ROUND TABLE DISCUSSION OF THE SESSION: "PHOTOMETRY IN THE VO"

Moderators: I.Chiligarian & J.Salgado

Introduction: How to include access to photometric data in the VO?

- Current situation for model: a pseudo-mini-data-model for photometry is being included in the SED data-model. There is currently no link to the source data model; this is possibly needed
- Current situation for access: no effort in place, as far as we know

To combine spectroscopic data and photometry data two approaches have been followed so far:

- Simple: Use zero-point and band to convert to flux
- Complex: Use filter transmission curves, filter responses, apertures, and zero points (synthetic photometry)

The first question we need to ask is therefore about the ultimate goals:

- Combine photometry data and spectroscopic data in a single SED?
- Fitting against models (attributing proper weight to each photometric point)?
- Automatic classification of sources?

Another interesting aspect was put forward by Garcia-Lario's presentation. The VO concept has an important overlap with the requirements of instrument cross-calibration through either synthetic photometry or calibrated photometry from different instruments/observatories. Is this a concern (and an opportunity) for the VO?

Tody: Proper dealing of photometric points should be handled in the process of generating a SED.

Garcia-Lario: The two main issues I see are: a) photometric data may be the result of large apertures. They cannot be treated the same way as spectroscopic slit data; b) photometric measurements are normally more accurate in absolute terms.

McDowell: One may argue on the last point. There are lots of spectro-photometric measurements in the VO with reasonable accuracy. We need to enforce data providers to provide information on the aperture.

Bayo: Data weighting is a true issue. There is no unique answer on how to weight the data, it depends on the resolution and on the scientific problem.

Chiligarian: Be reminded that aperture is not the only source of photometric inaccuracy. Seeing quality can have an even worse effect.

Skoda: The time domain needs to be taken into account as well. It is very difficult in stellar astronomy to deal with measurements taken at different epochs.

Tody: I would have a question for the astronomers in the audience: how important is it for you to get an homogenised SED? Would some of you sometimes be happy with a list of unharmonised points?

Padovani: The answer depends on the scientific problem. A true SED needs homogenised points. In this case, the data needs to come with their own zero-point, if one wishes to convert them into physical units ...

Colina: ... zero points, uncertainty on the zero points, system transmissions, apertures: all these pieces of information should be available, and the user should be allowed the choice of the data s/he needs. This would be enough.

Garcia-Lario: Let's not forget the time information. As a bonus, this will allow us to easily generate a light curve.

McDowell: Time and aperture are mandatory in the spectral model. The other quantities being mentioned so far need to be added to the model. The whole filter transmission curve should be associated to a photometric data point only when needed. This applies also to the effective special resolution.

Richards: It is important that we do not reject data, which do not have a full set of metadata, because in some

cases they may be not strictly required. I am against making compulsory something, which is not necessary in all possible cases.

Guainazzi: The discussion has taken an interesting direction for the publication of high-energy astronomy data in the VO. So far the approach has been: data providers should provide their data in physical units, it's their problem to do it. It seems now that the photometric model we are outlining could allow us to invert this approach: we could deliver X-ray spectra in counts, and let the photometric model calculate our "synthetic X-ray photometry"

Mc Dowell: This approach is indeed possible in principle. The analogy between high-energy astronomy and photometry is the following: the `"arf"` is the zero-point; the `"rmf"` is the filter profile.

Boselli: Back to the business of spatial resolution: the PSF of IRAS has a bi-dimensional shape. We need not only the encircled energy fraction; we need the true beam shape.

Chiligarian: So, we are back to the crucial point: which metadata should be compulsory? In some cases one does not need zero-points, for instance, if one is interested in studying relative variability.

Richards: For a period discovery research, zero-point is not necessary. Rigorously this is not true, of course, but for objects which typically vary by orders of magnitude, the residual uncertainties induced by the lack of detailed knowledge of the zero-point of each observation can be neglected

McDowell: Once again, everything depends ultimately on the scientific problem. It shall be possible for a user to query data, which don't have a specific characterisation data.

Freudling: There is always a a zero-point, even when it is not specified. For observations with a naked-eye it is something around 3 magnitudes.

Allen: There is a number of databases of photometric systems available. If these databases would be integrated in the VO, would the information included in them be sufficient?

Boselli: for the photometric systems this would be enough. However, this would not suffice for the zero points, because they depend on the observations and the observational conditions.

Genova: We should reject the temptation to exclude data from publication in the VO because they are not fully calibrated. It is important that all data are in the VO, but their data quality is preserved.

Chiligarian: This is true. However, this does not solve our problem. It simply shifts it from data publishing to applications.

Salgado: There should be a protocol, which makes simple for applications to prevent unwanted data to slip through.

Freudling: The accuracy on the zero-point is important. Data centres should be enforced to provide this piece of information.

McDowell: There is another information which is currently missing from the spectral data model: the spatial resolution as a function of a per-bin spectral resolution.

Genova: The point now is: how do we proceed with respect to the spectral data model and the SSAP? Should we delay their promotion to recommendation, waiting for the elements required to support photometry to be included? I am not sure we cannot afford it.

Tody: If the only modification required is adding some quantities to the data model, this is not a big deal and we can afford it. It is very unlikely that we can have the SSAP approved during the next IVOA Inter-Op meeting. We can aim at having a complete draft by then.

McDowell: the spectrum data model is basically ready to go and could make it for the next IVOA Inter-Op meeting. Photometry was intended to be handled in a different model (there was a specific meeting at the last ADASS on this issue). It makes sense to get the spectral model out now, and than later put together a comprehensive SED model (spectrum and photometry).

A this point a lively discussion arose as to whether a specific access protocol for SED is required, separated from the SSAP. The conclusion of the discussion is negative: SSAP can include the access to SED as well.