Data integration and synchronization with two telescopes in parallel

CEDIC '09
Linz, 5 April 2009
Giovanni Benintende

GRUPPO ASTROFIL CATANESI

Target:

Getting **two** nights of data in just **one** night:

- ✓ Luminance with the main telescope
- ✓ RGB with the second telescope

Setup:

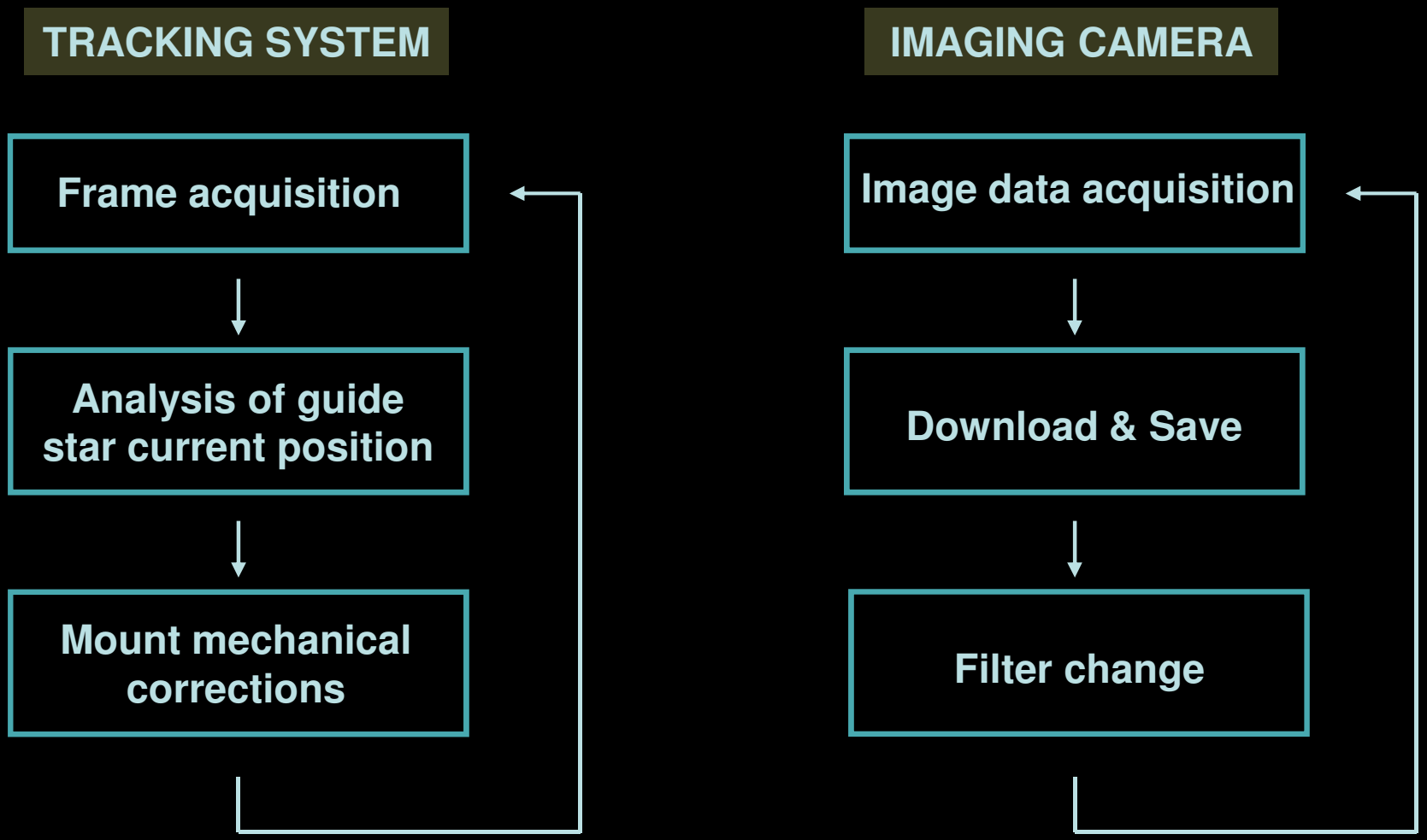
Two parallel telescopes on a single mount

Appropriate CCD or DSLR cameras to reach equivalent FOV

Methods:

