

Telescope Briefing

Safety and Usage

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The Observatory

- Used for third-year projects
- Available for use by PhysSoc members
- Located on Physics roof
- Access via door on C floor
- Astronomical scope in larger dome



The Observatory

- **Telescope**
 - 11-inch reflector
 - Schmidt-Cassegrain
 - Celestron EDGE-HD



The Observatory

- **Mount**
 - Equatorial
 - Computerised
 - Celestron CGX



The Observatory

- **Camera**
 - Specialised CCD
 - One-shot colour
 - Starlight Xpress SXV-25C
- **Eyepieces**
 - Variety of options



Purpose of this briefing

- **Safety**
 - Your own, others, equipment
 - By signing the register you agree to abide by these rules
- **Usage**
 - Brief overview of observing with our equipment
 - Hands-on introductions on suitable nights in weeks 6-8

University of Nottingham – School of Physics and Astronomy – 3.5 metre Observatory

Telescope User Instructions

This document contains important information about using the astronomical observatory on the roof of the Physics Building. To use the observatory, you **must** have attended a safety briefing. By signing the briefing register you agree to abide by the safety rules and instructions in this document. Failure to do so will result in your access to the observatory being withdrawn.

Safety Rules

- Only individuals who have attended a safety briefing (and signed the register) are allowed to operate the telescope and access the observatory outside normal working hours. Others may only visit the observatory out of hours with the permission of the observatory director or other member of academic staff. In such cases, guests must be informed of these safety rules and remain under the supervision of an experienced observatory user.
- The observatory is a hazardous place, especially at night. To minimize risks to yourself and others you must:
 - Never work in the observatory alone – if you have an accident, there will be no-one to get help. Always work in pairs or small groups.
 - Carry a mobile phone with you – put the numbers below in your contacts.
 - In an emergency, call 0115 951 8888 (the campus equivalent to 999).
 - In less urgent cases, security may be contacted on 0115 951 13013.
 - Wear suitable warm clothing.
 - Be careful moving around in the dome. There are plenty of cables and objects to trip over, which is especially easy to do in the dark.
 - Take care when entering the observatory; there is a step and reduced door height.
 - Carry a torch and use it when necessary.
 - Don't get locked out on the roof! Make sure you take the roof door key with you.
 - Set the sign on the door to show that you are working in the dome. This is important for fire safety.
 - Do not go onto the roof beyond the railed area and the path to the railed area.
 - Be careful when climbing the steps to the raised area of the roof.
 - If you see an intruder in the building DO NOT confront them – contact security.
 - Comply with School rules for out-of-hours access to the building.
- The telescope, its mount and associated equipment are expensive and delicate. In order to protect them from damage and ensure continued access for all, you must:
 - Be aware whenever the telescope is moving to a new target. Ensure it does not collide with anything (including its own mount) or snag any cables. Pressing any arrow key on the handset will immediately stop the telescope.
 - Try to keep dust and damp off the telescope. Open the dome before you take the covers off the lenses, and put them back on before you close the dome. Leave the telescope covered up when the dome is closed (in case of leaks).
 - Do not open the dome in poor weather (wet or excessively windy) – close the dome if conditions deteriorate.
 - Do not leave the dome open unattended if there is a risk of rain.
 - Take care of the roof door and dome keys. Return them to the key safe when you have finished observing.
 - Fill in the observatory log with times, names of all attendees, and note objects observed and any problems encountered.
- Never point the telescope anywhere near the sun. Doing so will damage the telescope in a fraction of a second, and could cause irreversible damage to your eyesight.
- Make sure the building is locked and the alarm is set when leaving out of normal hours.
- You should also read and understand the School Emergency Procedures. These are distributed at briefings and displayed inside the observatory.

Purpose of this briefing

- Lots of information
- Most in instructions document (also online)
- These slides will go online
- Briefing video will go online
- <http://www.nottingham.ac.uk/astronomy/observatory.php>

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 - Do not go onto the roof beyond the railed area and the path to the railed area.
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 - Do not open the dome in poor weather (wet or excessively windy) – close the dome if conditions deteriorate.
 - Do not leave the dome open unattended if there is a risk of rain.
 - Take care of the roof door and dome keys. Return them to the key safe when you have finished observing.
 - Fill in the observatory log with times, names of all attendees, and note objects observed and any problems encountered.
- Never point the telescope anywhere near the sun. Doing so will damage the telescope in a fraction of a second, and could cause irreversible damage to your eyesight.
- Make sure the building is locked and the alarm is set when leaving out of normal hours.
- You should also read and understand the School Emergency Procedures. These are distributed at briefings and displayed inside the observatory.

Safety rules

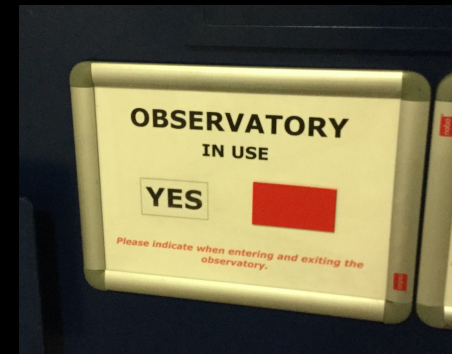
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 - allowed to operate the telescope, and
 - access the observatory outside normal working hours.
- Others may only visit the observatory out of hours with the permission of the observatory director or other member of academic staff.
 - In such cases, guests must be informed of these safety rules and remain under the supervision of an experienced observatory user.

Safety rules

- **Never work in the observatory alone**
 - If you have an accident, there will be no-one to get help
 - Always work in pairs or small groups
- Carry a mobile phone with you
 - Put these numbers in your contacts:
 - Emergency (999) on campus: 0115 951 8888
 - Campus security: 0115 951 13013

Safety rules

- Set the sign on the door to show that you are working in the dome
 - This is important for fire safety
- Don't get locked out on the roof!
 - Make sure you take the roof door key with you



Alarm panel

Key box

Emergency telephone

Top lock

'Observatory in use' sign

Bottom lock



Safety rules

- Do not go onto the roof beyond the railed area and the path to the railed area
- Be careful when climbing the steps to the raised area of the roof



Safety rules

- Take care when entering the observatory; there is a step and reduced door height
- Be careful moving around in the dome
 - There are plenty of cables and objects to trip over, which is especially easy to do in the dark
- Carry a torch and use it when necessary
- Wear suitable warm clothing
 - It is cold sitting still on a roof, at night, in winter!

Safety rules

- If you see an intruder in the building (or on the roof):
 - DO NOT confront them
 - contact security
- Follow School rules for out-of-hours access to building
 - Make sure the building is locked and the alarm is set when leaving out of normal hours
 - More later...

Safety rules

The telescope, its mount and associated equipment are expensive and delicate.

In order to protect them from damage and ensure continued access for all, you must:

- Be aware whenever the telescope is moving to a new target
 - Ensure it does not collide with anything (including its own mount) or snag any cables
- Try to keep dust and damp off the telescope
 - Follow the start-up and shut-down procedures

Safety rules

The telescope, its mount and associated equipment are expensive and delicate.

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- Do not open the dome in poor weather (wet or excessively windy)
 - Close the dome if conditions deteriorate
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Safety rules

The telescope, its mount and associated equipment are expensive and delicate.

In order to protect them from damage and ensure continued access for all, you must:

- Take care of the roof door and dome keys
 - Return them to the key safe when you have finished observing
- Fill in the observatory log:
 - times, names of all attendees, objects observed and any problems encountered

Observatory access

- Keys kept in safe by the roof door
 - **blue** fob for dome and top lock on roof door
 - **green** fob for bottom lock on roof door
- Key safe code: XXX ← *make a note of this and keep it secret*



- Building access out of hours
 - Key-card entry via main doors
 - Door to roof is alarmed
 - Deactivate and re-activate alarm
 - before exit and after entry



- Alarm code: XXXXXXXX ← *make a note of this and keep it secret*

Alarm panel

Key box

Emergency telephone

Top lock

'Observatory in use' sign

Bottom lock



Register

- By signing the briefing register you agree to abide by the safety rules and instructions
 - Failure to do so will result in your access to the observatory being withdrawn
- Include your university ID number
 - So we can enable your card to access building
- Include your university username: *ppy...*, etc.
 - So we can add you to the mailing list
- Please write clearly!

