

SourceXtractor++

Emmanuel Bertin and the SX++ development team

SExtractor has been around for too long!



My Computer



Network Neighborhood



Inbox



Recycle Bin



The Microsoft Network



My Briefcase

Welcome

Welcome to Windows 95

Did you know...
To open a program, button, and then click

What's New

File Edit View Go Bookmarks Options Directory Window Help

Back Forward Home Reload Images Open Print Find Stop

Location: about

What's New! What's Cool! Handbook Net Search Net Directory Software

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JAVA COMPATIBLE

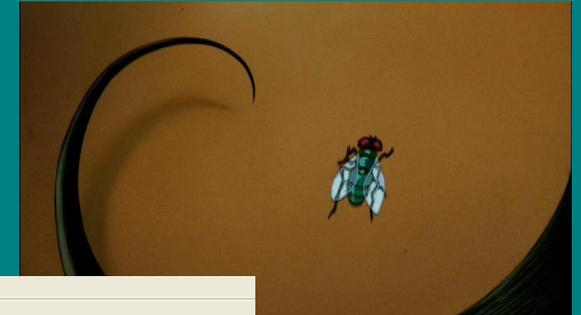
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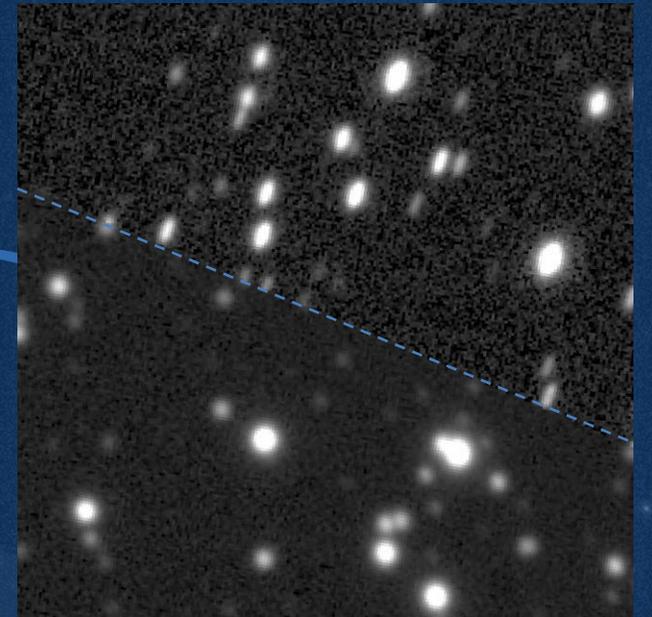
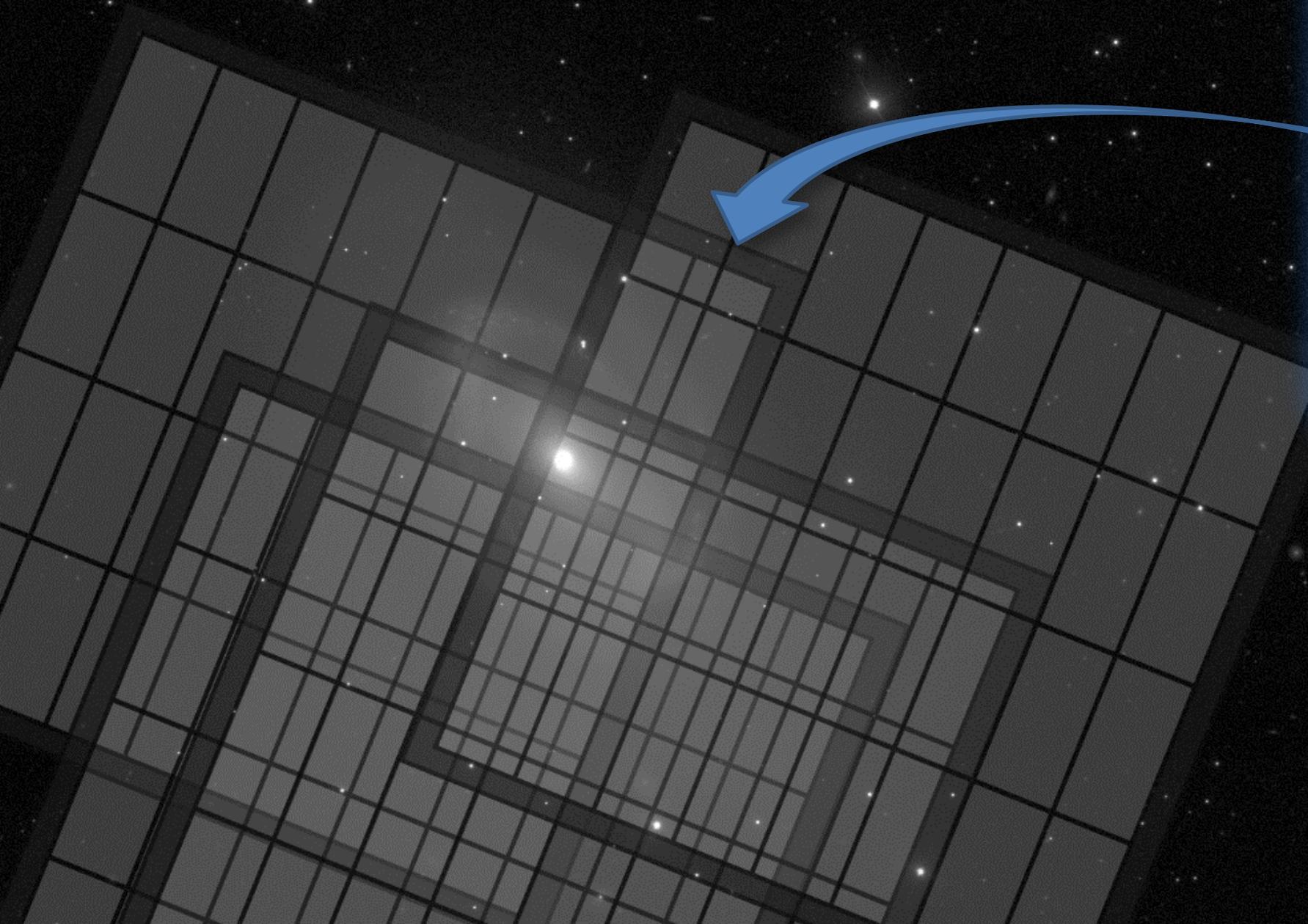
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Welcome