Collecting deep-sky data with tracking system and using of dithering

Data acquisition with *simple tracking*



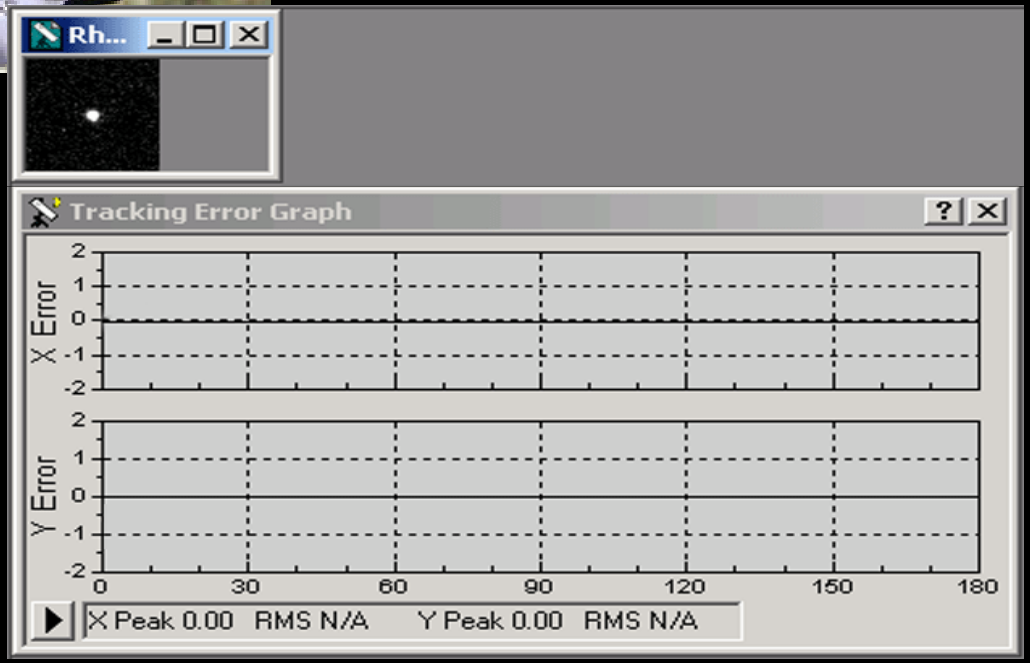
1 – 10 seconds per cycle

5 – 30 minutes per frame

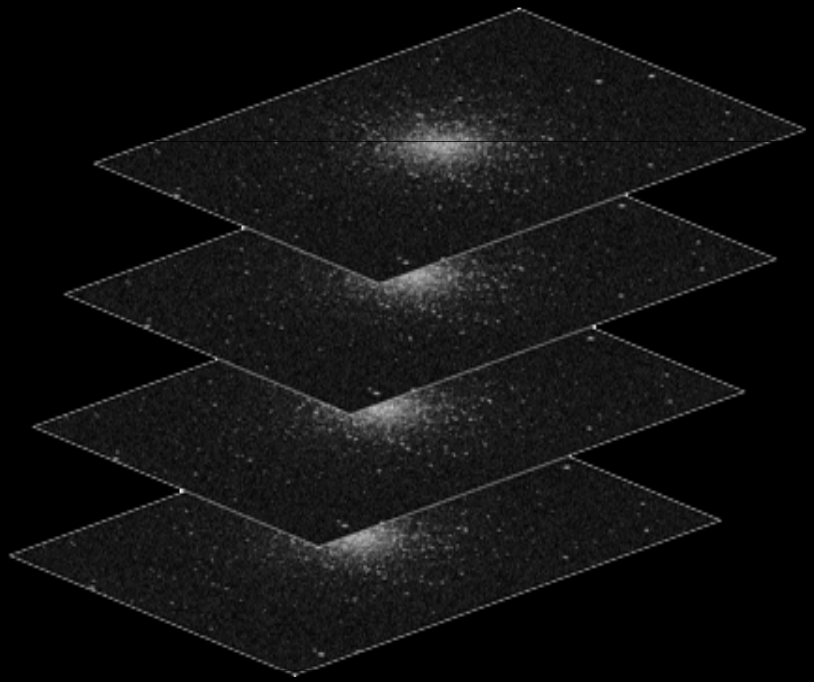
Basic tracking system

- Analysis of guide star position