Starting observing

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Telescope Startup Instructions

Items in *italics* may not be required for casual users

- **Ensure all the power sockets are turned on**
 - There are two on the wall and two on the telescope pillar
- ***Turn on the computer screens***
- ***If it is not already running, turn on the computer***
- **Switch on the dome-rotation unit**
 - if in use, otherwise you will need to turn the dome by hand
- **Open the upper dome slit**
 - leave the handle pointing up to avoid it hitting the dome-rotation unit
- **Open the lower section of the dome**
- **Take the cover off the telescope**
- **Remove the dust caps from the telescope and finderscope**
- **Ensure the eyepiece or camera is mounted on the telescope**
 - as required – store unused equipment carefully
- **Turn on the telescope mount drive**
- **Check the telescope mount handset**
 - either (1) 'wake up' the telescope from 'hibernation' or (2) select 'Last Alignment'
 - do not manually confirm or adjust the time– **wait for the GPS to provide the time**
- ***Start the imaging software: 1) TOPCAT, 2) DS9, 3) Control***
- ***Start image backup: open WinSCP and start the 'synchronize folders' tool***
- ***Take a set of bias images***
- ***Take set of sky-flats, if possible***
- When stars are visible, **check pointing alignment** by acquiring a star
- **Check focus** on this star and **adjust focus** if necessary
 - remember to loosen the mirror locks first, and tighten them again afterwards
- ***If focus adjusted, take a new set of sky- or dome- flats***
- ***If necessary, perform pointing alignment***
- **You are ready to observe!**

Using the telescope

- Ensure all the power sockets are turned on
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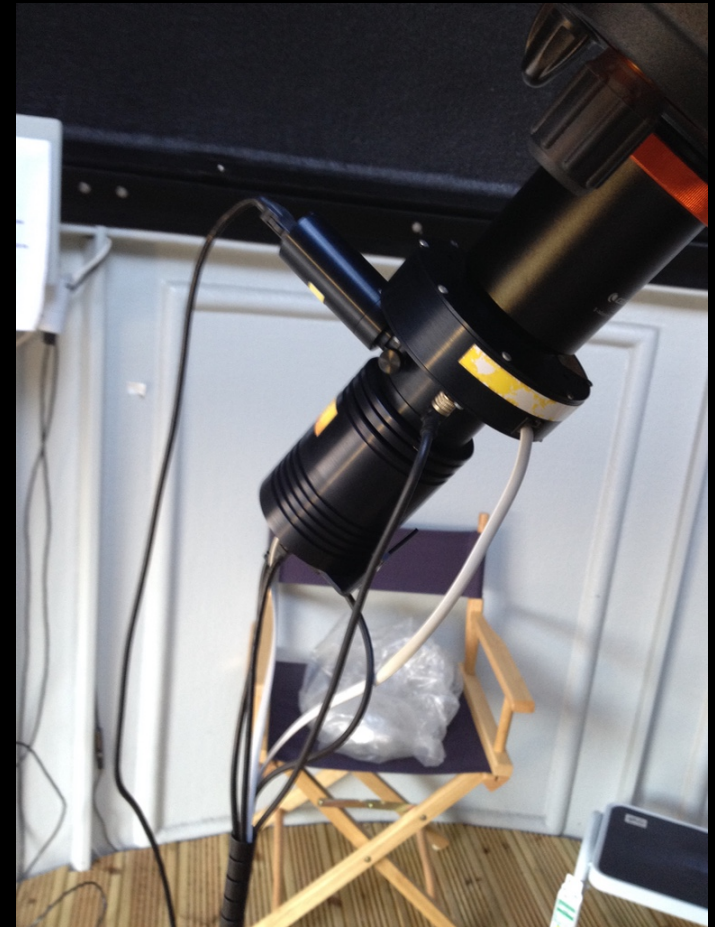
Using the telescope

- Ensure the eyepiece or camera is mounted on the telescope
 - only remove/replace camera if you have done it before under supervision
 - store unused equipment carefully
- Turn on the telescope mount drive
- Check the telescope mount handset
 - either (1) 'wake up' the telescope from 'hibernation' or (2) select 'Last Alignment'
 - do **not** manually confirm or adjust the time – **wait** for the GPS to provide the time



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Using the telescope

- When stars are visible...
- Check pointing by acquiring a star
 - e.g. using list on handset
 - if pointing ok, should be in finderscope, and ideally in eyepiece / on CCD
- Check focus on this star and adjust focus if necessary
 - remember to loosen the mirror locks first, and tighten them again afterwards
- If focus adjusted, and using camera, ideally take new set of sky- or dome-flats
- If necessary, perform pointing alignment
 - not usually necessary

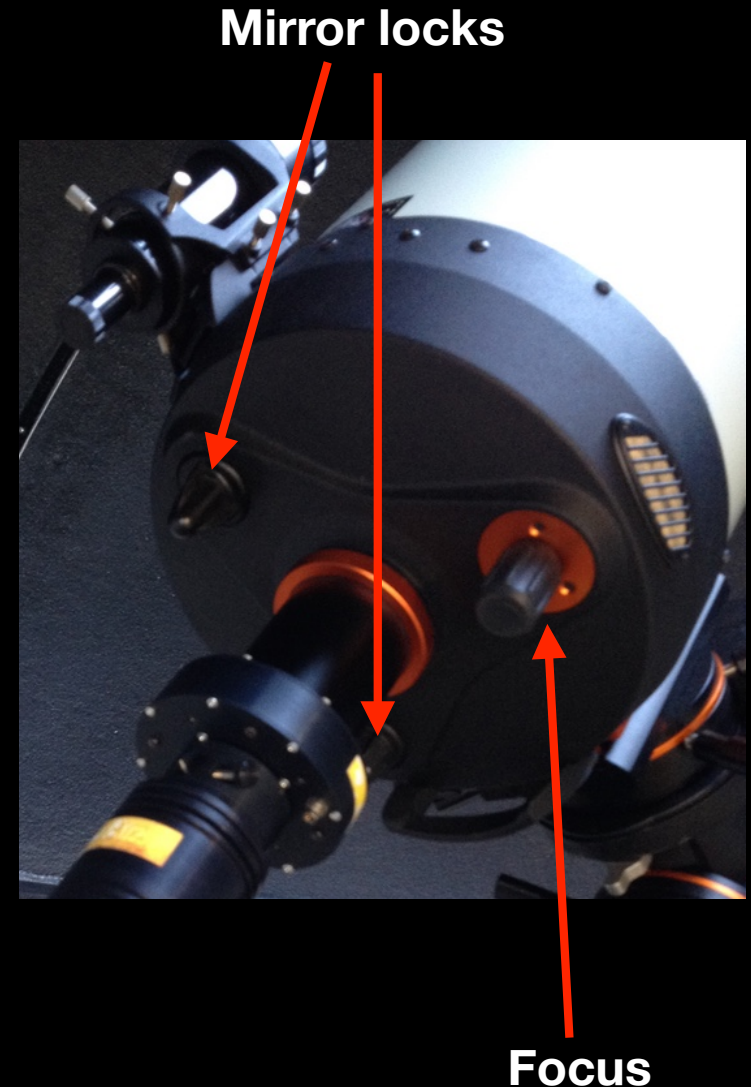
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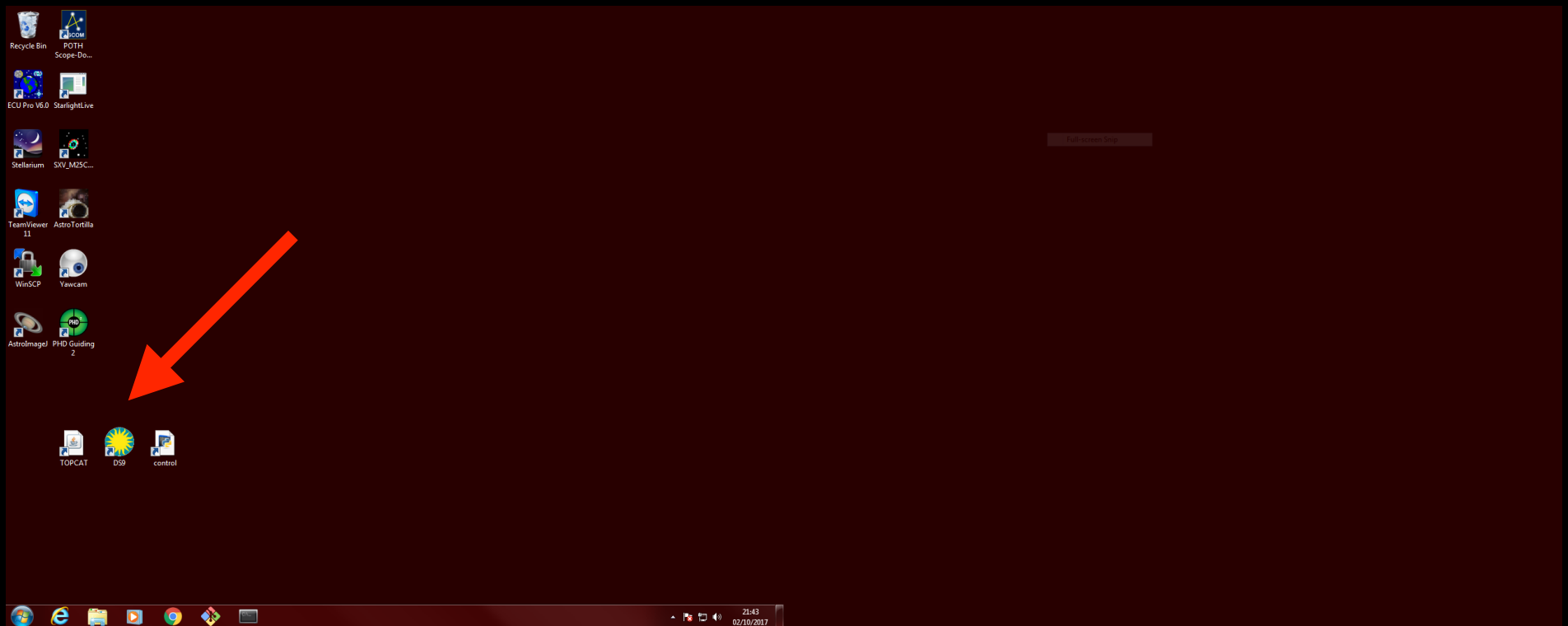
Using the telescope

