

Time Domain DRP for SN

Dominique Fouchez, LSST France meeting, Nov 8



DRP and alert from LSST-Stack



- Alert system will produce 10 million of transient candidates per night
 - To be sent to brokers for selection and delivery to community
- DRP : data release :
 - Static release : to produce reduced images, coadditions and catalogs
 - Time domain release : lightcurve of transients : work not yet done in the DM stack

LSST DM - DRP

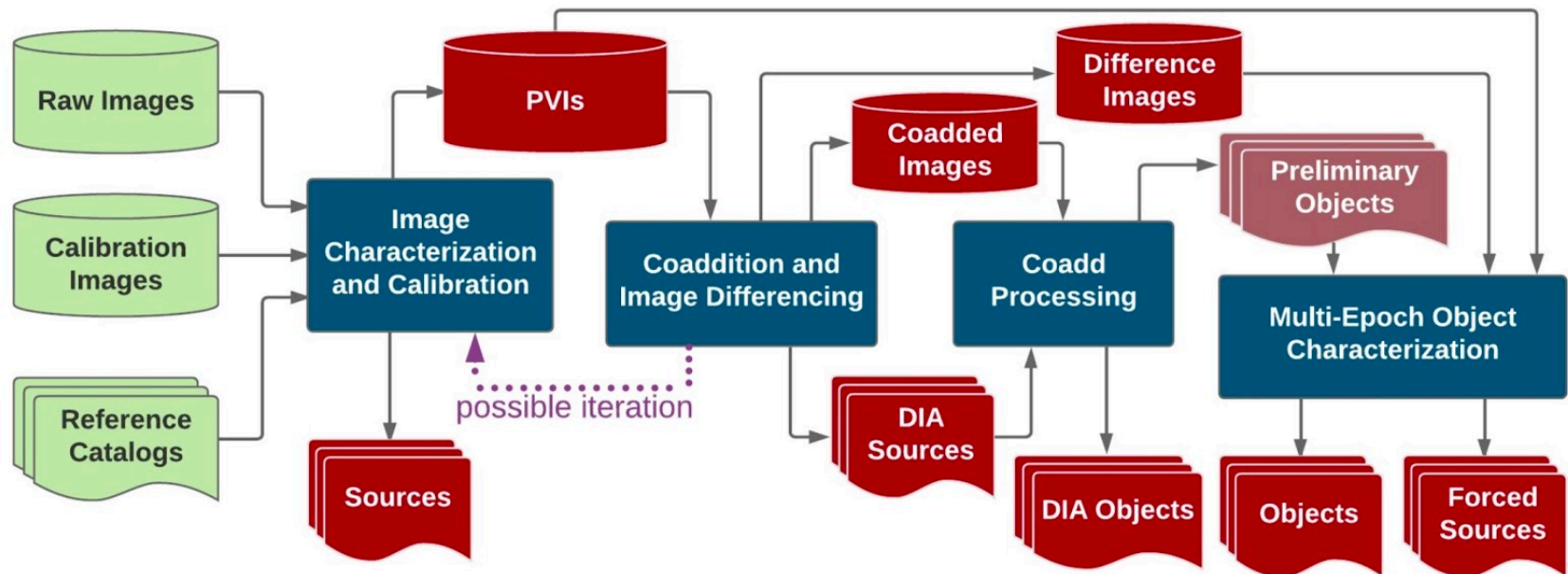


Image difference in Stack

- Main algorithm = Alard-Lupton (1998-2000)
 - PSF estimated over the focal plane
 - Convolution kernel to 'PSF match' 2 images
- Improvements : tuning parameters for kernel (done on simulation)
- Zackay method :
 - 'optimal' statistical treatment of detection
 - introduced by adding a noise decorrelation step in Stack Alard-Lupton algorithm