6:18 PM

Dealing with large ditherings



Development team

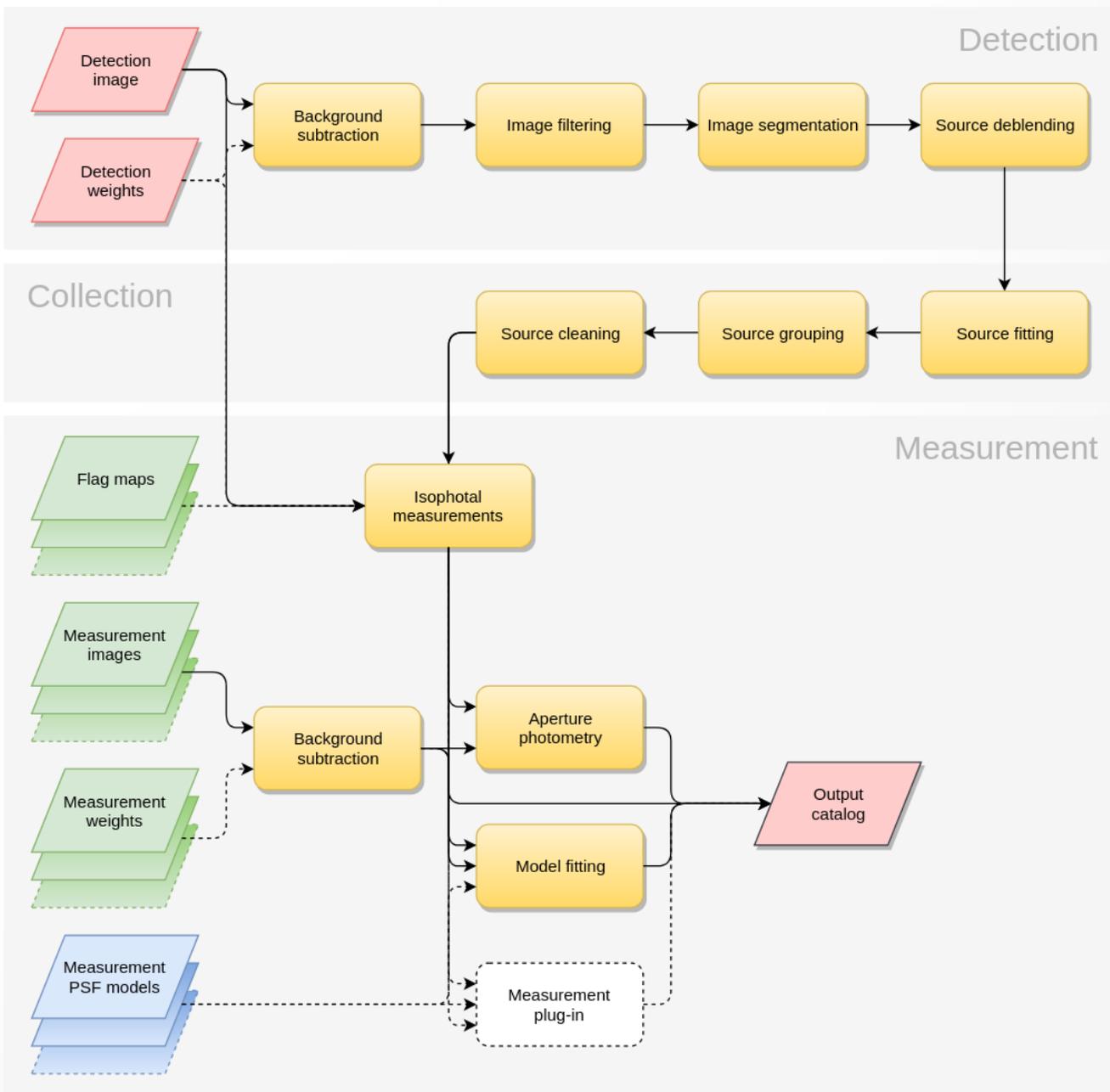


- Alejandro Álvarez Ayllón
- Nikolaos Apostolakos
- Pierre Dubath