- You are ready to acquire your first target of the night!
- Use the handset
 - Lists of named objects
 - Sky tour
 - (Precise) go to RA & Dec
- Or use software on the PC
 - if connection to mount available



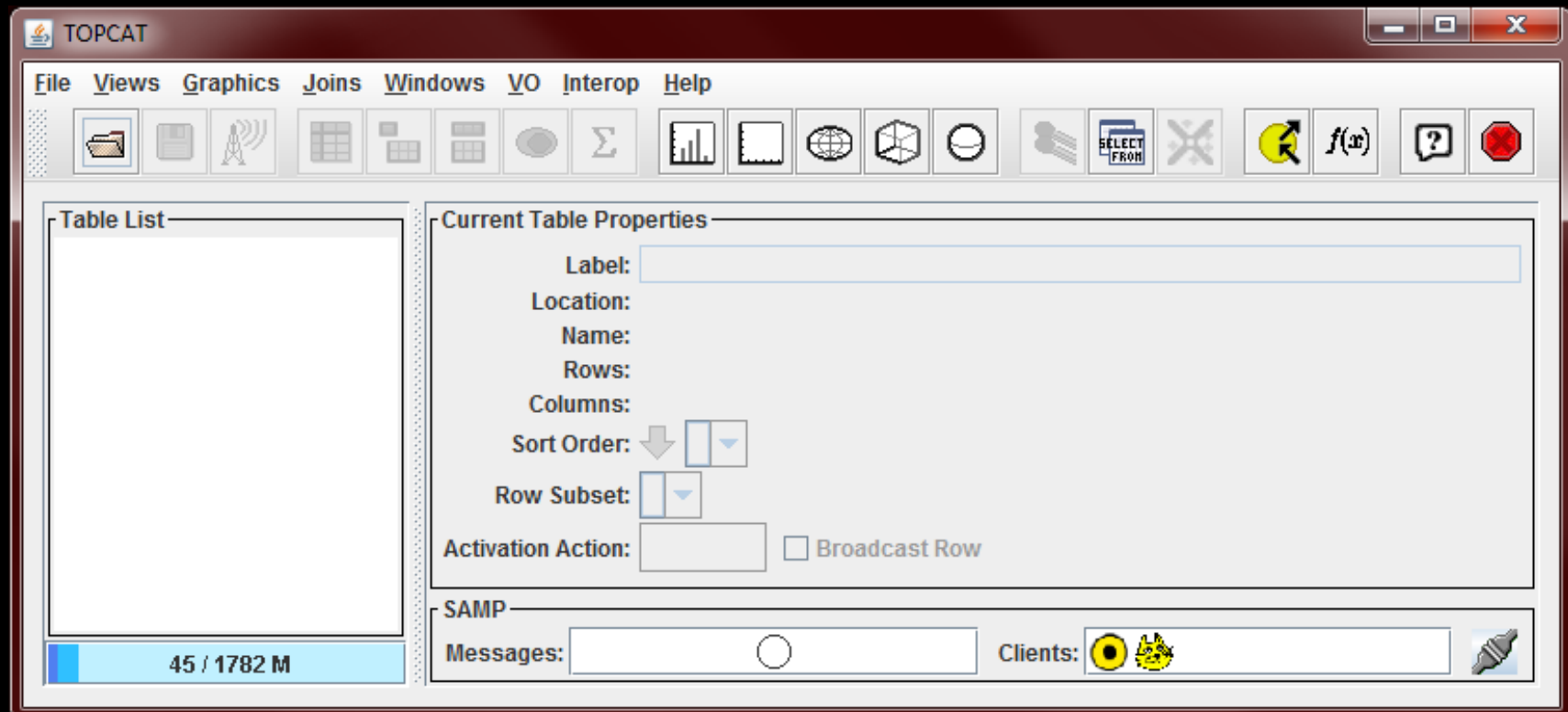
Using the camera

- Start the imaging software: 1) TOPCAT, 2) DS9, 3) Control



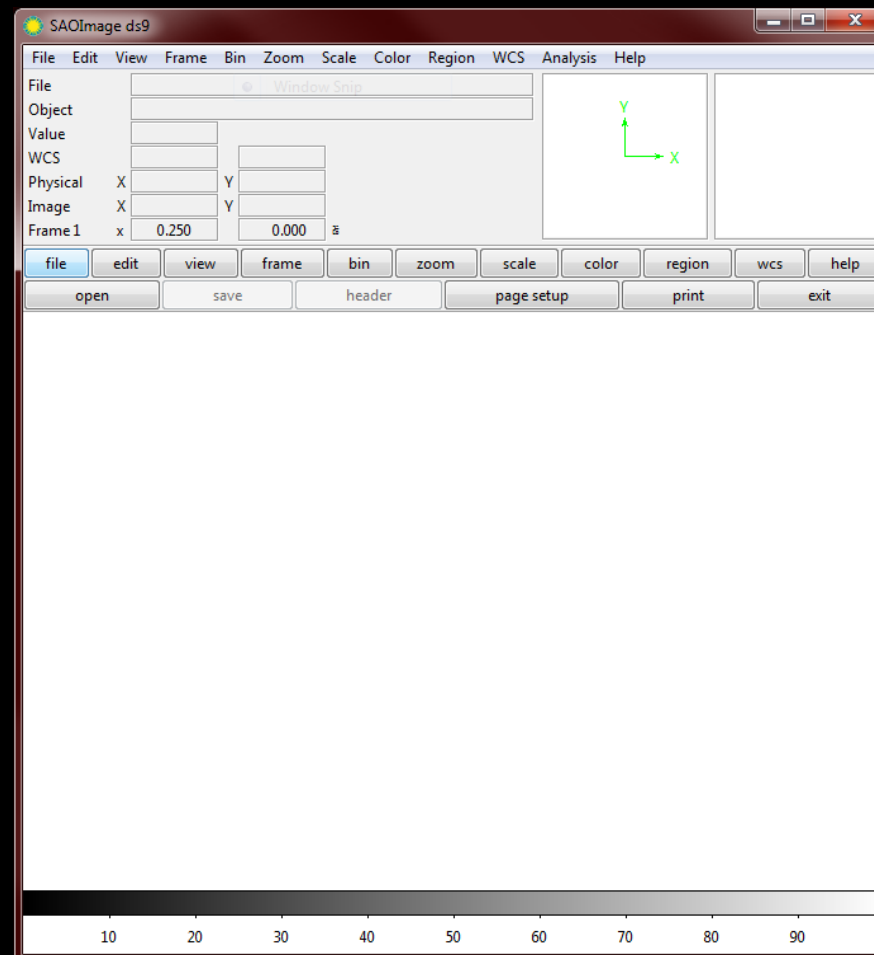
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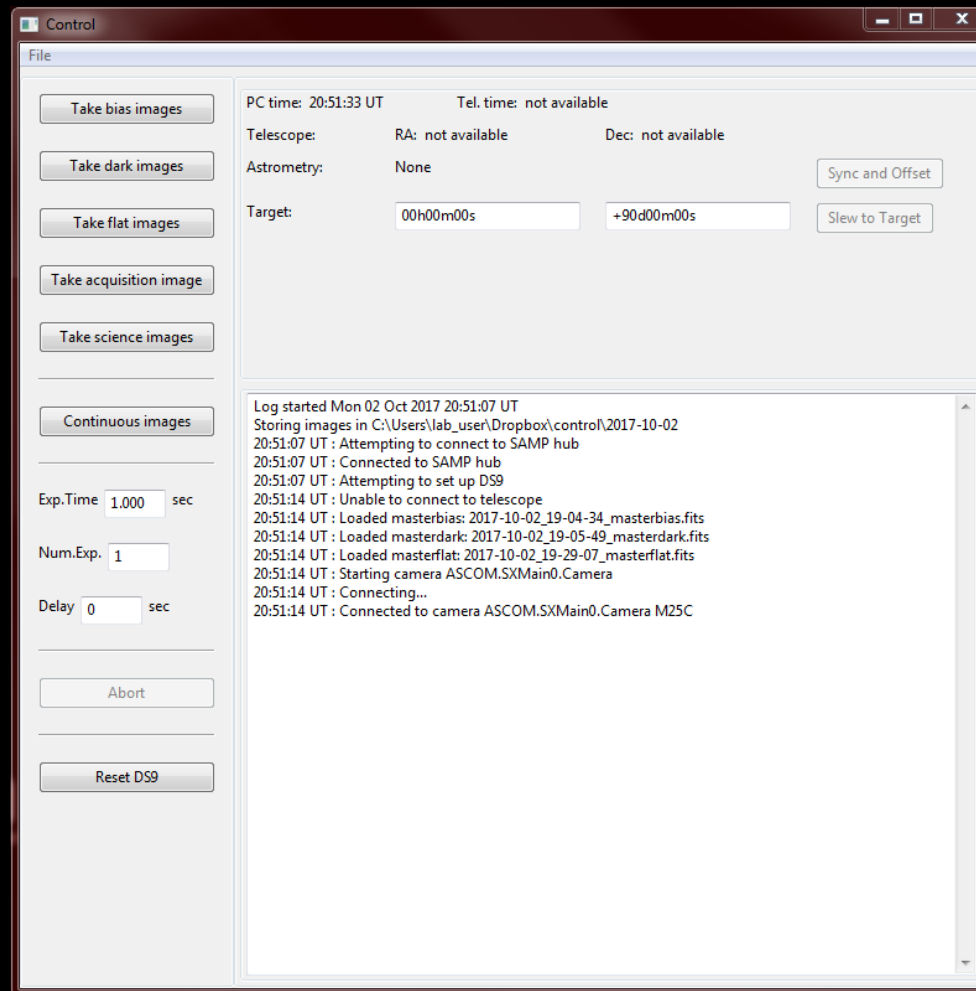
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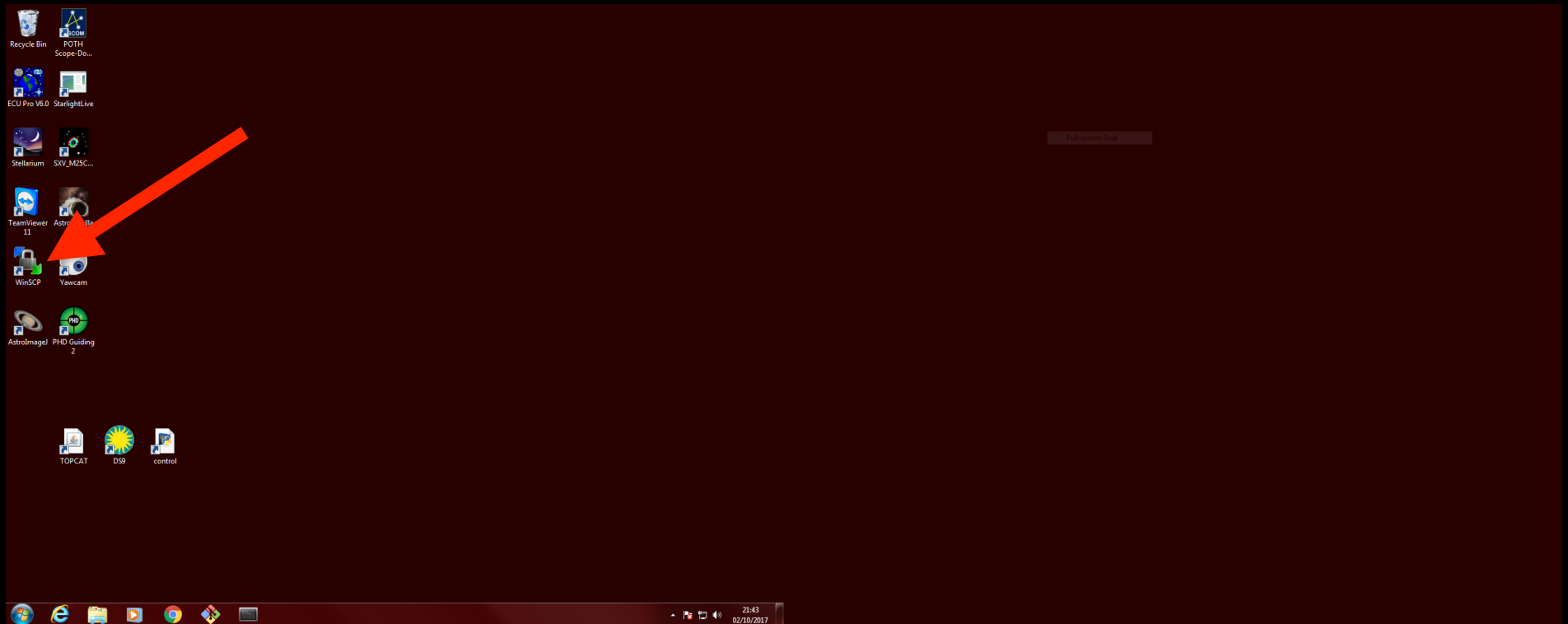