- Tracking correction software commands

Mechanical tracking correction commands

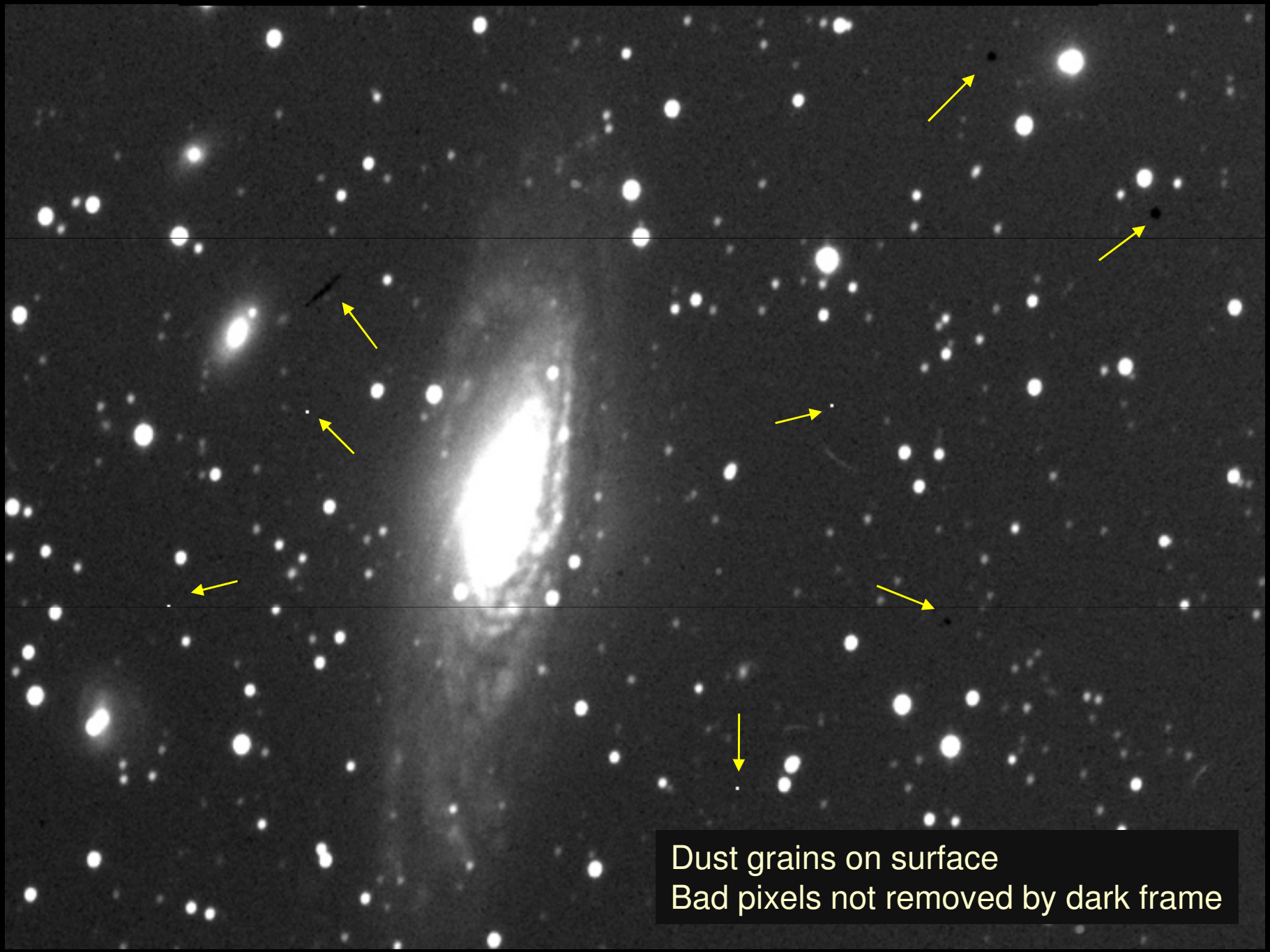


Stacking

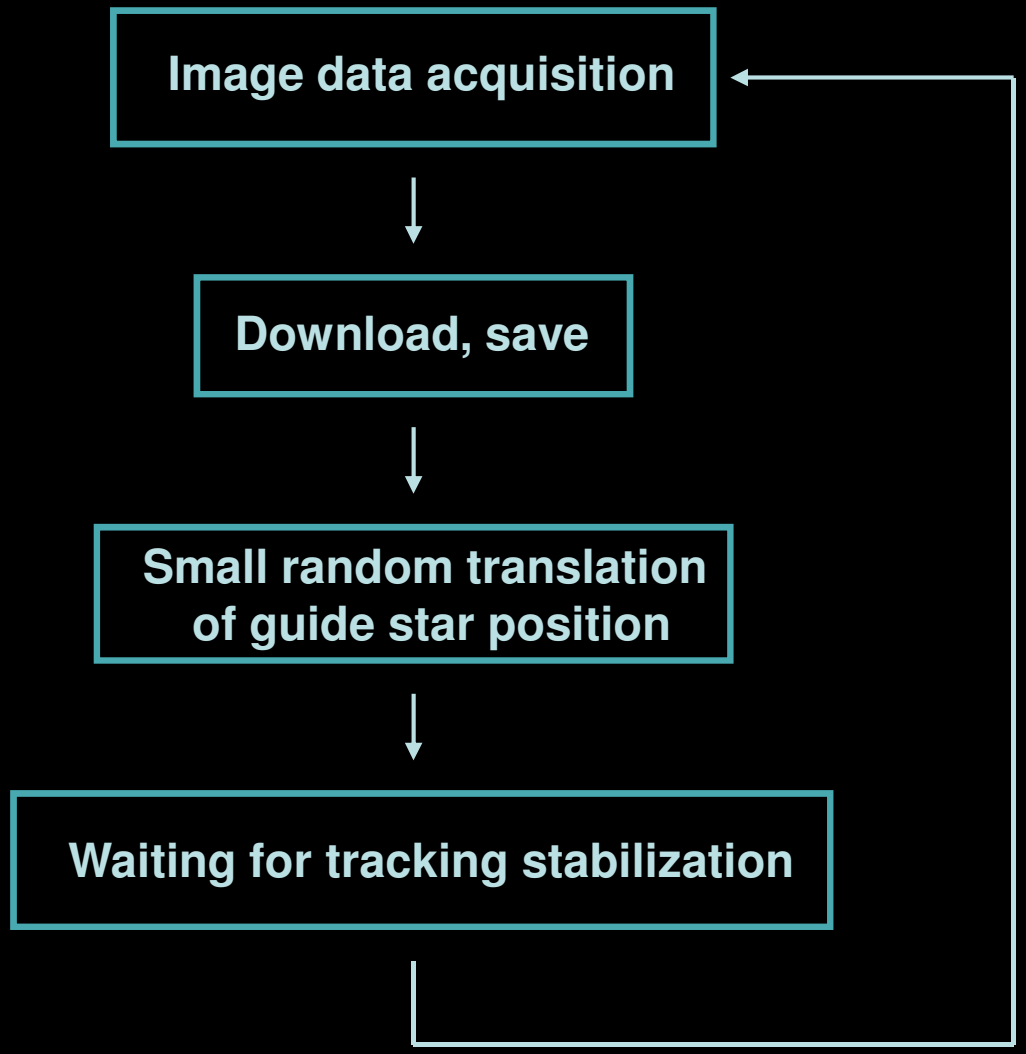


4 exposures of 10 minutes *...make...* 40 minutes of data integration

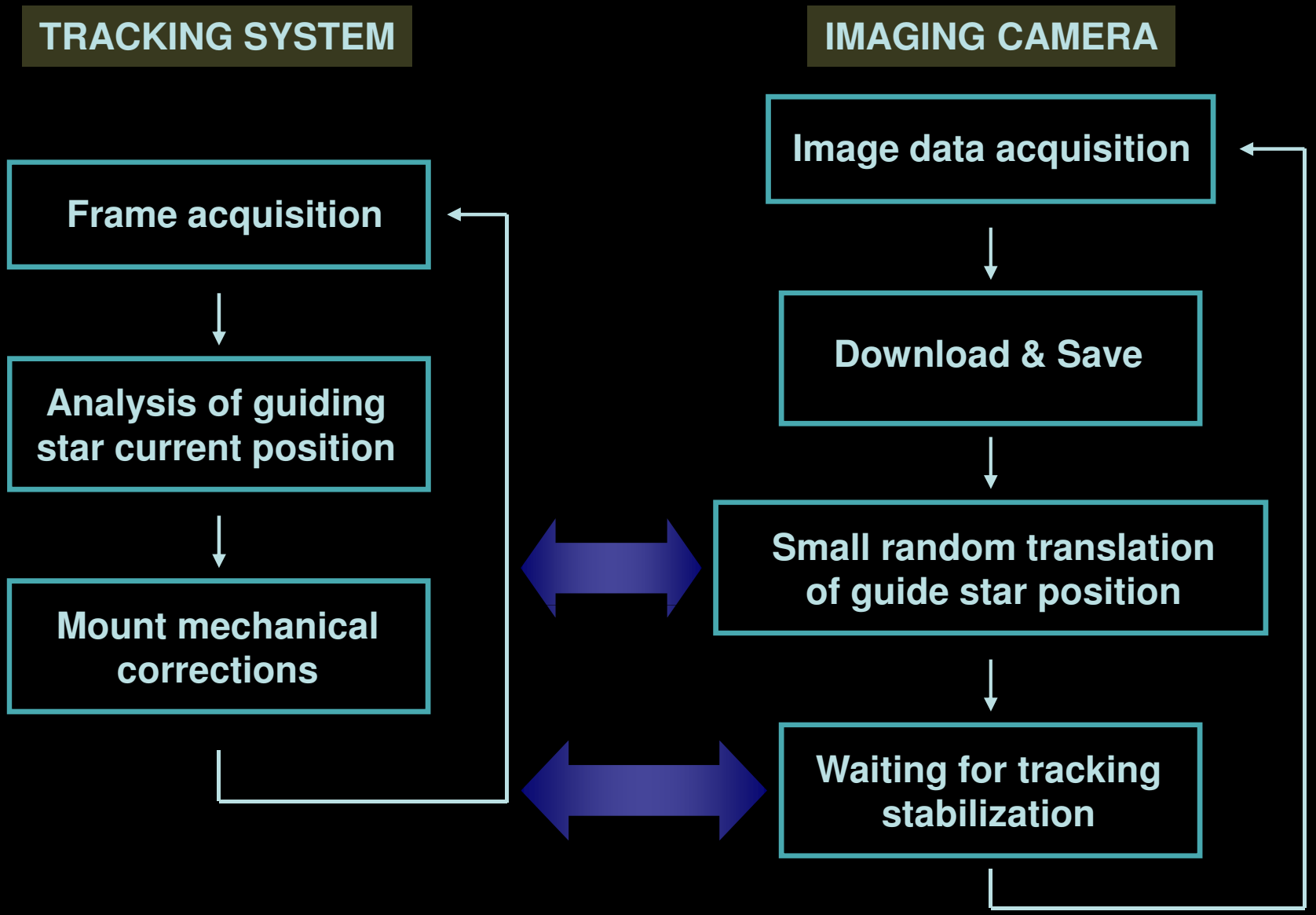
Systematic image defects