- Marc Schefer

- Martin Kümmel

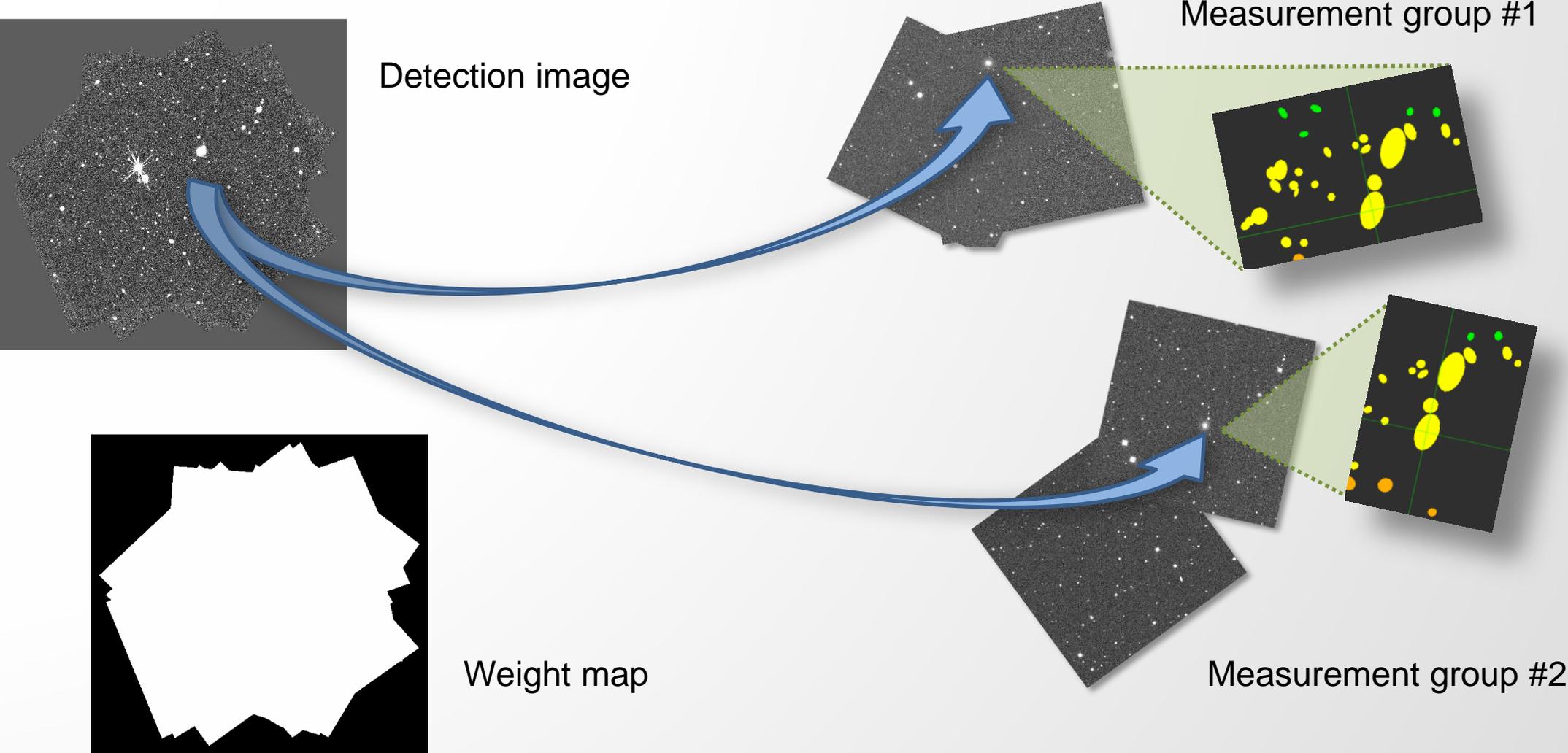


- Emmanuel Bertin

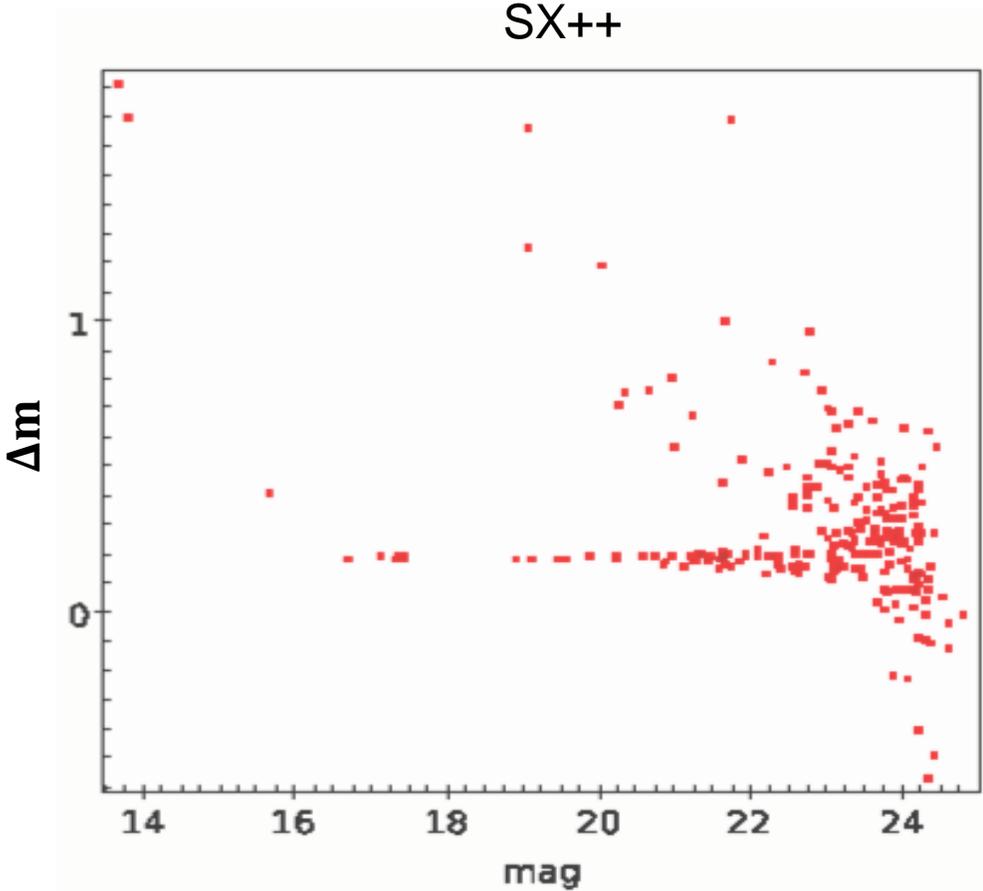
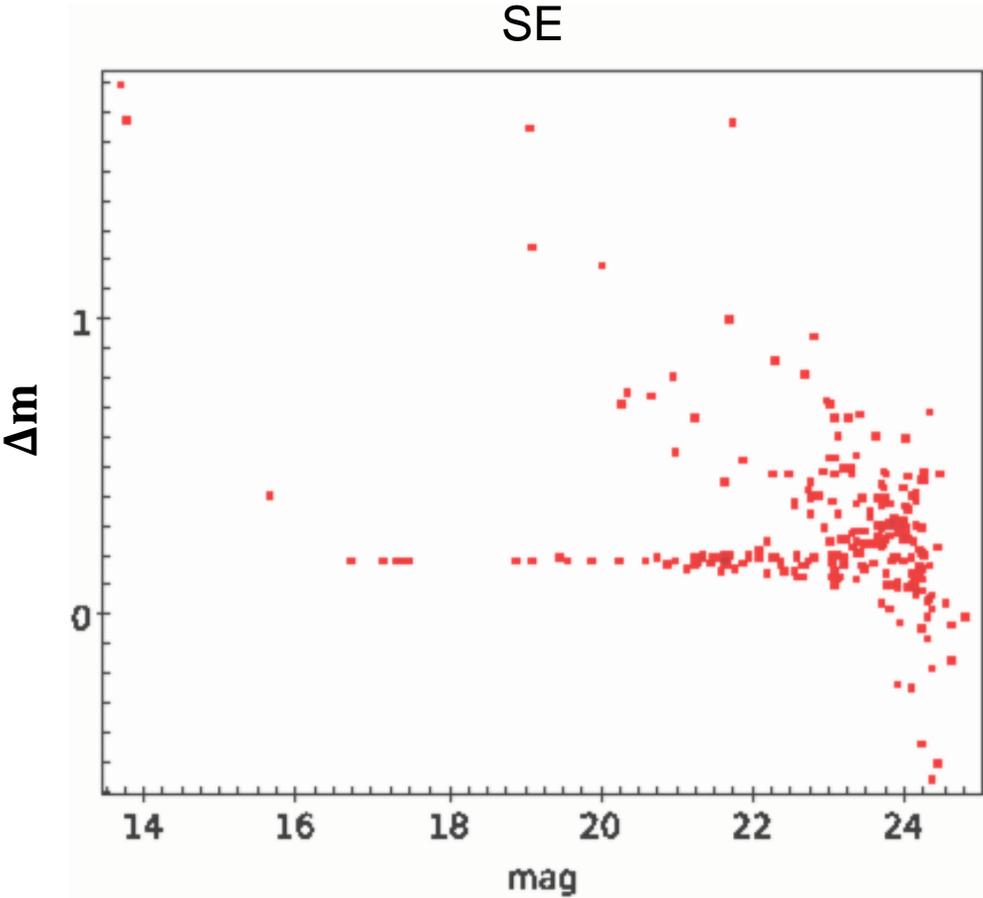