Using the camera

- Start the imaging software: 1) TOPCAT, 2) DS9, 3) Control
 - If using the camera and want best results:
 - Take a set of bias images
 - Take set of sky-flats, if possible

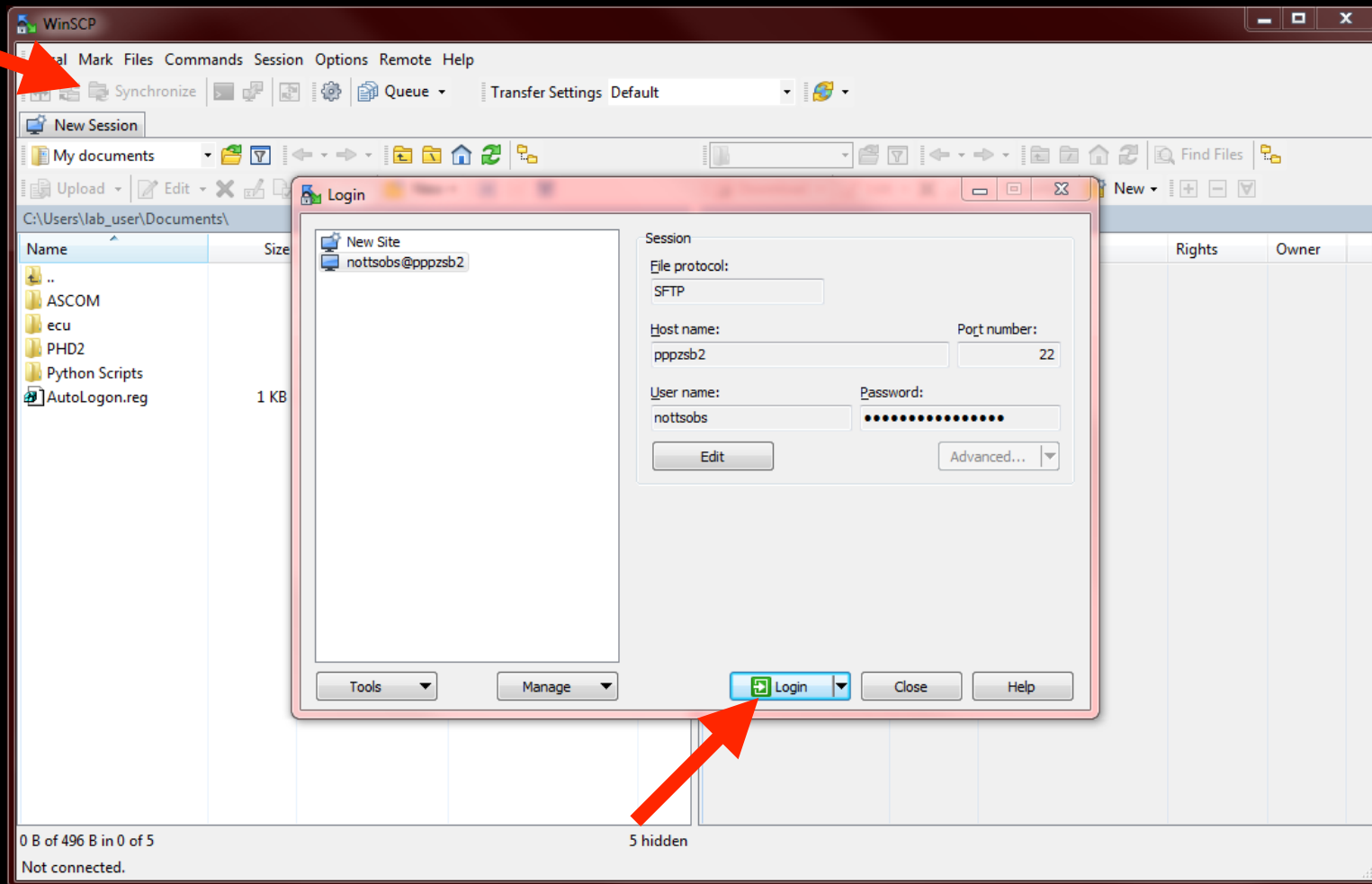
Using the camera

- Start image backup
 - open WinSCP and start the 'synchronize folders' tool



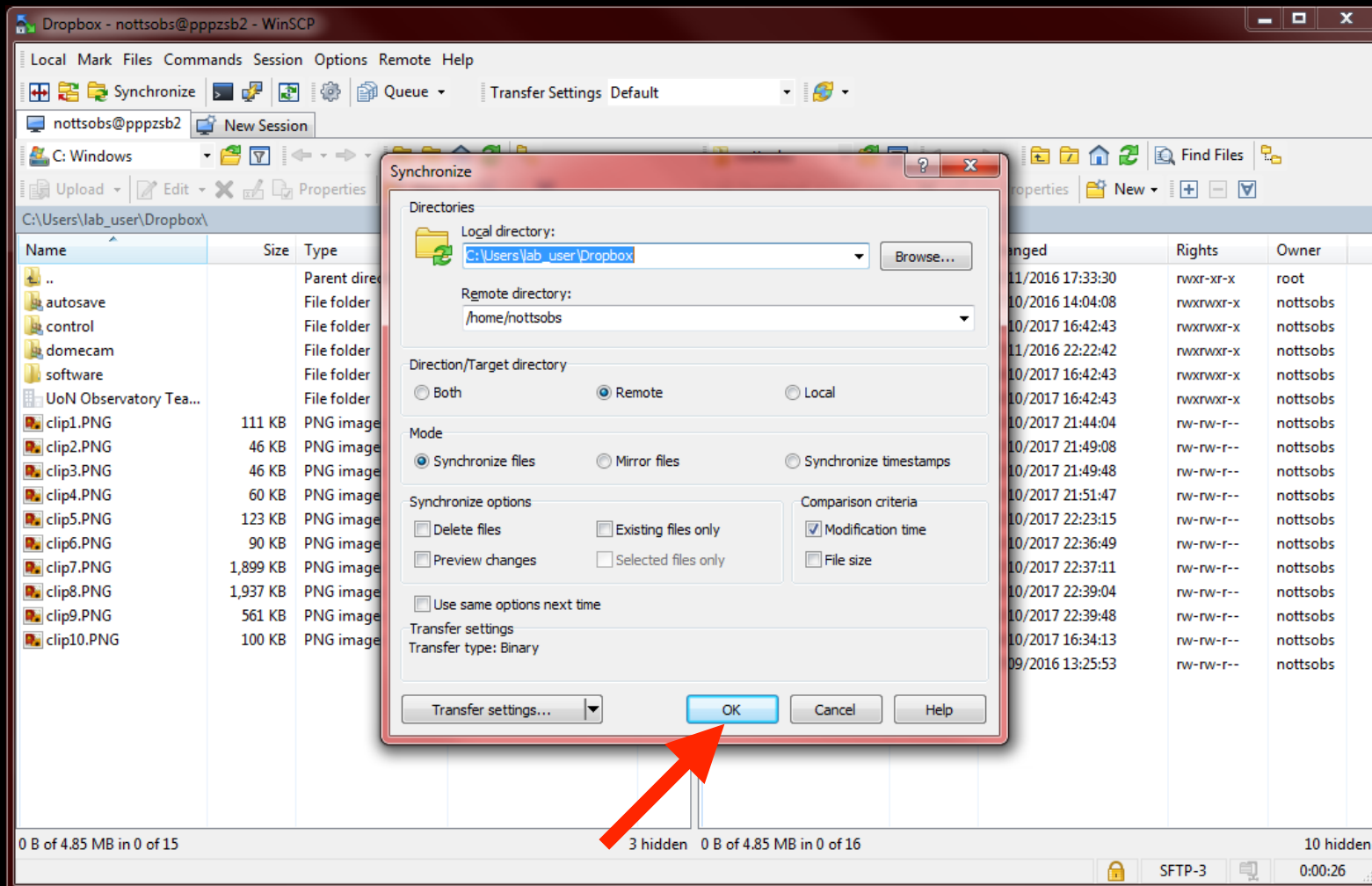