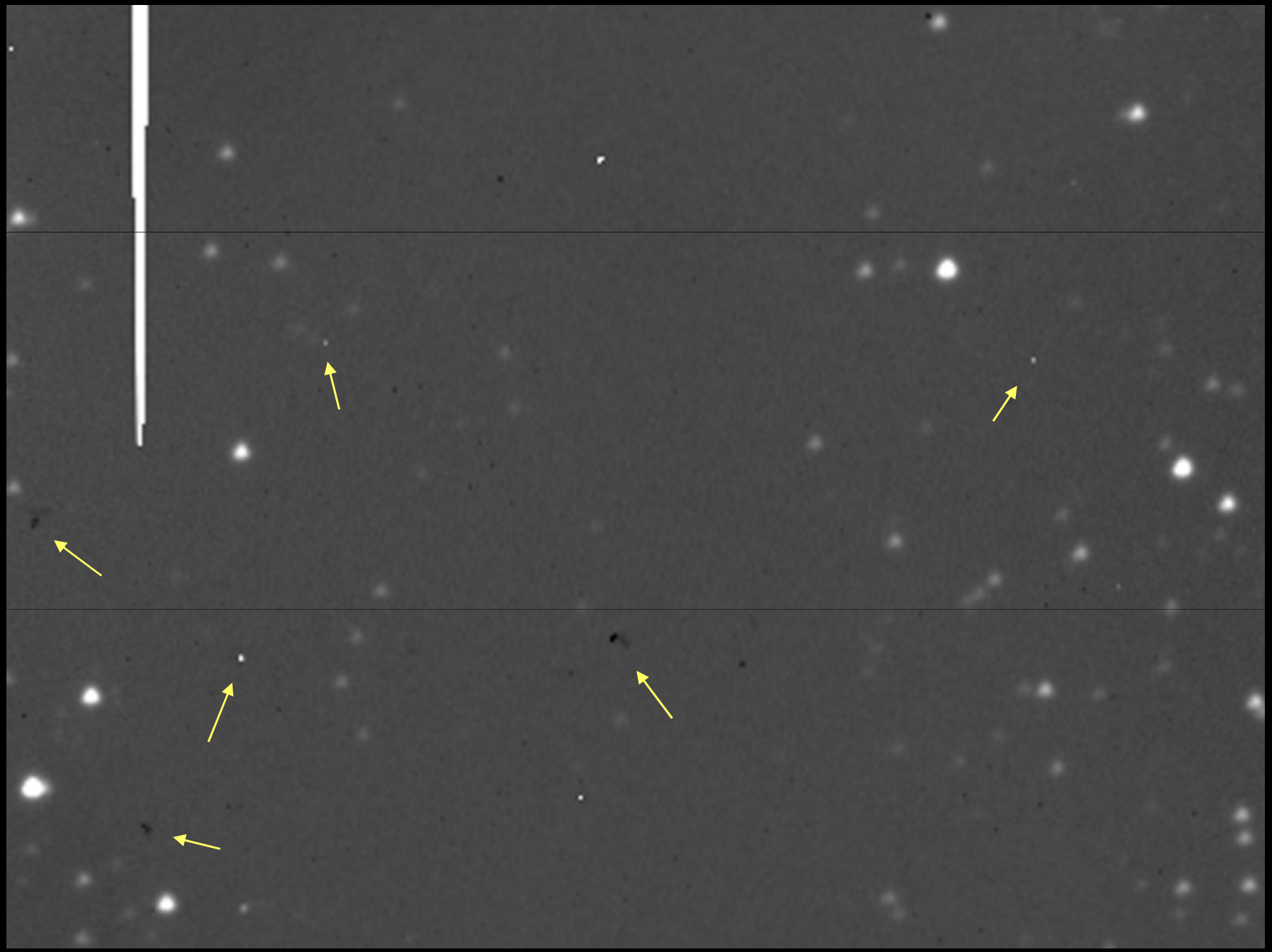
Getting images using dithering



Complete workflow of data acquisition using dithering

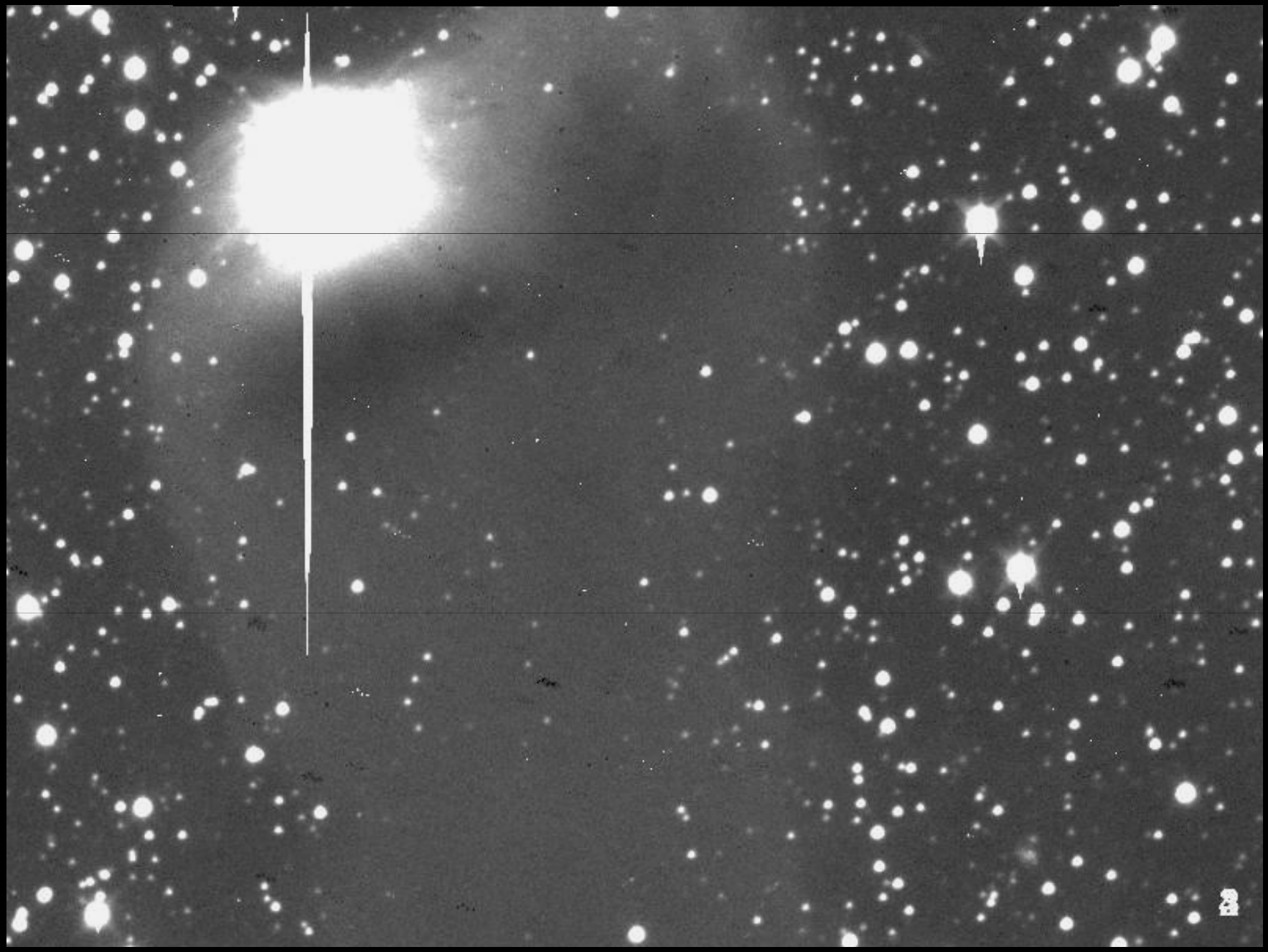


Subframes in dithering

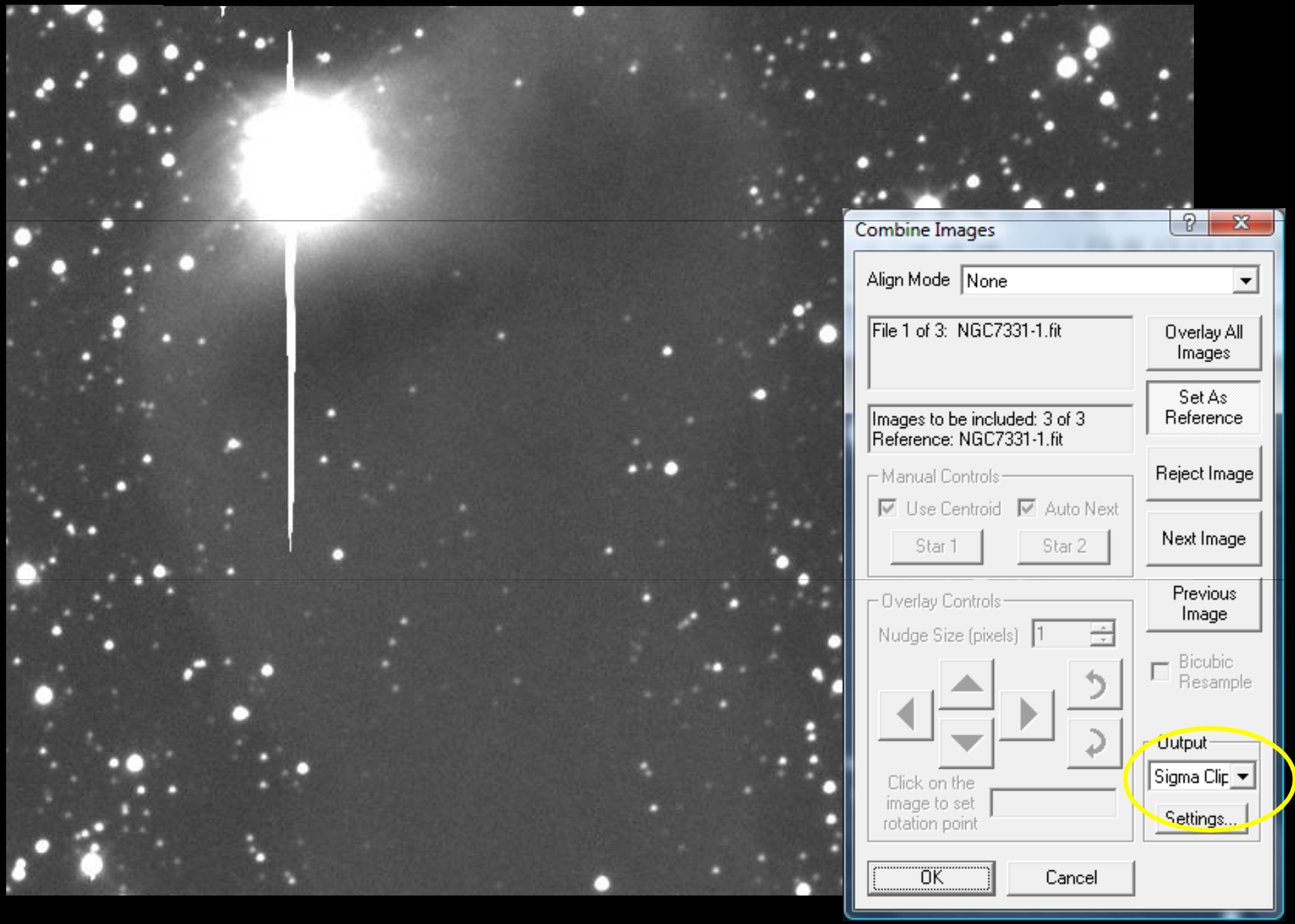


…after alignment on stars

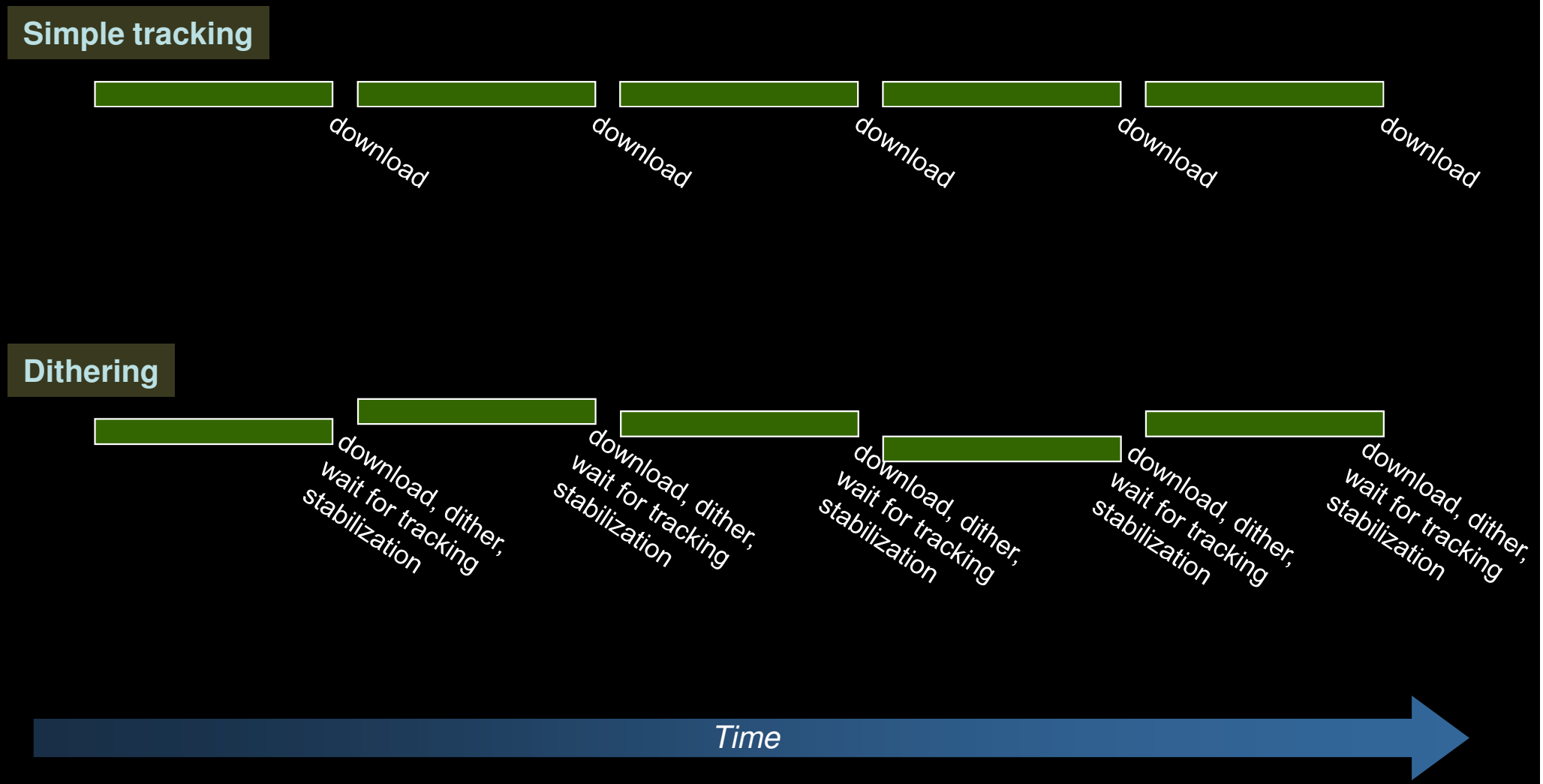