- C++ code
 - Efficiency + abstraction
- Multi-exposure
 - Rely on WCS
- Multi-object
 - Simultaneous model-fitting
- Multichannel
 - Define groups
- Multithreaded
 - One instance per node
- Modular
 - « Property » scheme
 - Plug-ins

Multiframe measurements

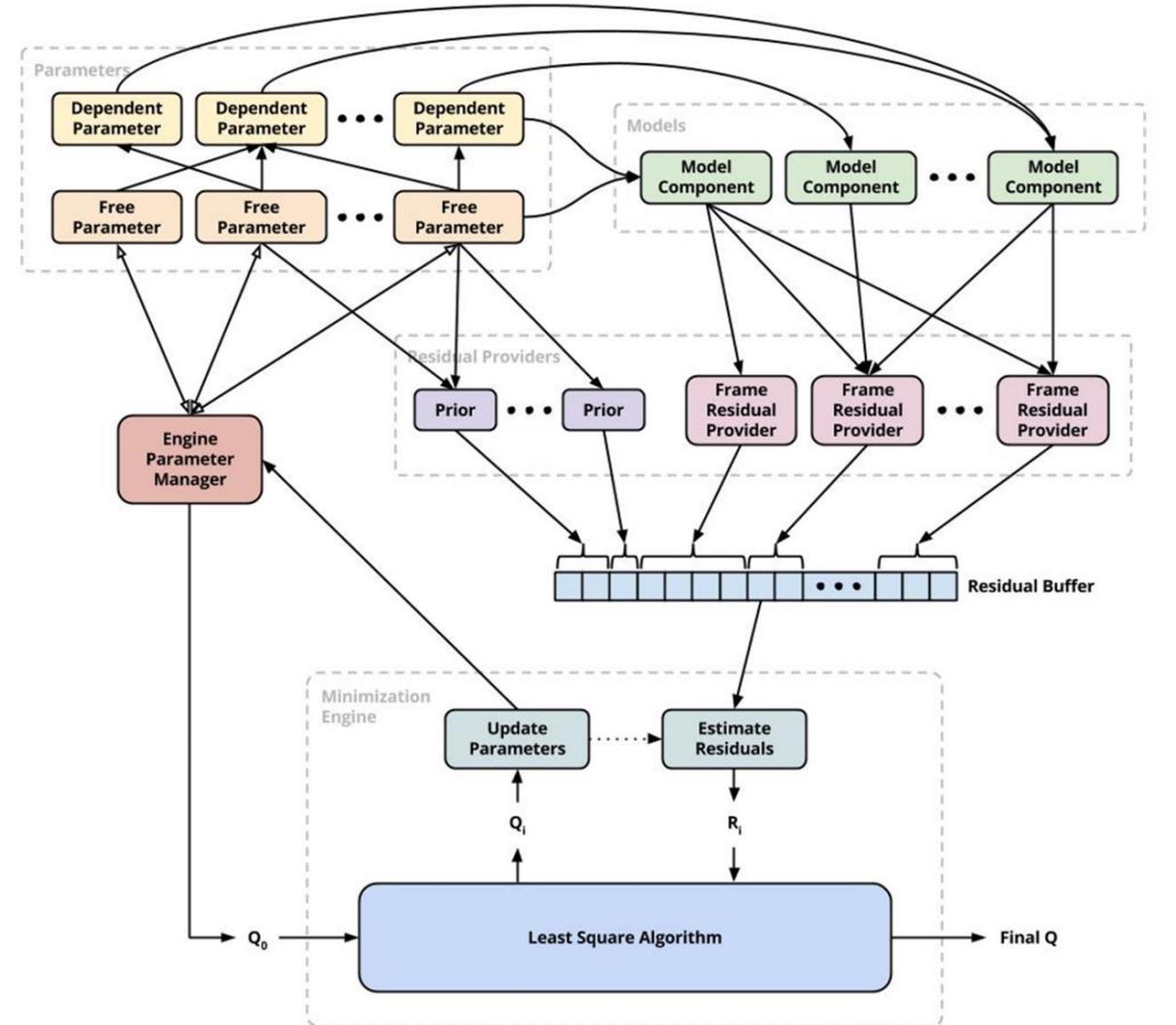


Photometry comparison with the original SExtractor



Flexible model-fitting engine

- Multiple models in one run
- Can combine models
- Can create custom catalog columns
- Uncertainties automatically computed and propagated (from the approximate Hessian of the fit)
- χ^2 +priors (MAP estimator in the Gaussian case)