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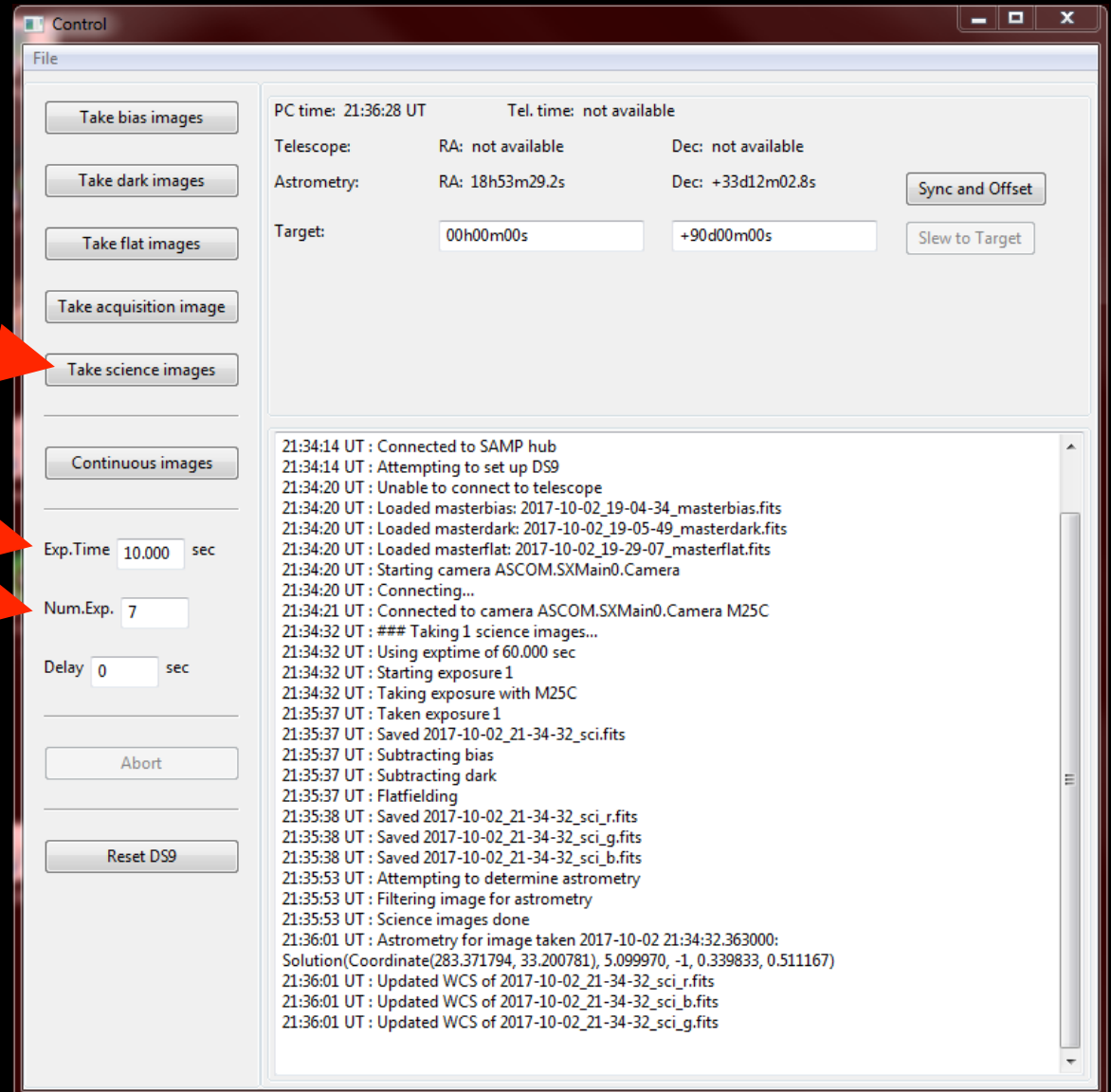
Using the camera

- Start image backup
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Using the camera

- Taking 'science' images
- choose exposure time and number of exposures



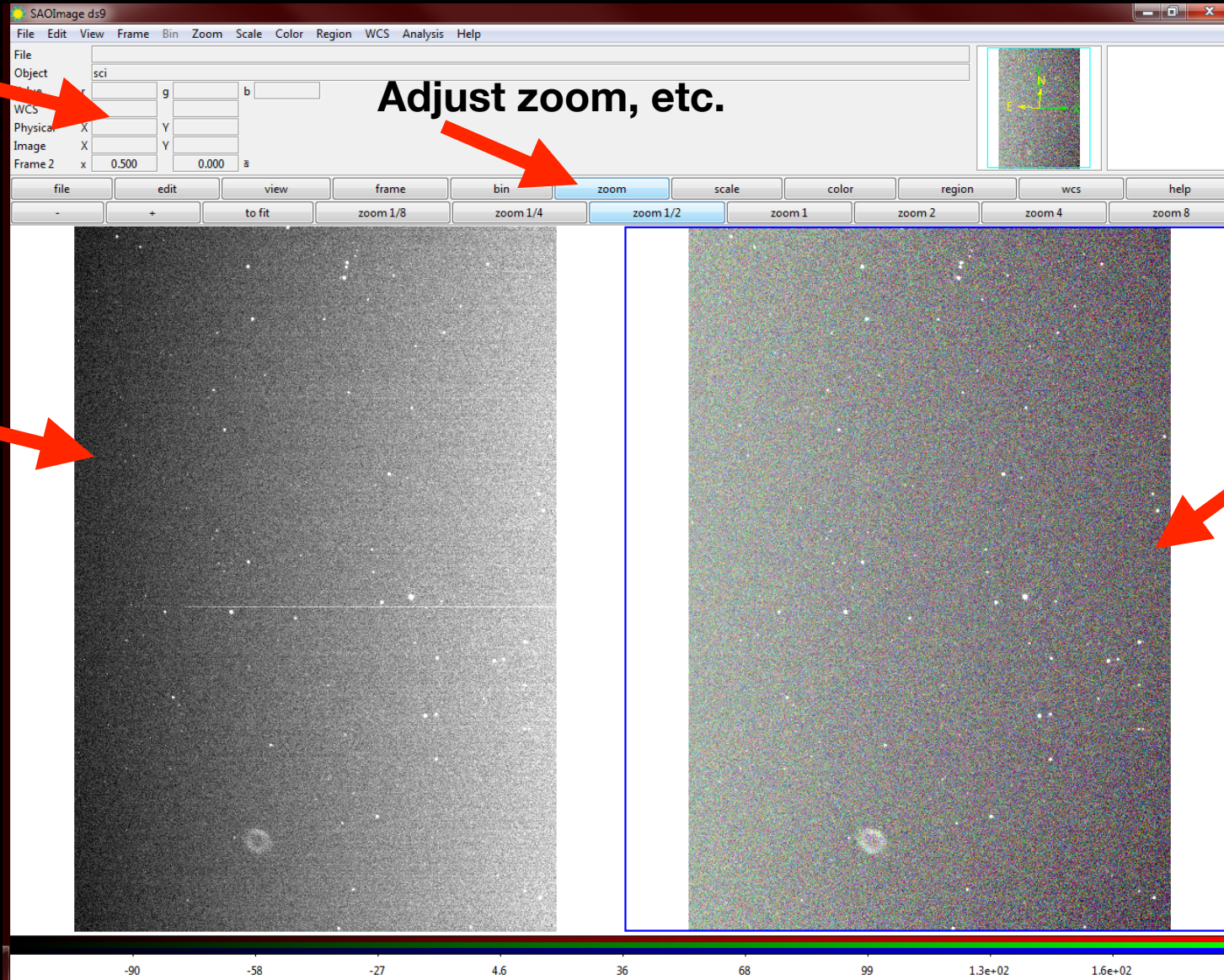
Using the camera

Counts,
position

Adjust zoom, etc.