Template and science image



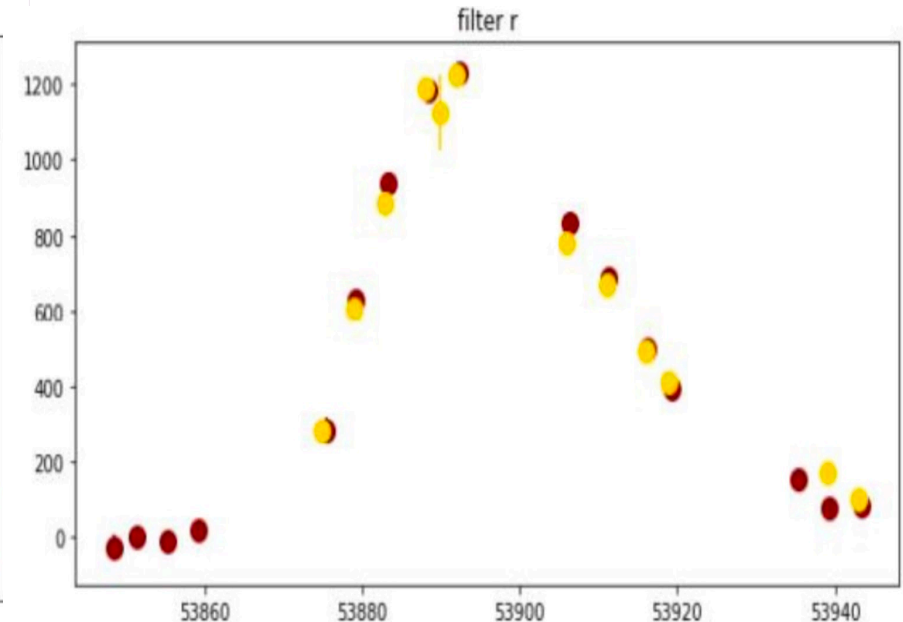
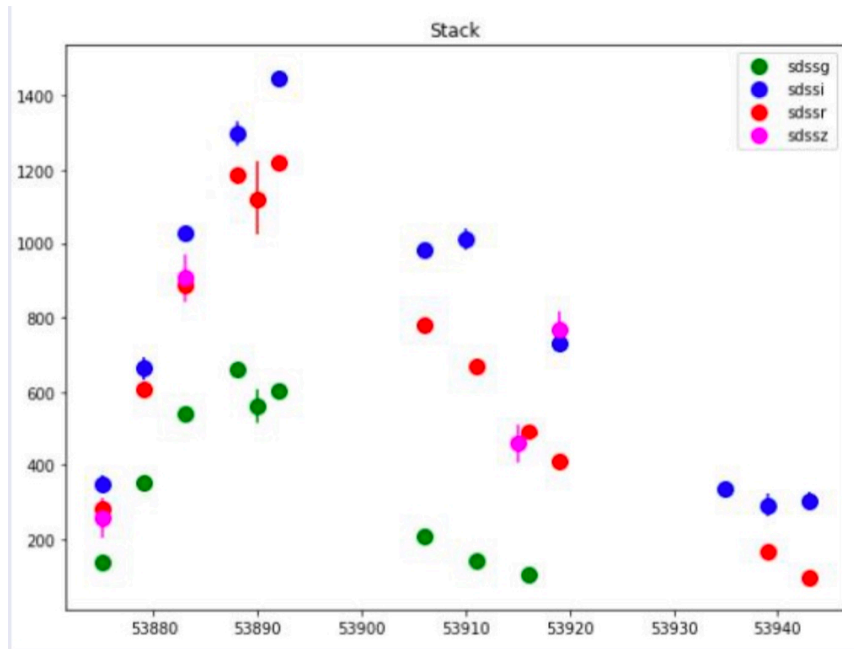
- Difference from two images :
 - Template : usually a deep coaddition, different choice on image quality (seeing..) and depth can be chosen
 - Science image :
 - for WDF survey : 1 or 2 images : single image imdiff ok
 - for DDF : need coadd per day to reach high mag "spatially static" objects