Proper motions from pixels

```
from glob import glob
import numpy as np
from sourceextractor.config import *

top = load_fits_images(
    sorted(glob('im_?_?.fits')),
    sorted(glob('im_?_?.psf'))
)

top.split(ByKeyword('FILTER'))

# Split each band by image filename (one image per subgroup)
for n, filter in top:
    filter.split(ByKeyword('IMAGE_FILENAME'))

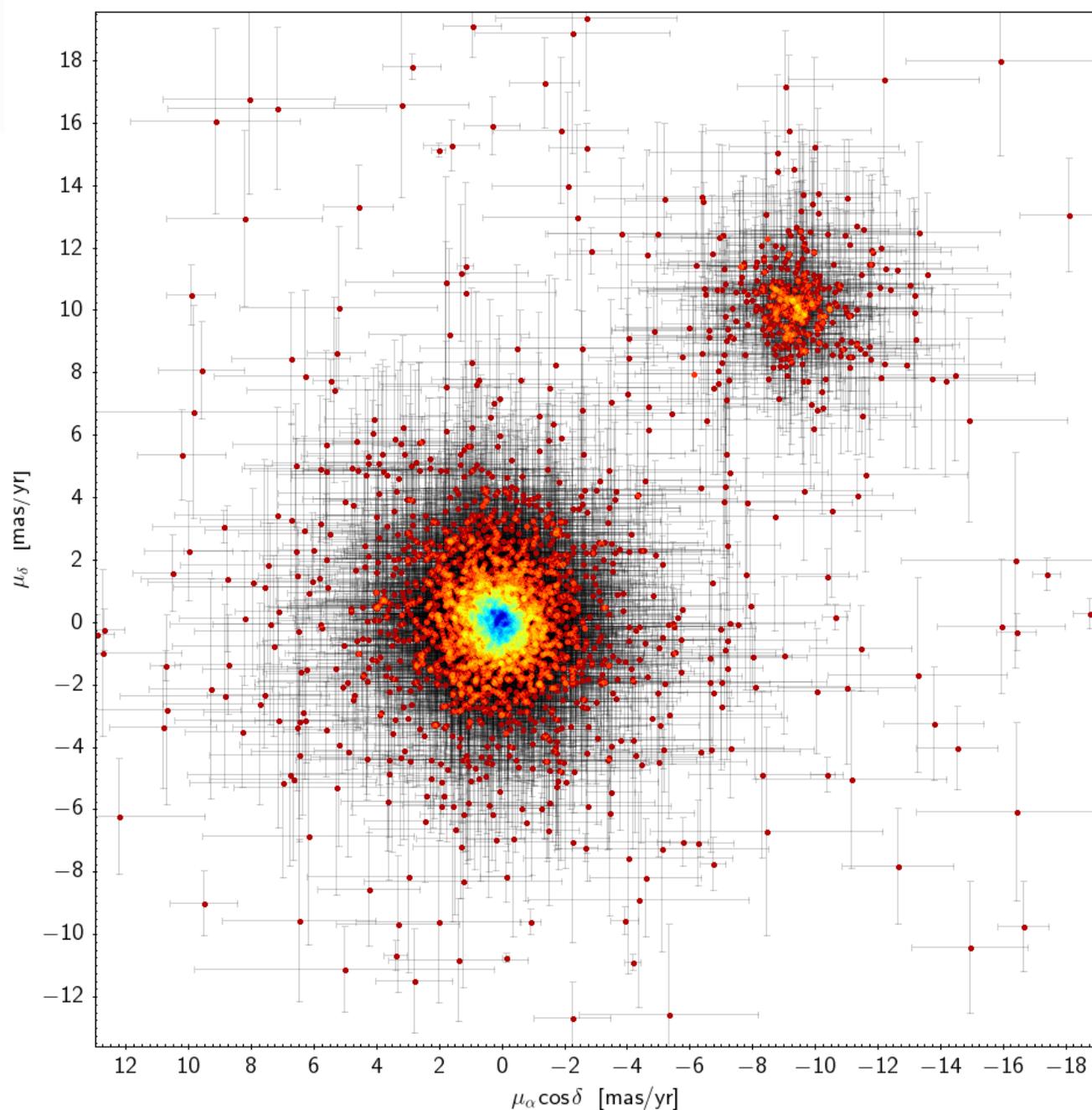
mesgroup = MeasurementGroup(top)

pmx = FreeParameter(0.0, Range((-100.0, 100.0), RangeType.LINEAR))
pmy = FreeParameter(0.0, Range((-100.0, 100.0), RangeType.LINEAR))
add_output_column('pmx', pmx)
add_output_column('pmy', pmy)