Stacking: Simple sum



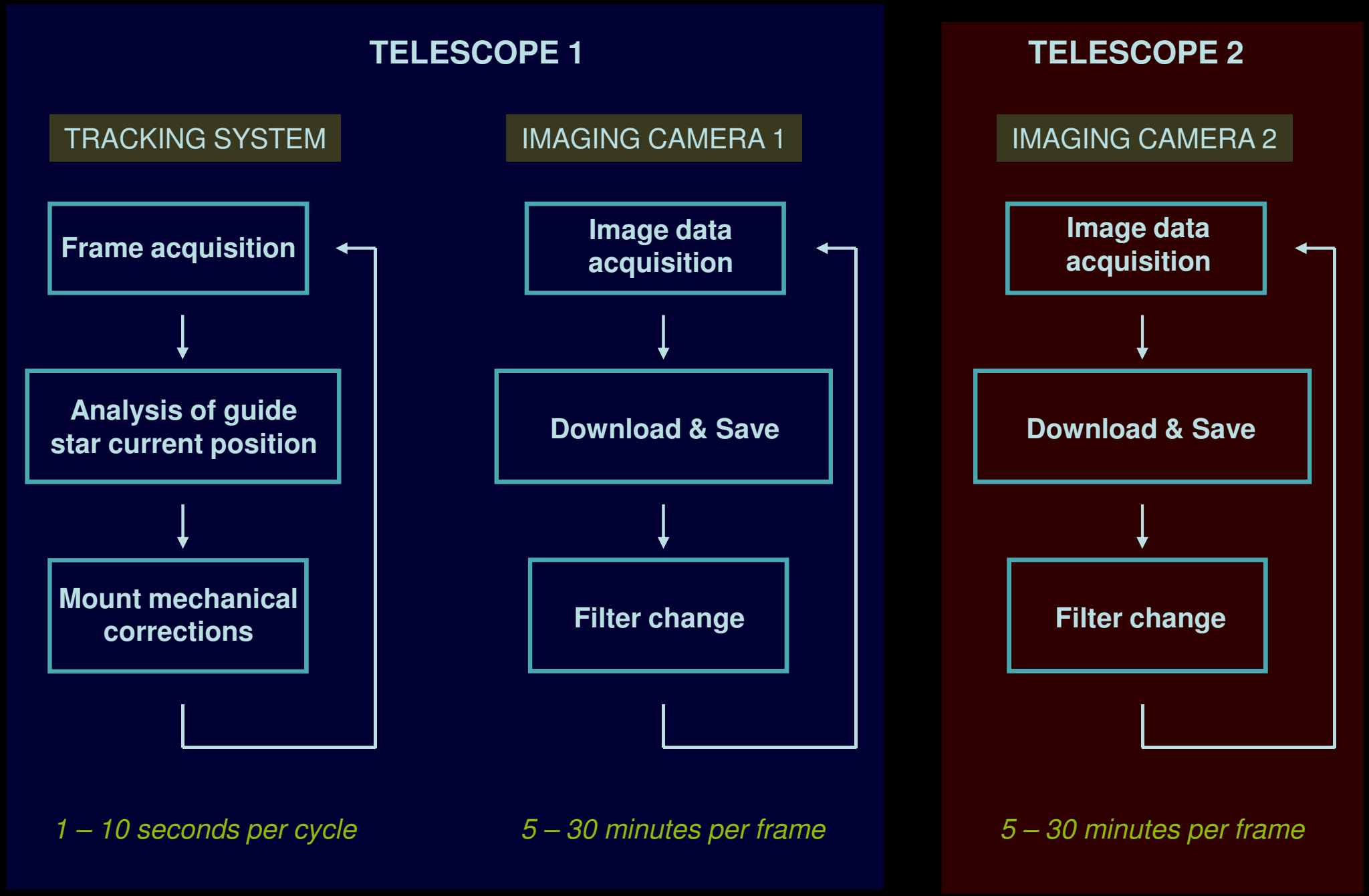
Stacking: Sigma Clip algorithm



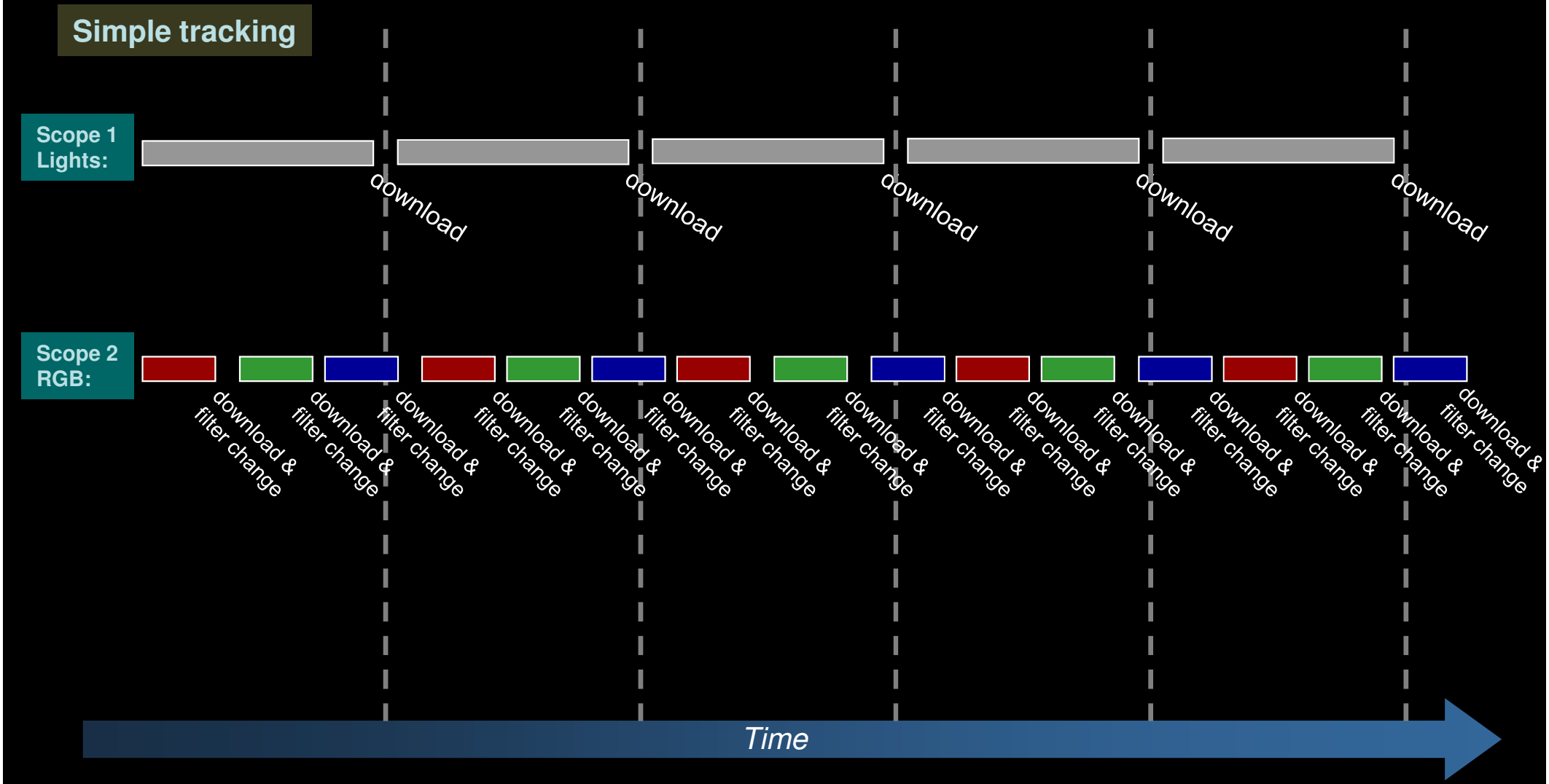
Timing with single ccd imaging systems

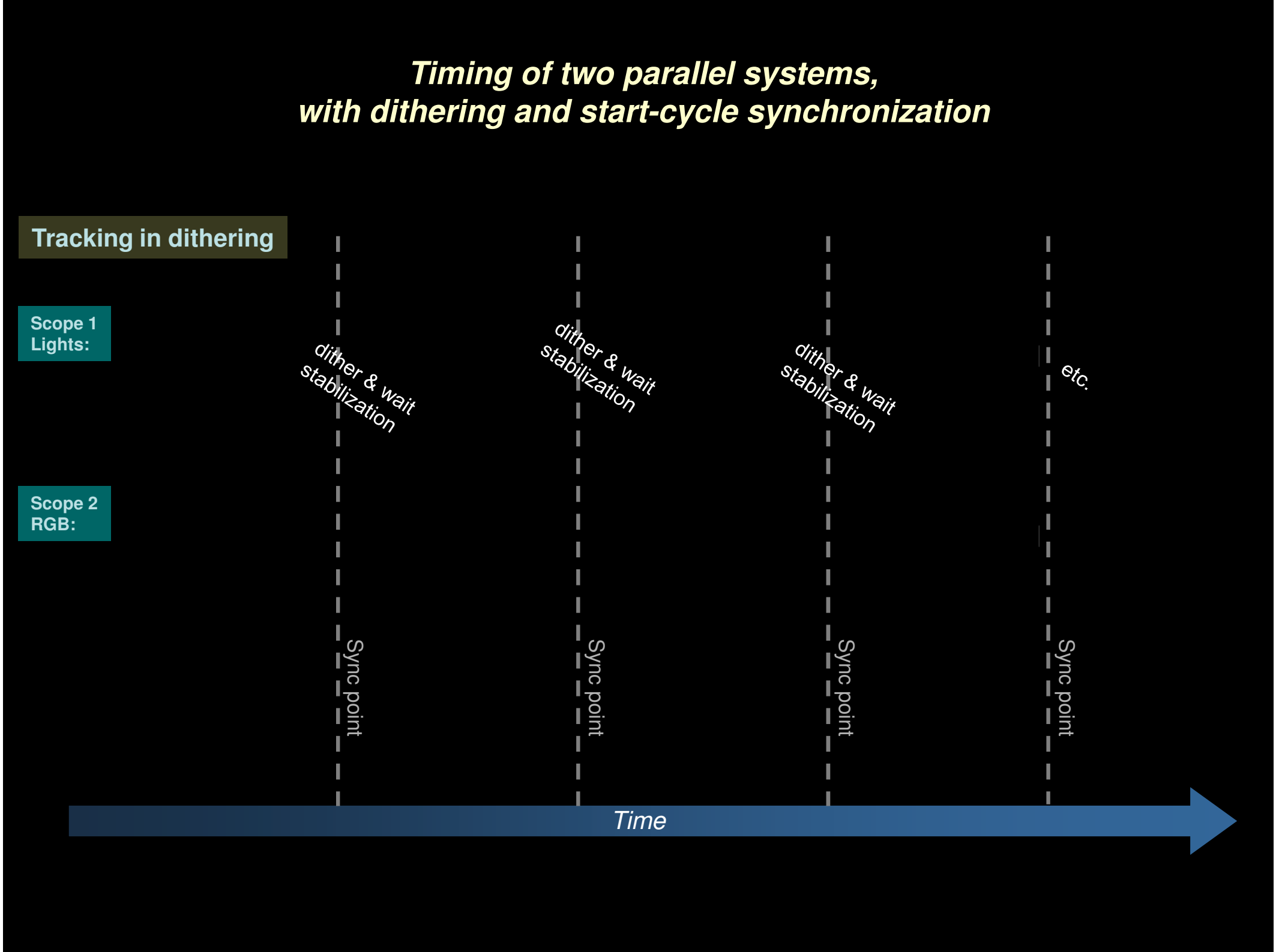


Data acquisition with two independent telescopes in parallel, using *simple tracking*