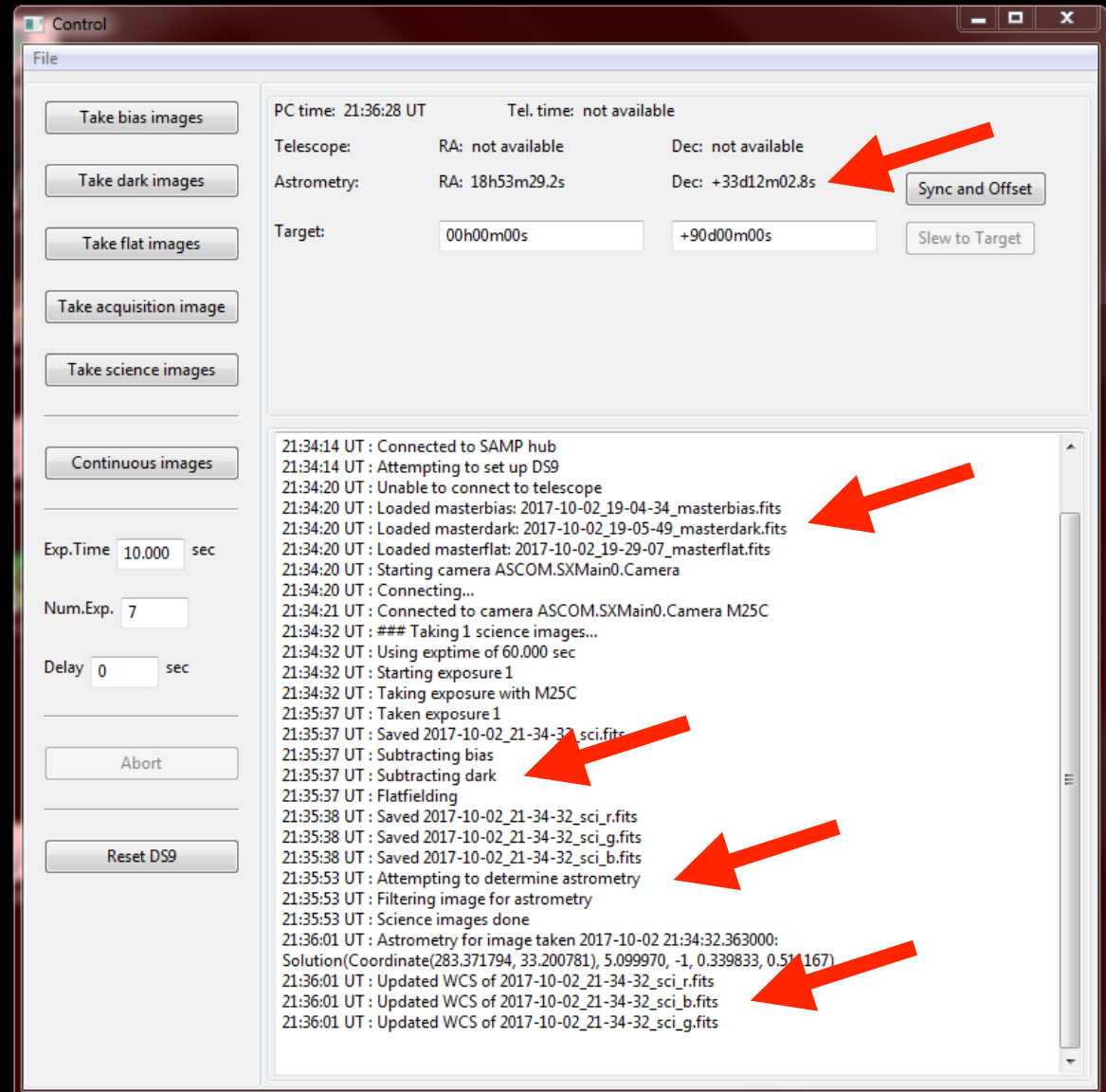
Raw
image

Processed
colour
image

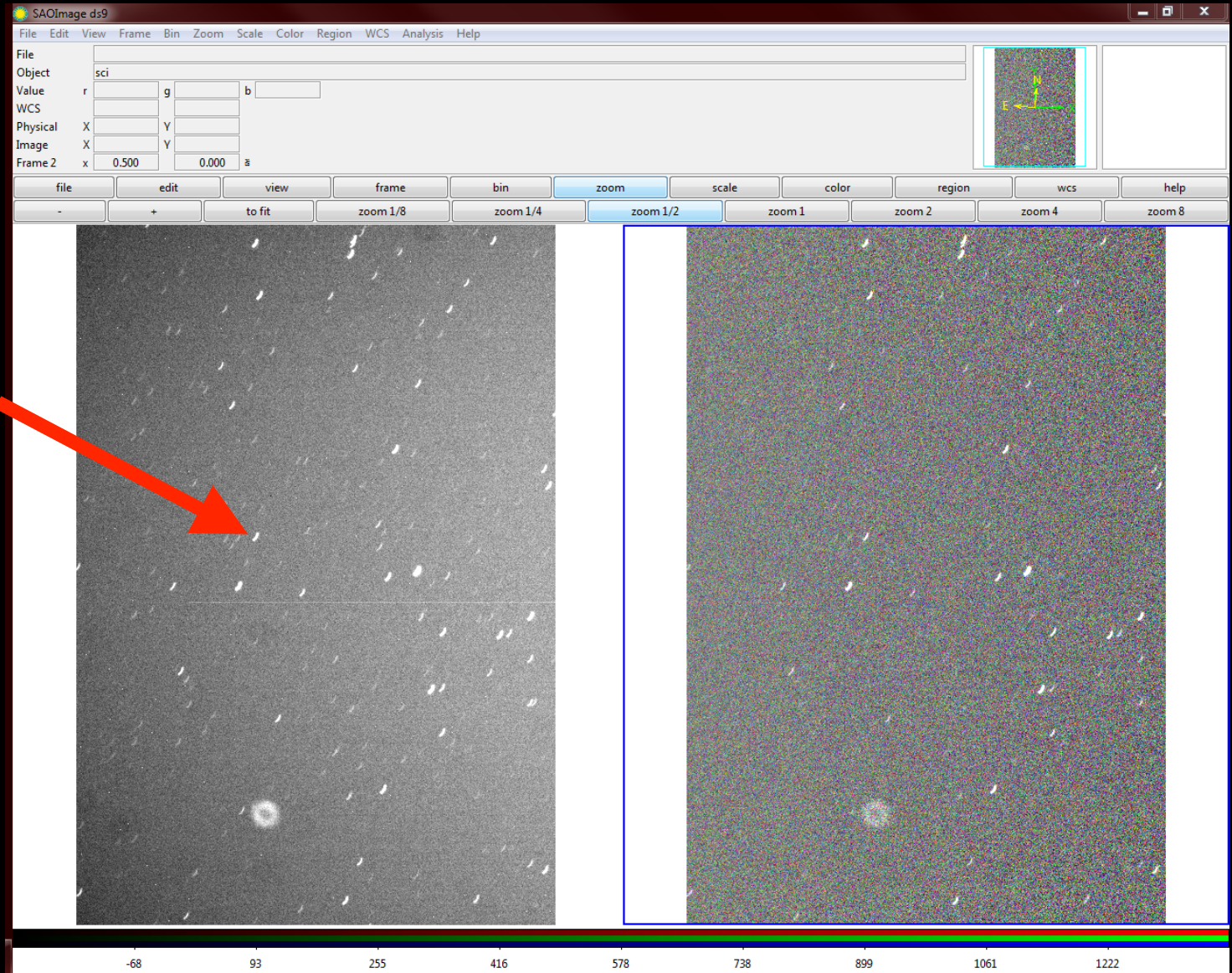


Using the camera

- Automatic processing
 - loads previous calibrations
 - reduces images
 - separates R, G, B
 - attempts to determine position of image