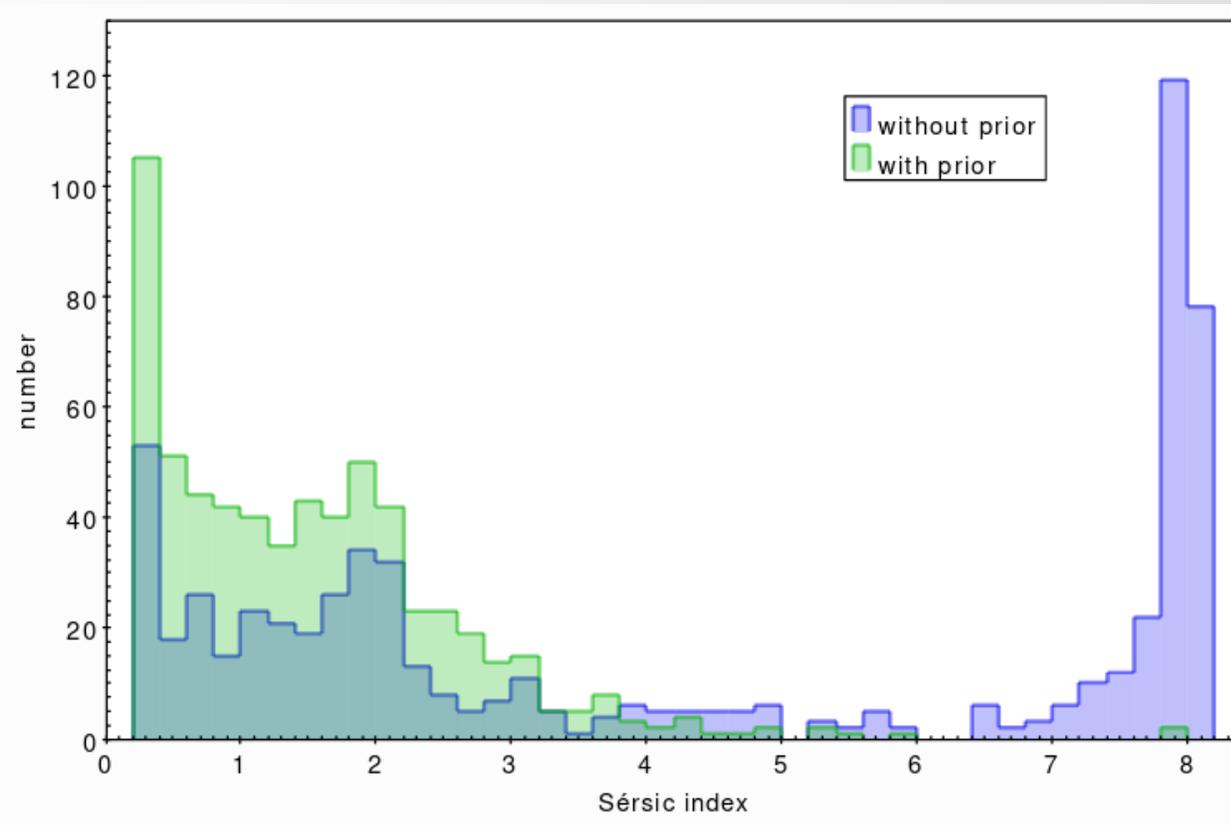
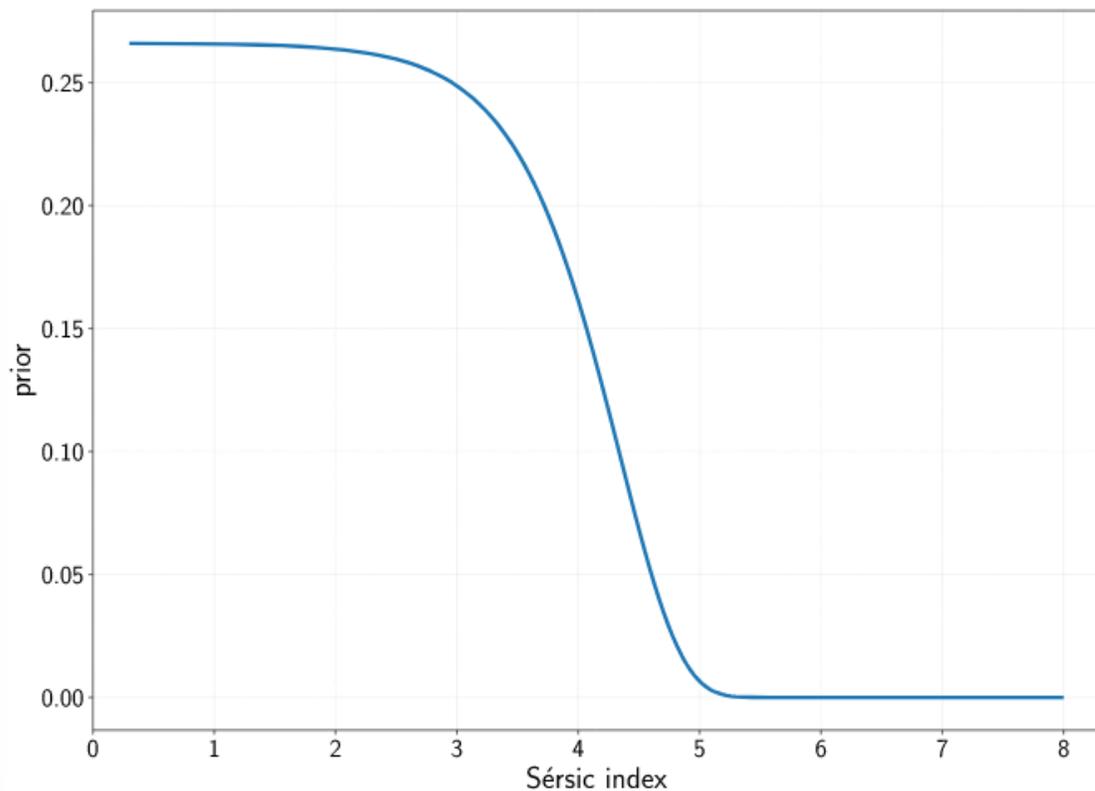
x, y = get_pos_parameters()

# Loop over filters
for filter, group in mesgroup:
    flux = get_flux_parameter()
    # Loop over exposures
    for filename, subgroup in group:
        t = (float(subgroup[0].meta["MJD-OBS"]) - 6000.0) / 365.25
        tp = ConstantParameter(t)
        xr = DependentParameter(lambda x, dx, tp: x + tp*dx, x, pmx, tp)
        yr = DependentParameter(lambda y, dy, tp: y + tp*dy, y, pmy, tp)

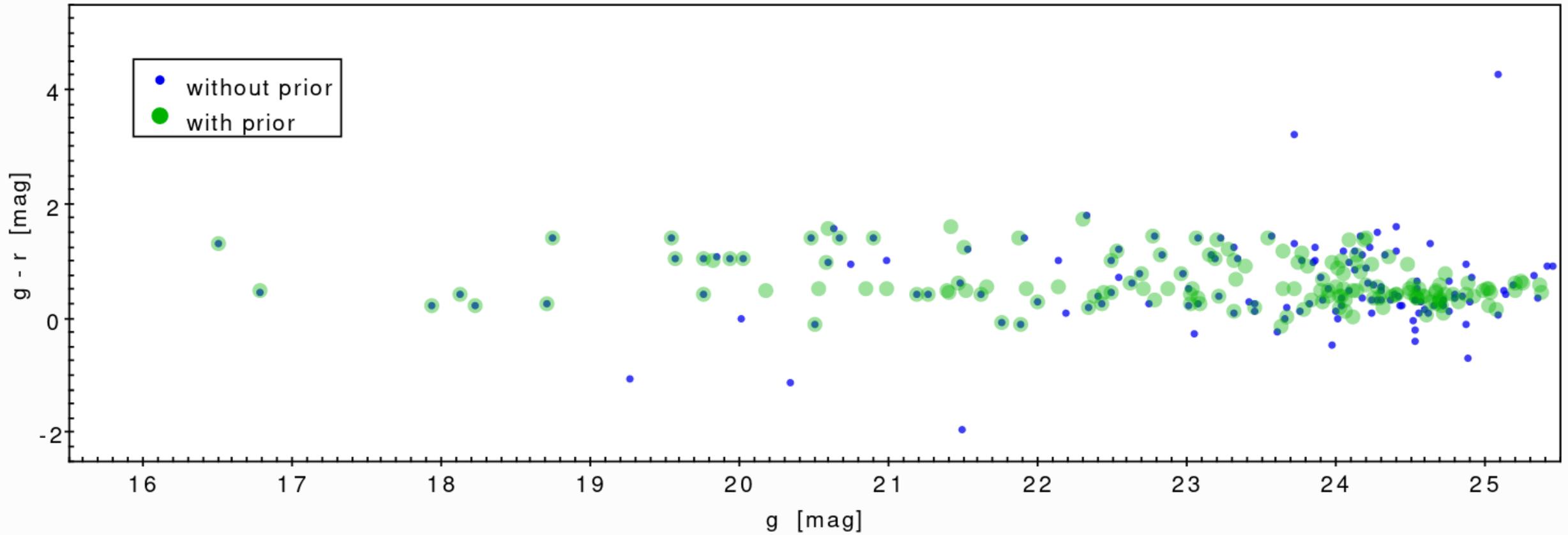
        add_model(subgroup, PointSourceModel(xr, yr, flux))
```