Timing with two **independent** telescopes in parallel, with *simple tracking*



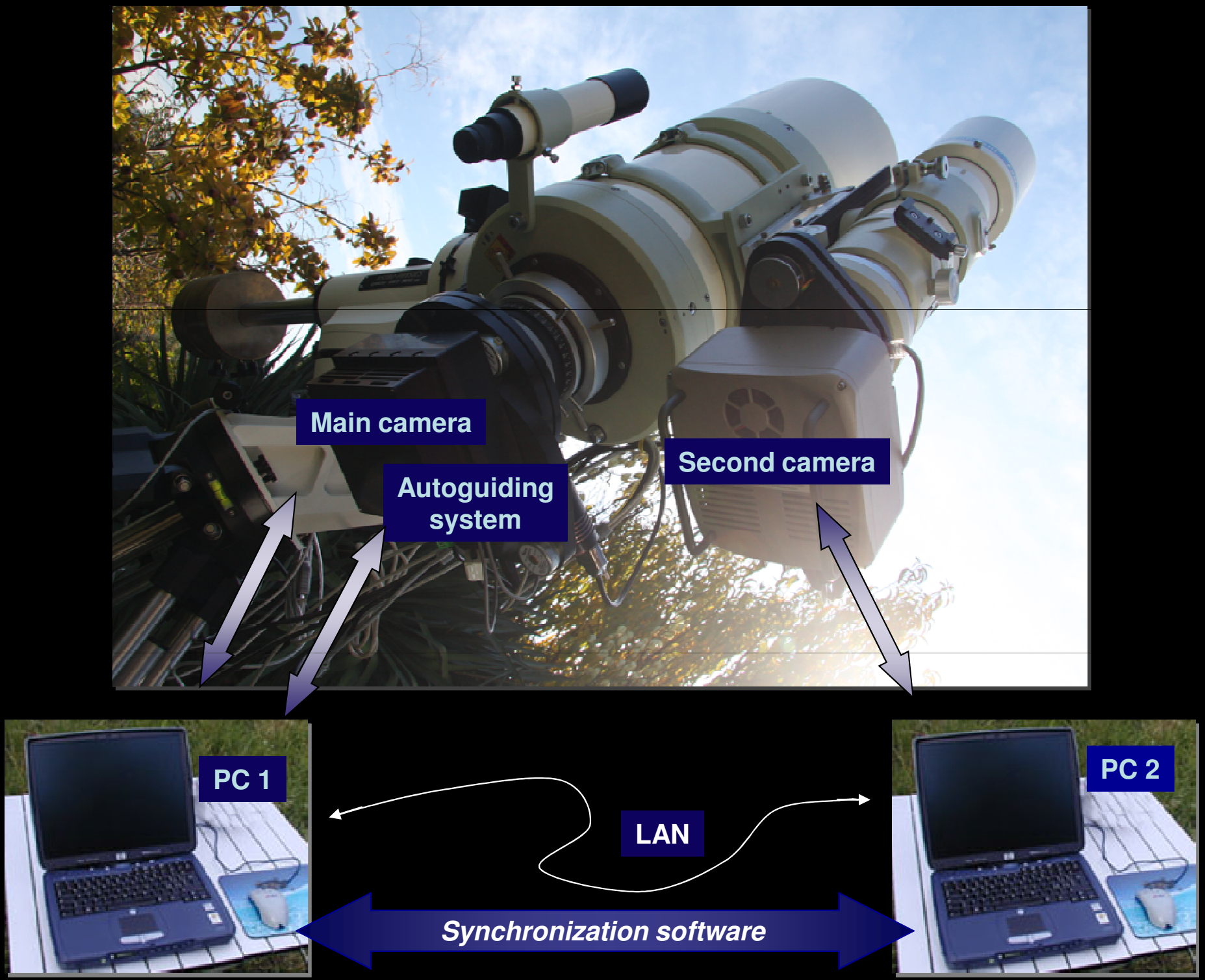

Timing of two parallel systems,
with dithering and start-cycle synchronization
Tracking in dithering
Scope 1
Lights:
Scope 2
RGB:
dither & wait
stabilization
dither & wait
stabilization
dither & wait
stabilization
etc.
Sync point
Sync point
Sync point
Sync point
Time

CCD Sync

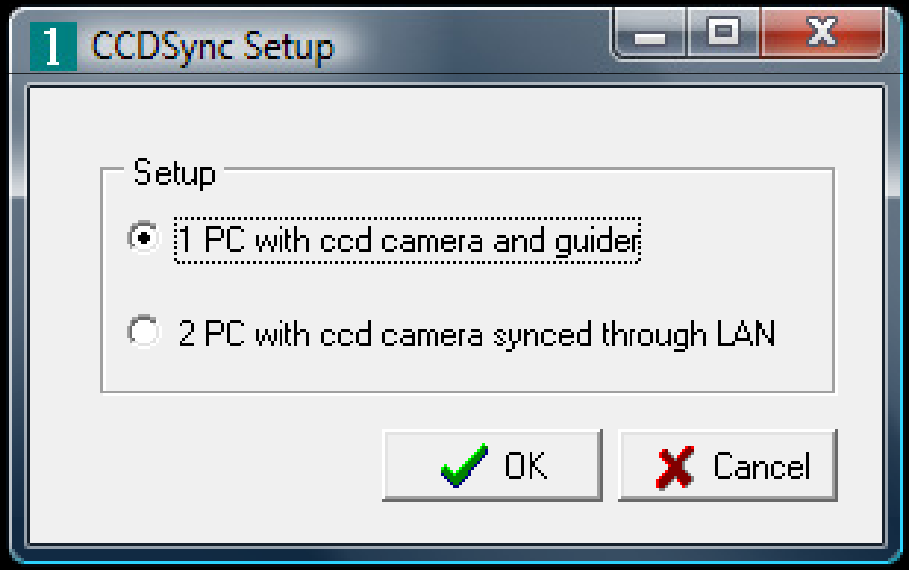
- ✓ *Work over MaxIm/DL, using OLE communication technique*
- ✓ *Sequence management*
- ✓ *Dithering control*
- ✓ *Guider stabilization watching between steps*
- ✓ *Send / receive synchronization signals to / from other CCDSync instance in network*

MaxIm/DL

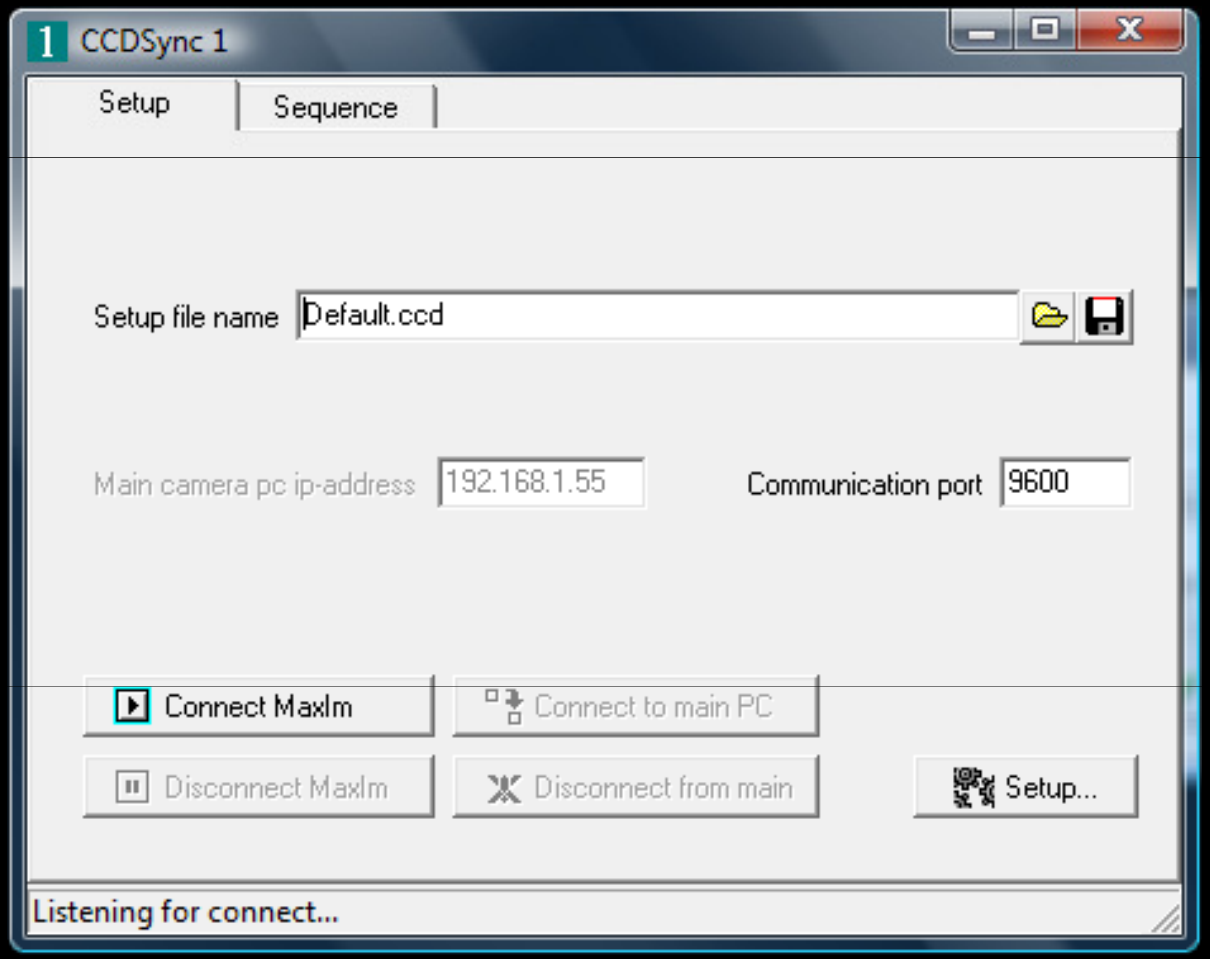
- ✓ *Device control*
- ✓ *Autoguiding management*
- ✓ *Image data acquisition*


Main camera
Autoguiding system
Second camera
PC 1
LAN
PC 2
Synchronization software

