels are interpretable by the VO. This workpackage has to write the standards to specify what this involves and provide the tools (mostly already written?) to perform simple conversions e.g. m to km. More complex conversion tools (e.g. B1950 to J2000) are thought of as applications which should be supported but this workpackage does not write or maintain these.

At present, astronomer queries in ADQL have to know the native units of the data they are seeking to extract. Another application of the Units standard suggested by Lusted would be to convert between query and database units, and back again, including forming products not already present. We would have to be careful to limit this to cases where there is no loss of precision or metadata (e.g. frequency \gg wavelength could be problematic).

WP7 T11 Units



Model by Louys

Bottom: Simple types defined by the model and used for class attributes.

Middle: The simple class diagram illustrates how a Quantity Class might use the Units Class to represent which unit string is used to code the value attribute.

Top: As an example, a specific Quantity, SpeedOfLight, is represented by a Quantity instance object and uses the KiloMeterPerSecond object, an instance of the Units Class.