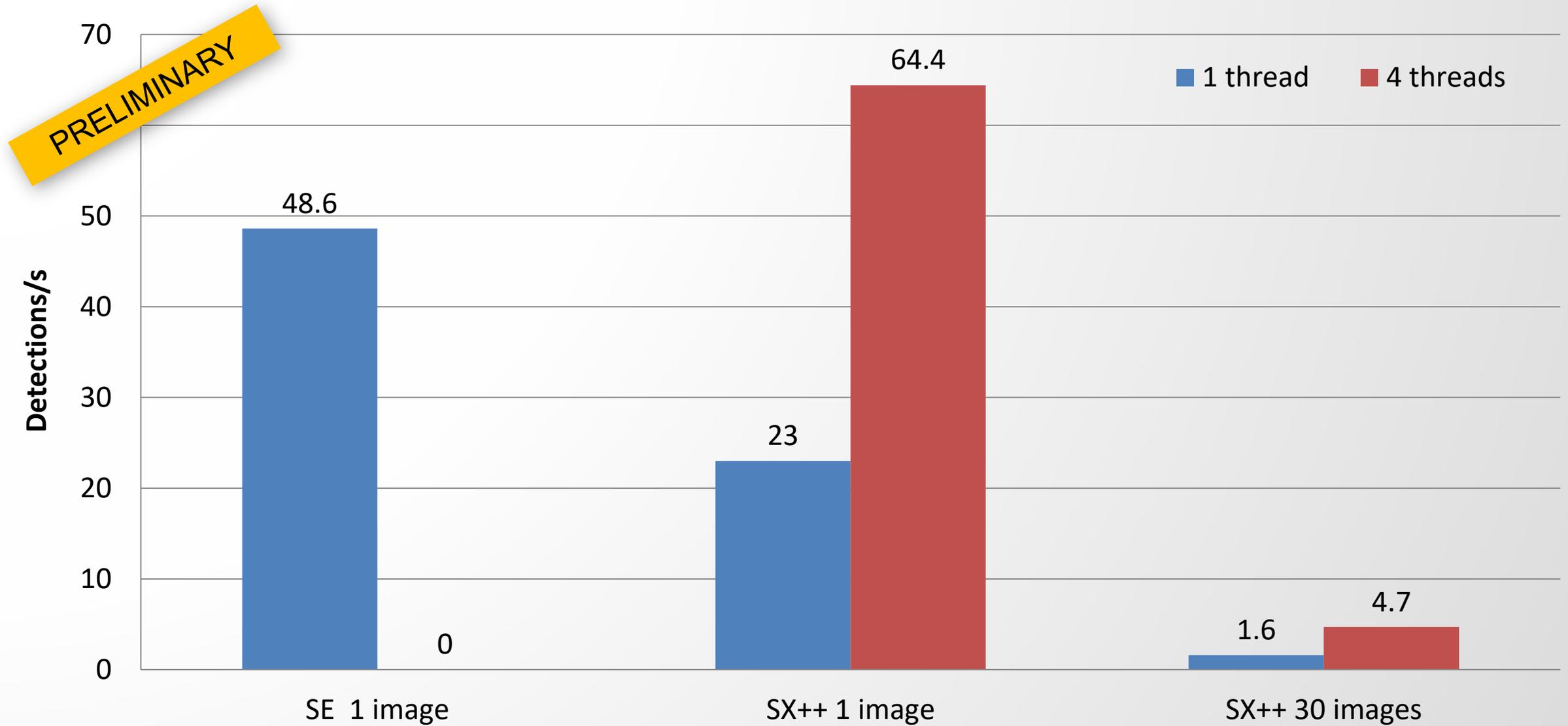
Shape priors



Photometric priors



Performance (pure Sersic fits)