Current stack status and DC2

- DRP : static : main stream is implemented
- Alert : very recently (1 month), first version of alert is implemented
- DC2 :
 - Alert : not tested for DC2
 - DRP static : running on DC2
 - DRP time domain : need tweaks to be implemented

DC2/ SN pipeline scientist work

- Implementation/test and validation of time domain DRP for DC2
- Pre-DC2 work : run of image difference on CFHT images



A common LSST DM/DESC effort



- DESC agenda/timeline is different from LSST/DM stack : need time domain now to test DC2 transients : Supernovae and strong lensed quasar.
- Proposition. : co-effort from « SN » PS (DF) and « DM » PS (Bob Armstrong) to implement missing part in DM.
- Discussion/exchange with LSST/DM (alert : Eric Belhm)
- Agreement with LSST DM management to help collaboration.
- Useful for DC2 but necessary also for future DESC developpements where test and validation of DRP TD is foreseen by DESC during operations to control effoiciency and biases of DM pipeline.

PS SN+DM Task List



- *Create a new difference imaging package in lsst-dm that will include:*
 - *Write a new association task that matches diaSrc catalogs one visit at a time to create a master list of diaObject for a single patch.*
 - *Write a driver script to run code at scale for DC2.*
 - *Combine diaObjects from individual patches into a single catalog.*
 - *Write task to do forced photometry on the visit difference images at the location of the diaObjects.*
- *Write code to convert output from forced photometry into format readable by GCR*
- *Run tests on simulations available including Run1.2 and DC2.*

Time Domain on-going activities



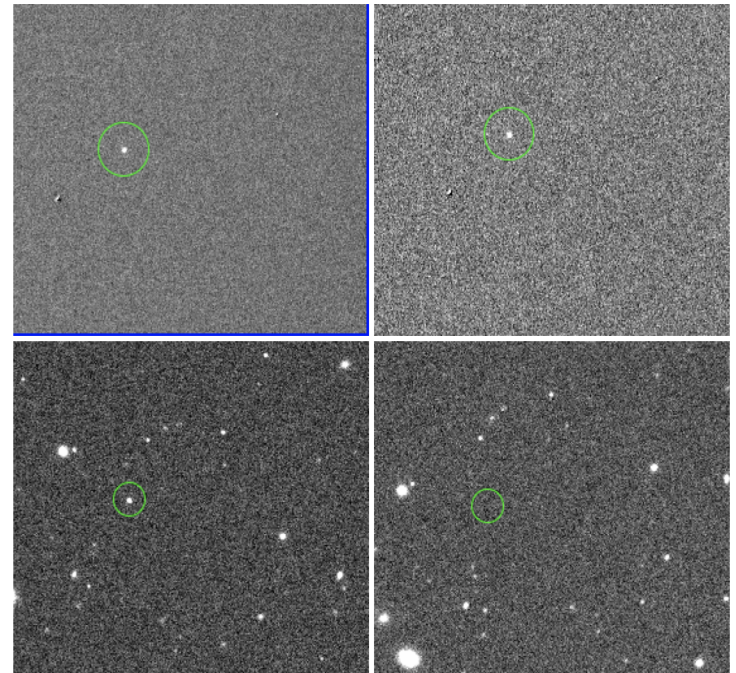
- Test full process ✓ (Dominique)
- Implement full process in "SRS" ✓ (Dominique + Johann)
- Test DM-AP tools ✓ (Bob)
- Test Diaobject construction performance ✓ (Dominique)
- Link phosim input (truth) to Diaobject fluxes ✓ (Rahul)

DC2 DIA processing (scripts level)

MakeDIA = imageDifference (with input = calexp and coadd template)
+detect/measure DIAsources

Test on DC2 1.1p at eimage level : OK

Test on DC2 1.2p calexp to be done
more artifacts expected



MakeDIAobject = Run afwTable.MultiMatch on diaSrc.

Current status and perspectives

- Finalise and run DC2
 - Validate pipeline
 - Quantify performances
- Going further
 - Bright galaxy (in)efficiency effect
 - Scene modelling
 - Efficiency test
 - DCR
 - ...