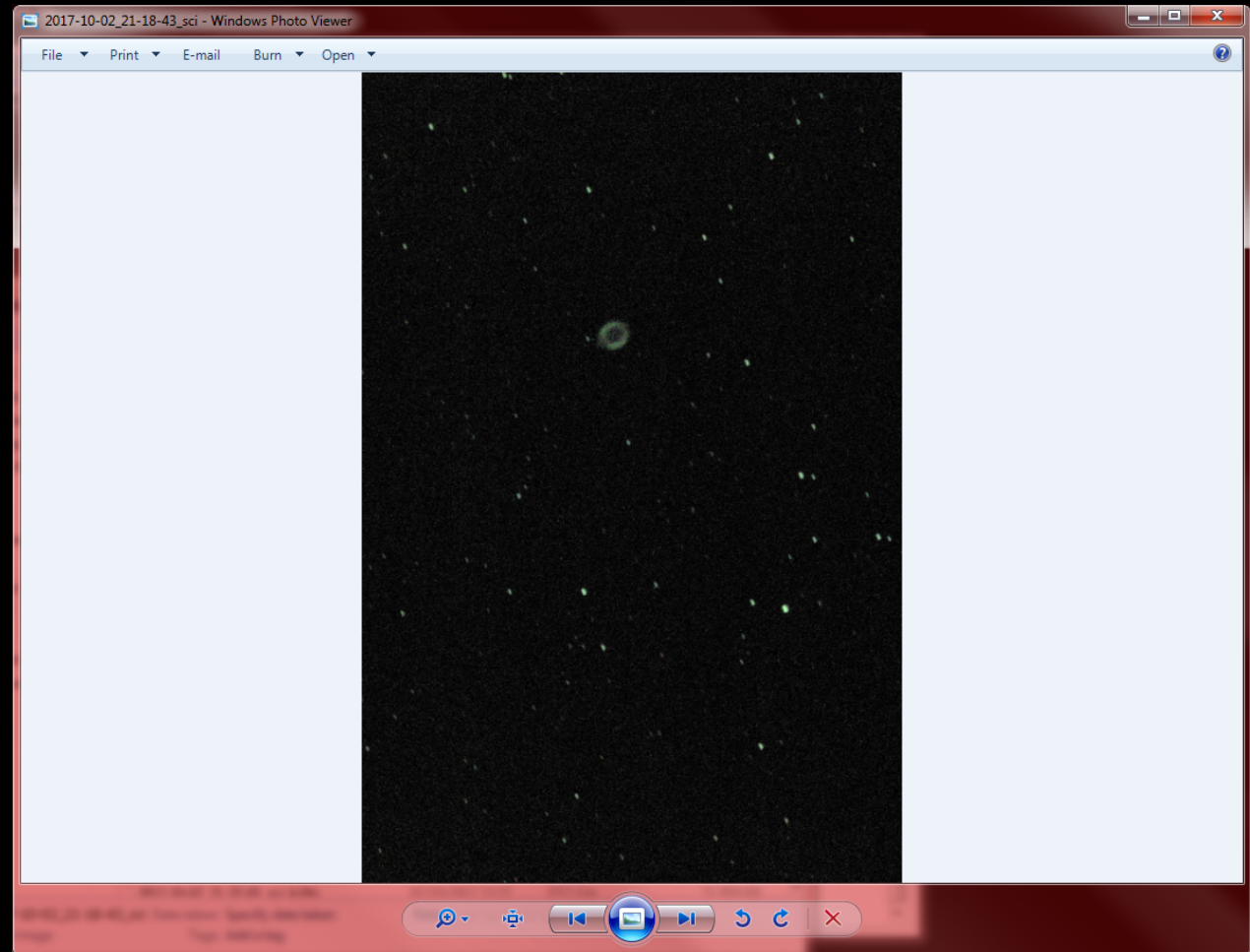
Using the camera



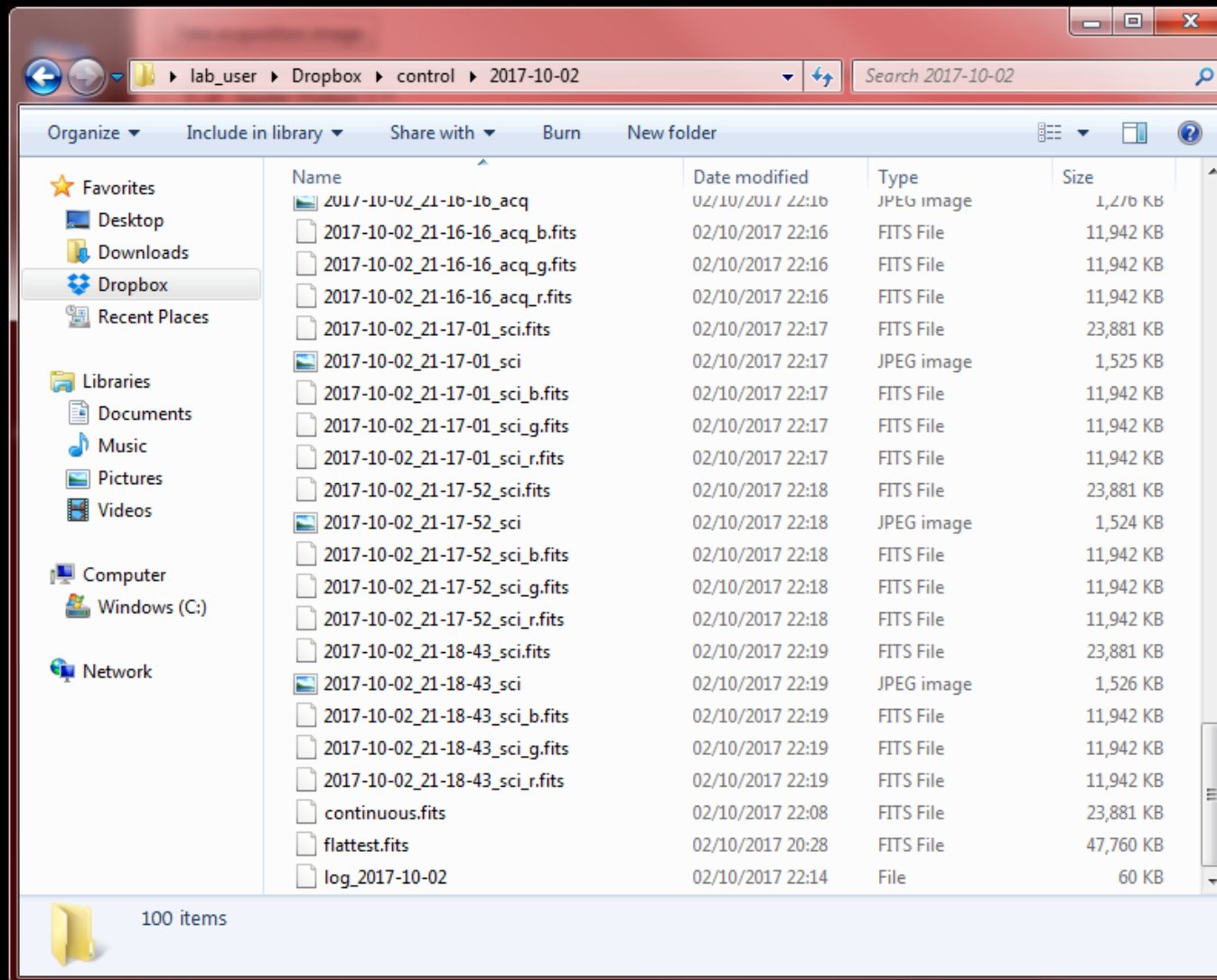
Imperfect tracking
for long exposures

Using the camera

- JPEG output
 - reasonable defaults
 - can be improved by manual processing, e.g. co-adding exposures