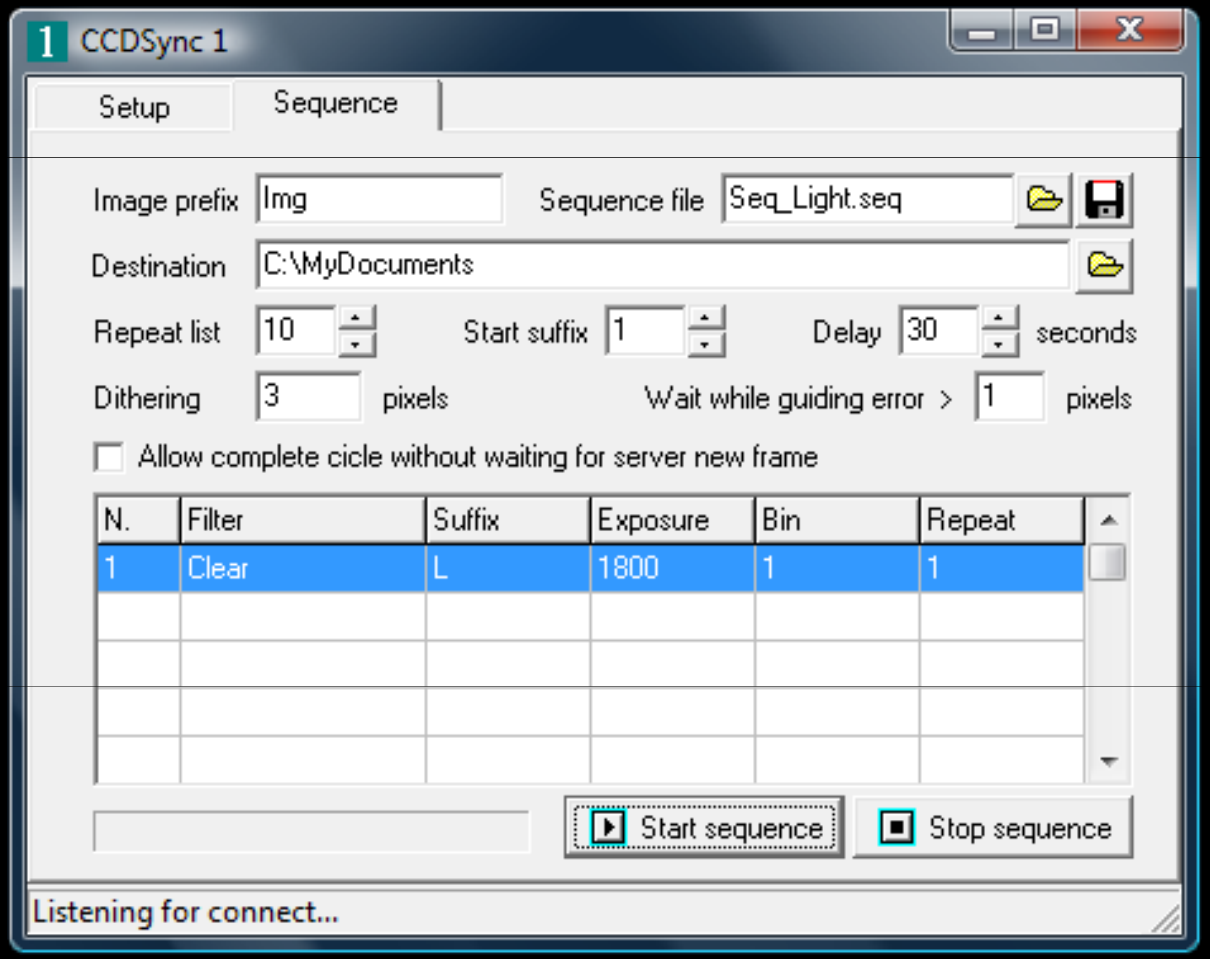
Setting mode



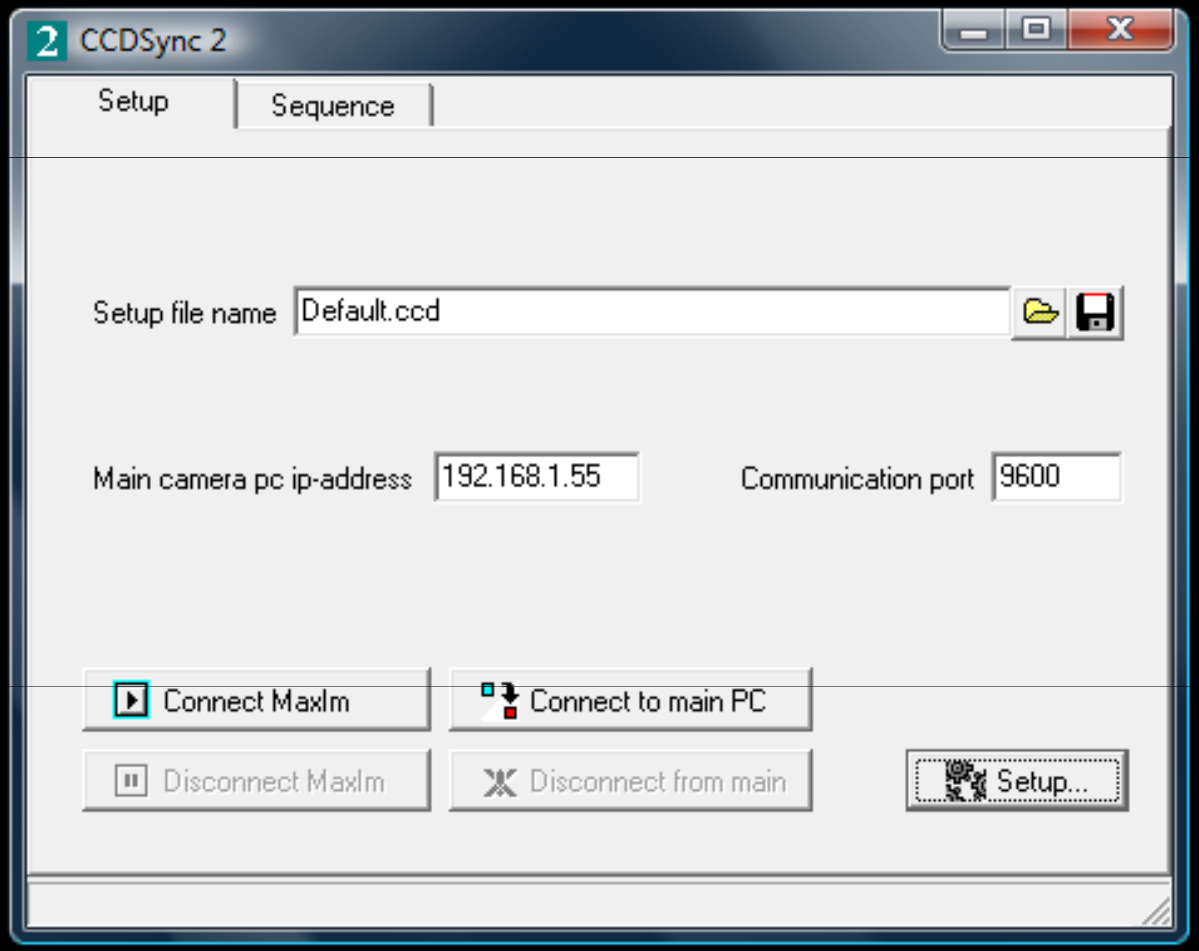
Setting main session



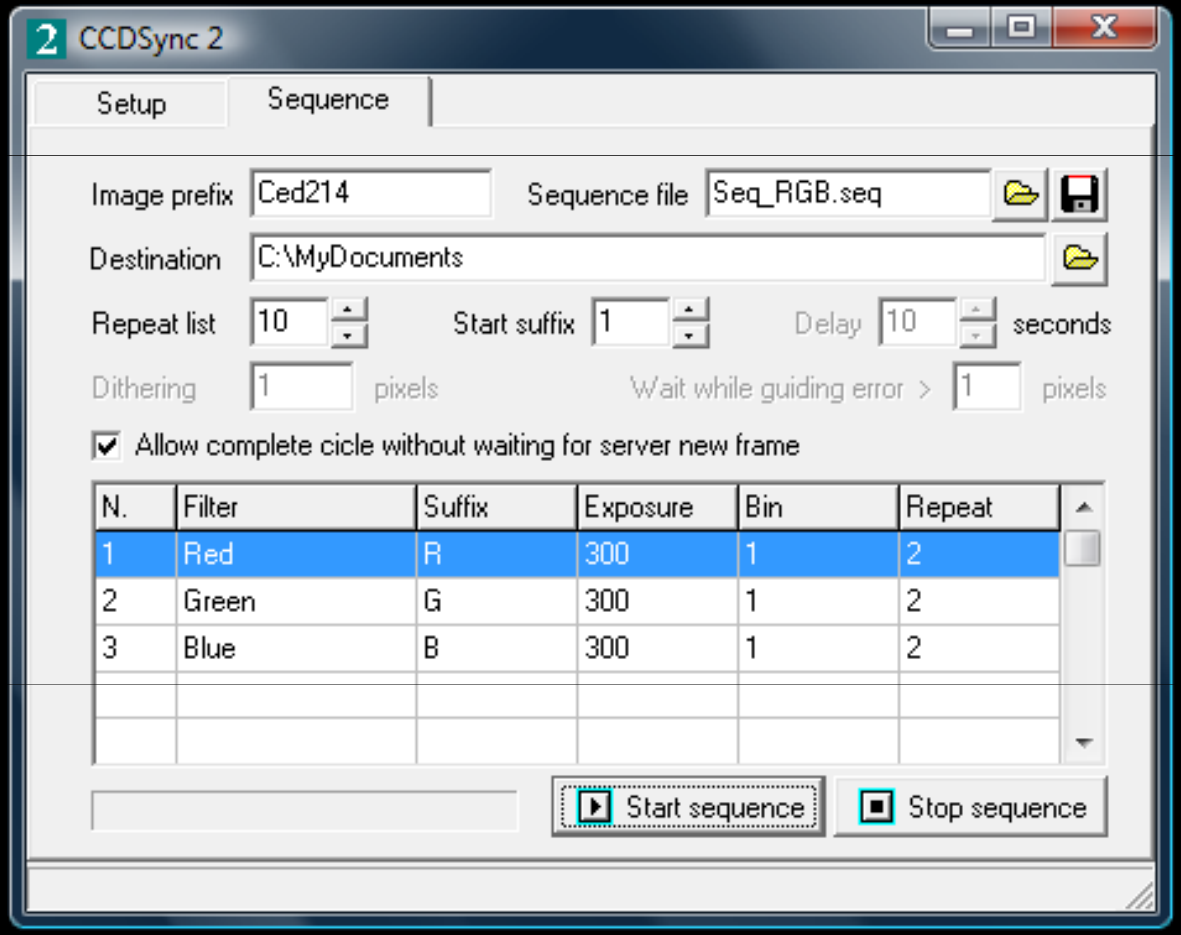
Main sequence (Light frames)