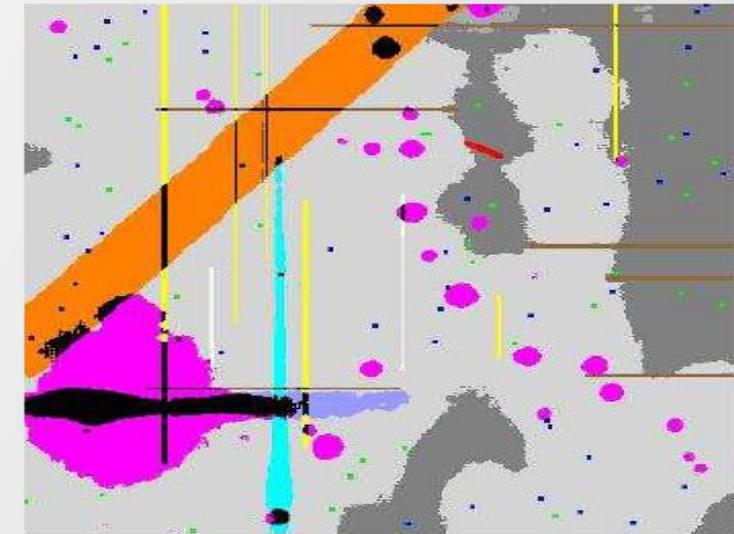
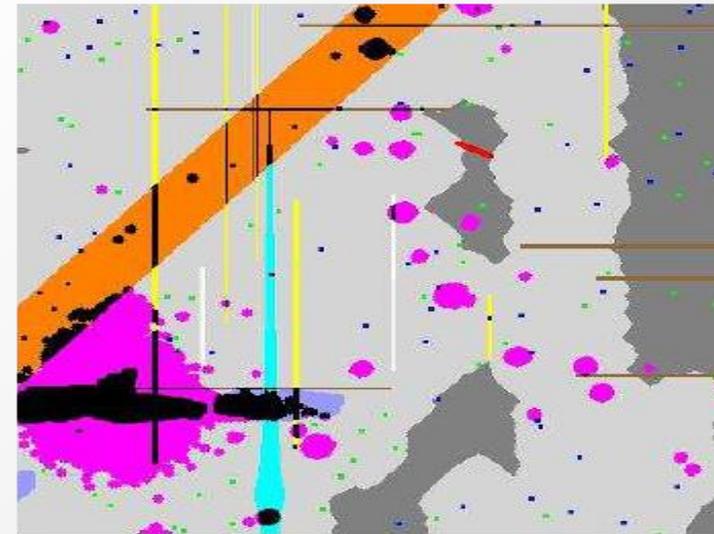
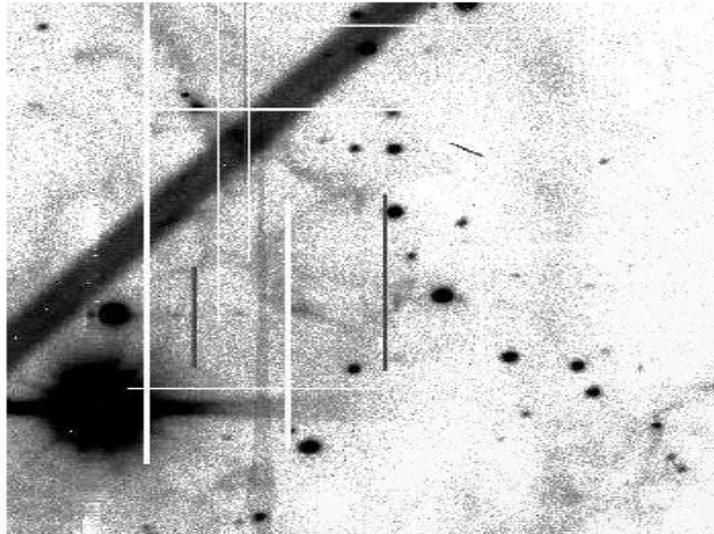
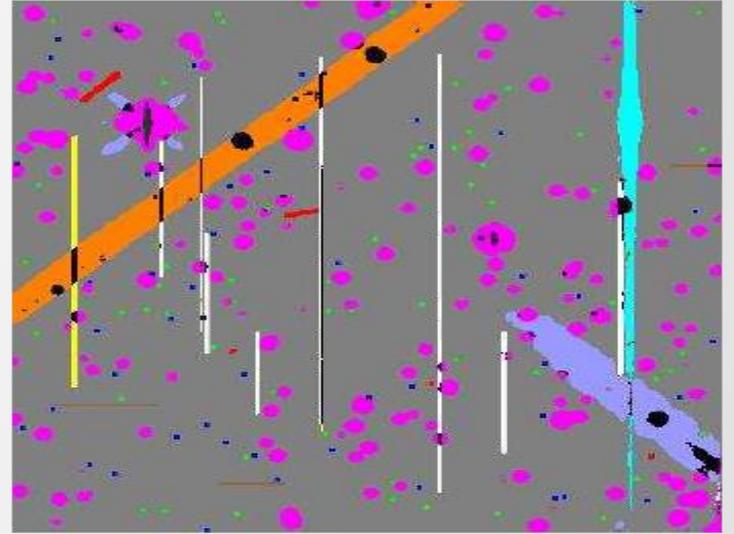
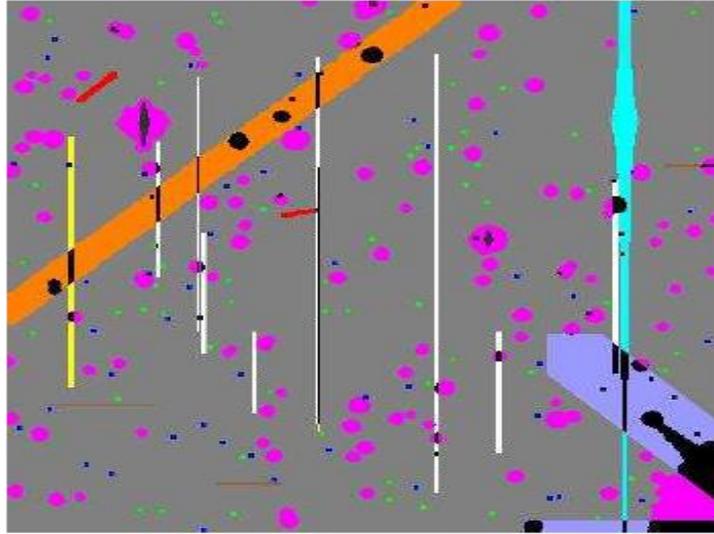
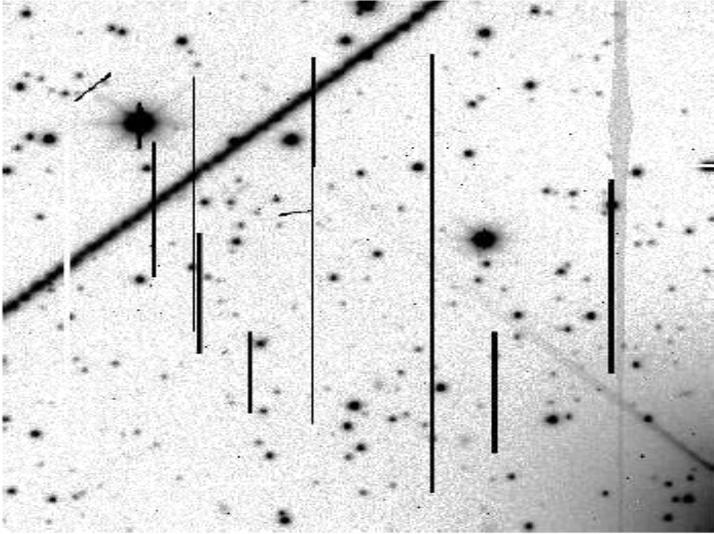
The road ahead

- Early alpha release at <https://github.com/astrorama/sourceextractorplusplus>
- Heavy testing on survey data
- Feedback from users
 - Tune behavior
- Improve performance
- Compatibility with existing companion packages
- Improve documentation
 - <https://sourceextractorplusplus.readthedocs.io>
- High level Python interface
- New AI-based detection/deblending module (M.Paillassa)
- More modules coming

Back-up slides →



MaxiMask example (Paillassa et al. 2019)



Examples of posterior PDFs (Pasquet et al. 2019)