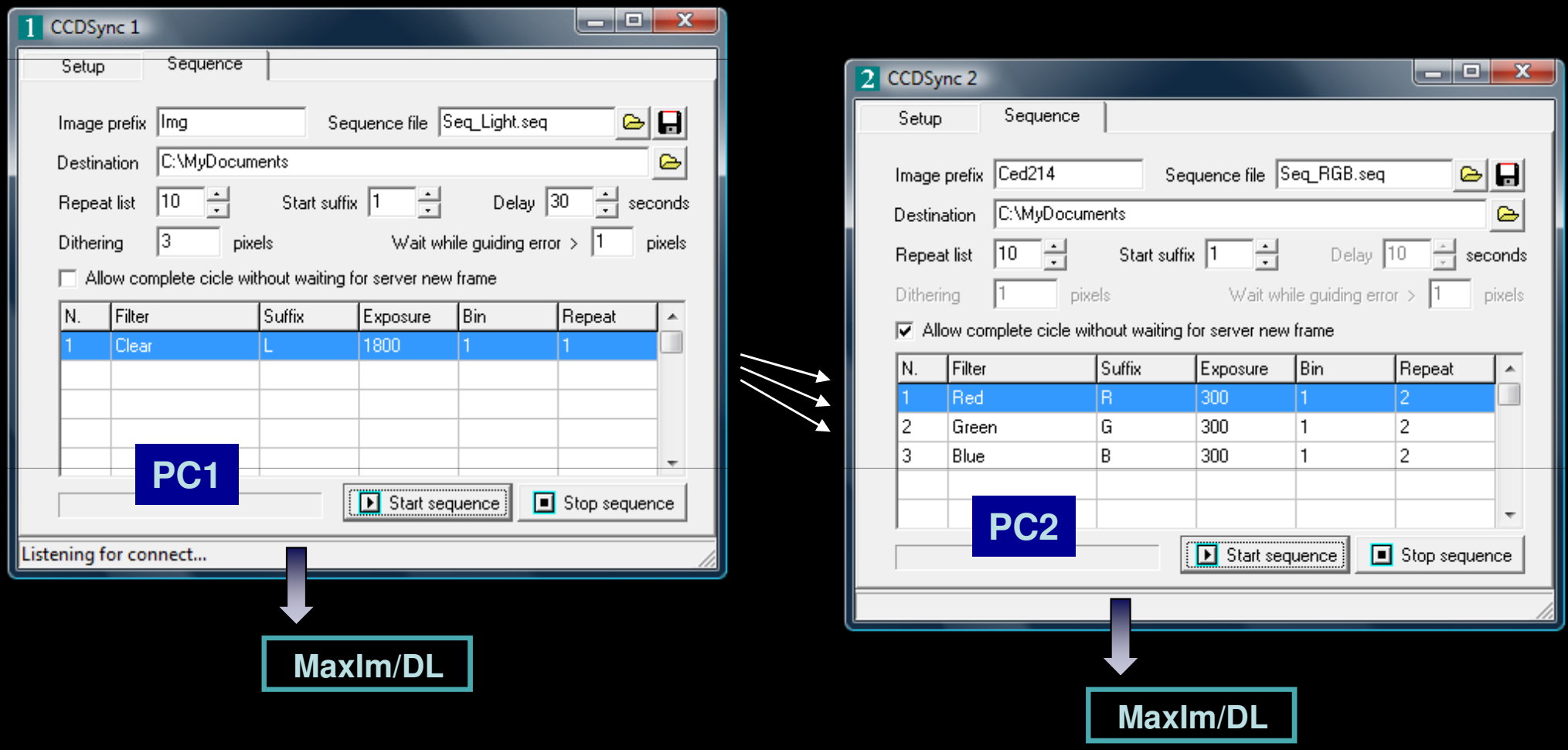
Setting secondary session



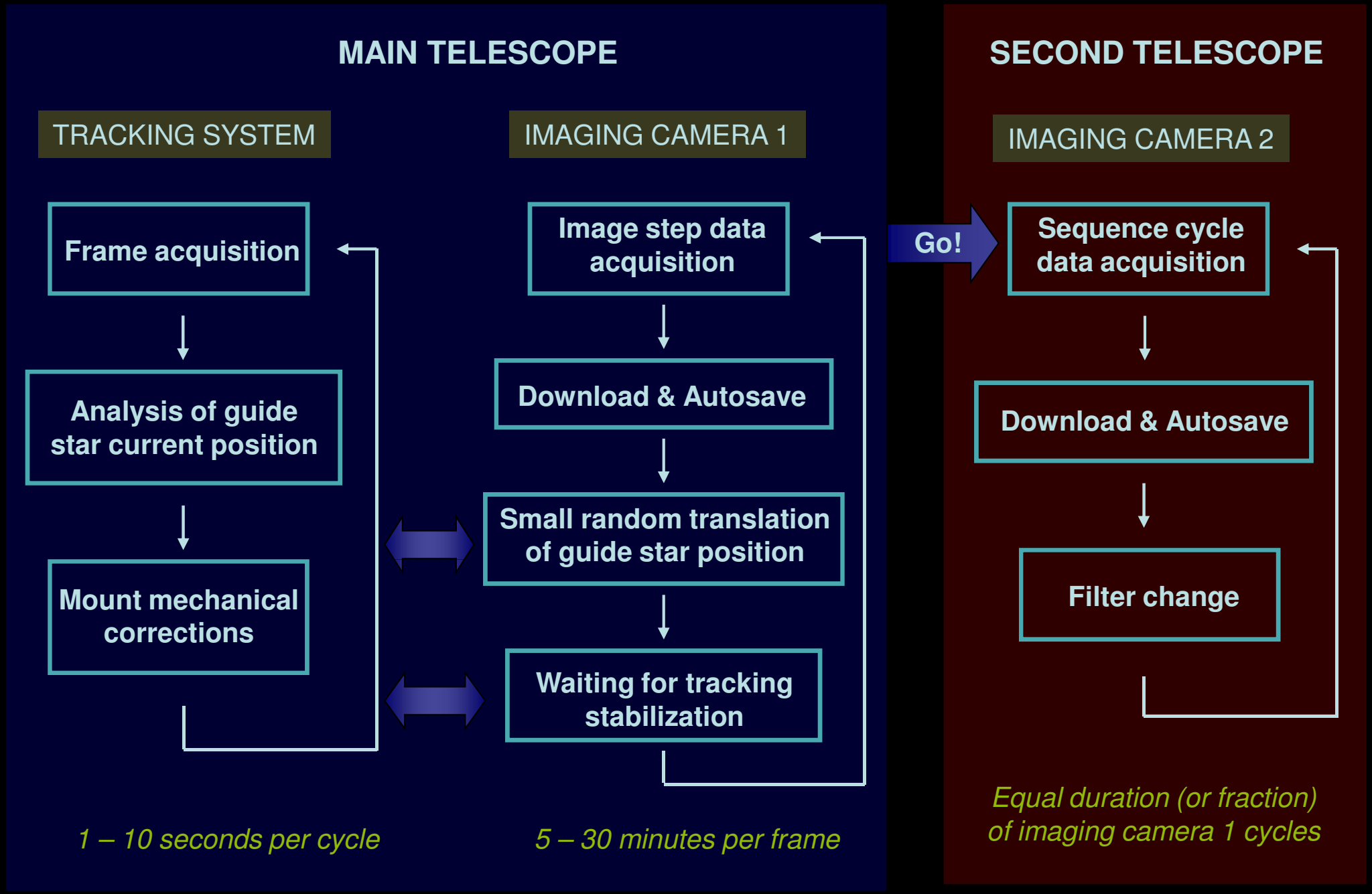
Secondary sequence (RGB)



...at work


1 CCDSync 1
Setup
Sequence
Image prefix
Img
Sequence file
Seq_Light.seq
Destination
C:\MyDocuments
Repeat list
10
Start suffix
1
Delay
30
seconds
Dithering
3
pixels
Wait while guiding error >
1
pixels
Allow complete cicle without waiting for server new frame
N.
Filter
Suffix
Exposure
Bin
Repeat
1
Clear
L
1800
1
1
Start sequence
Stop sequence
Listening for connect...
PC1
MaxIm/DL
2 CCDSync 2
Setup
Sequence
Image prefix
Ced214
Sequence file
Seq_RGB.seq
Destination
C:\MyDocuments
Repeat list
10
Start suffix
1
Delay
10
seconds
Dithering
1
pixels
Wait while guiding error >
1
pixels
Allow complete cicle without waiting for server new frame
N.
Filter
Suffix
Exposure
Bin
Repeat
1
Red
R
300
1
2
2
Green
G
300
1
2
3
Blue
B
300
1
2
Start sequence
Stop sequence
PC2
MaxIm/DL

Data acquisition with two parallel systems, using dithering and synchronization with *CCDSync*



What all this needs

Own a second scope / camera witch cover at least the same field of view

Own a second pc / notebook

Arrive / initiate the set up about 1 hour before the usual time

Spend 15-30 minutes for starting the 2nd camera and focusing

Download:

http://www.astrogb.com/downloads/ccdsync.zip
http:// www.astrofotografia.uai.it/downloads/ccdsync.zip


Thank you much for the attention !