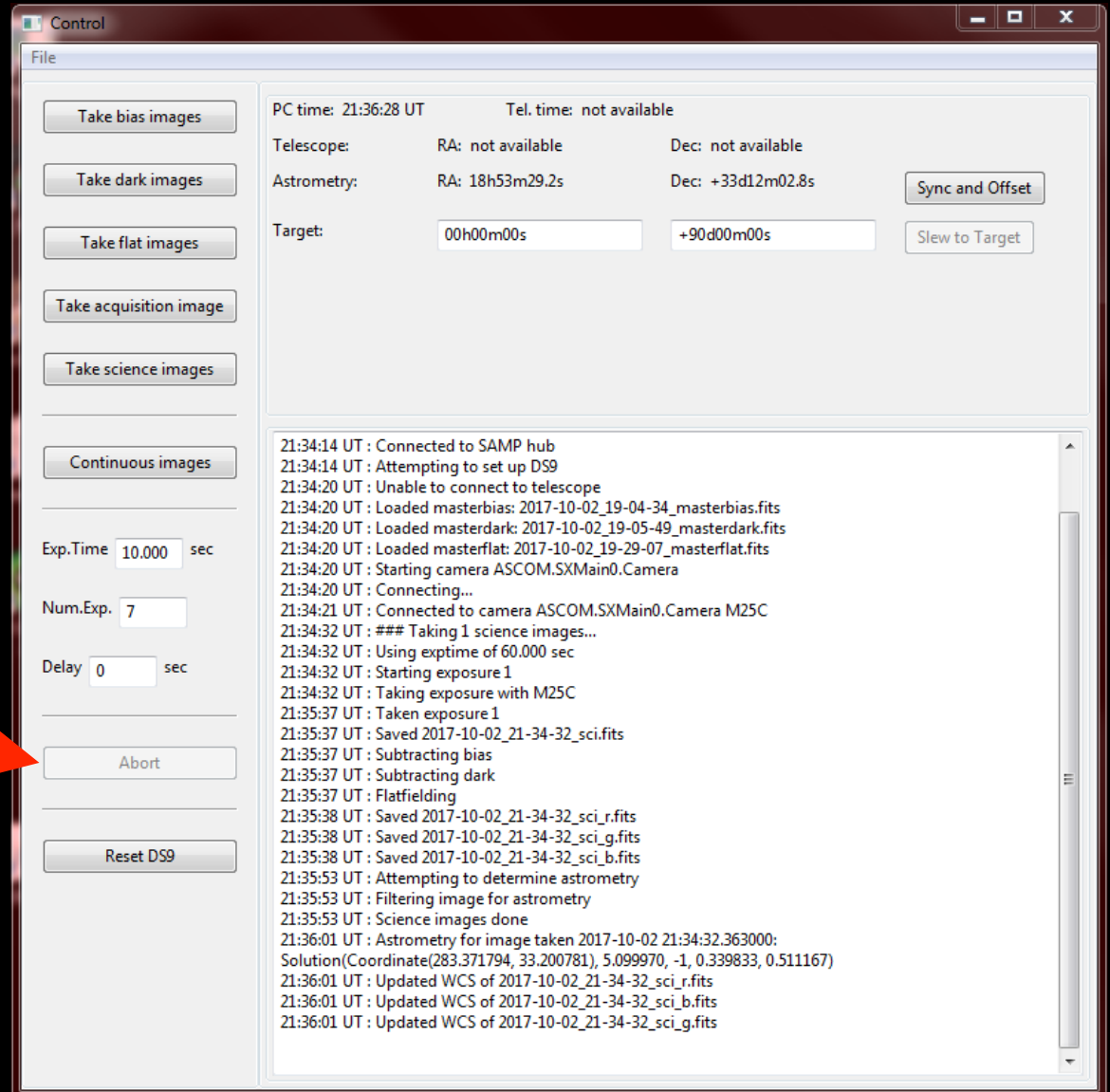


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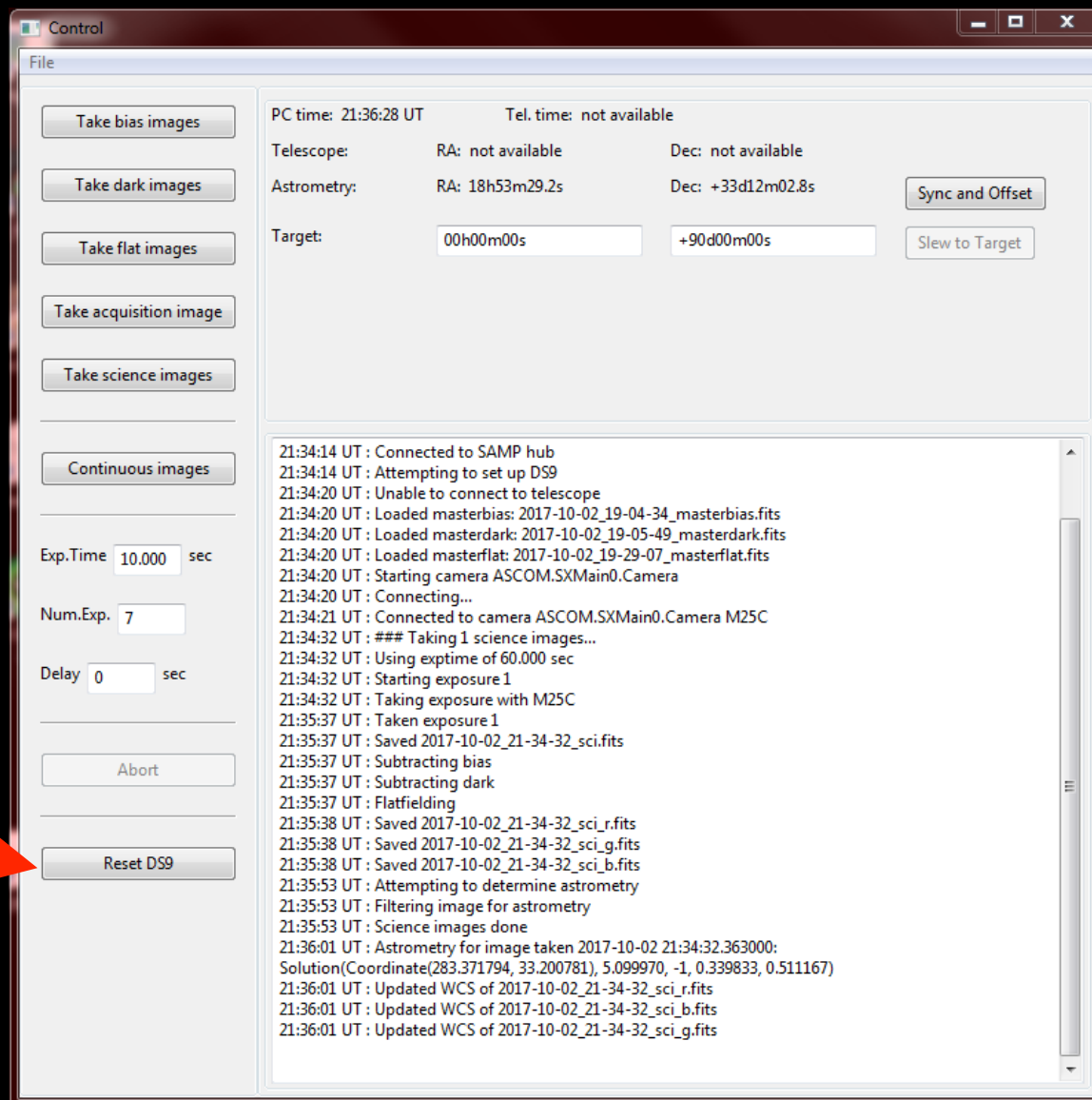
Using the camera

- Abort
 - stops current set of exposures



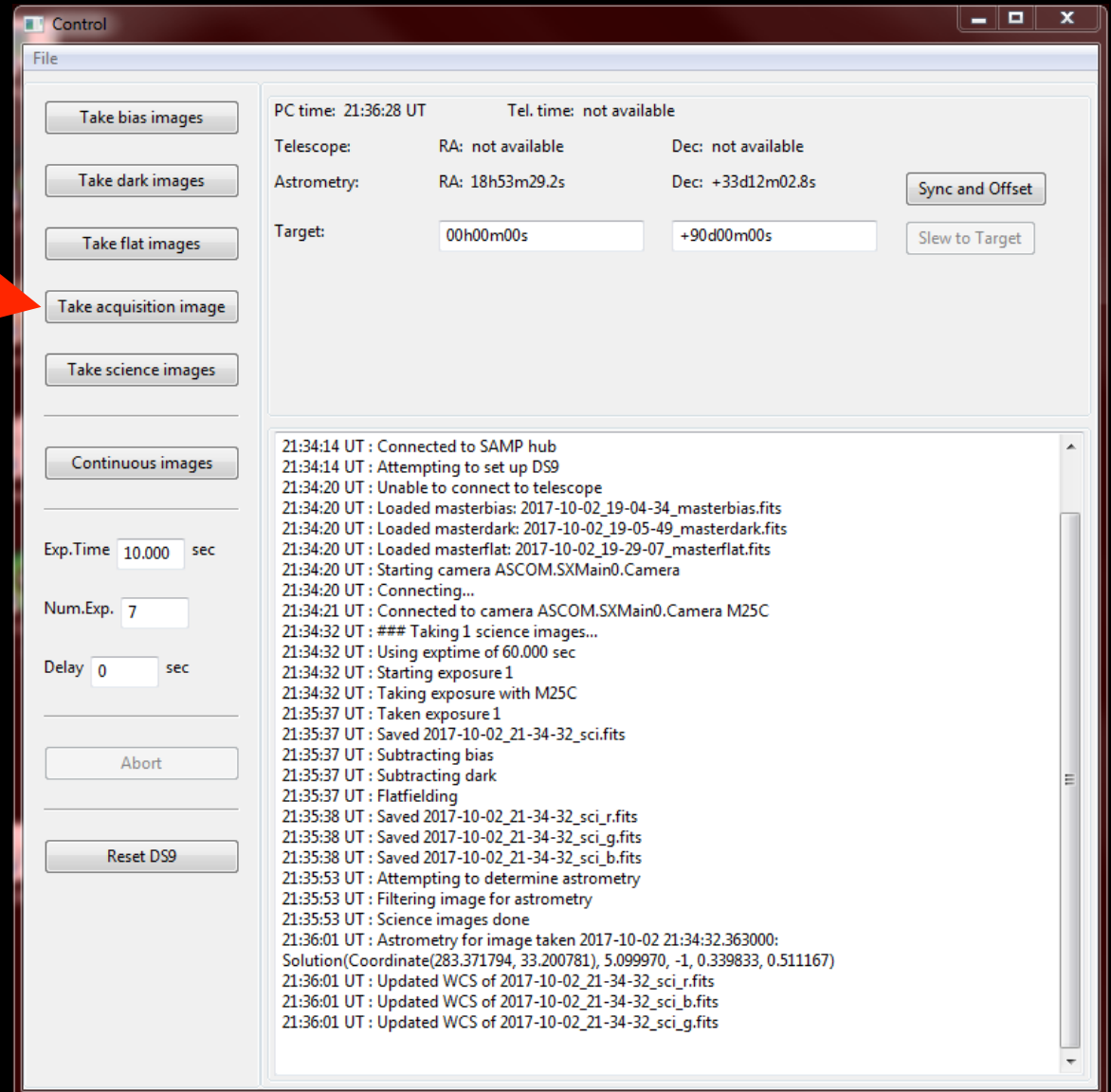
Using the camera

- Reset DS9
 - attempts to re-establish link to DS9 and initial setup
 - if problems persist close and reopen software



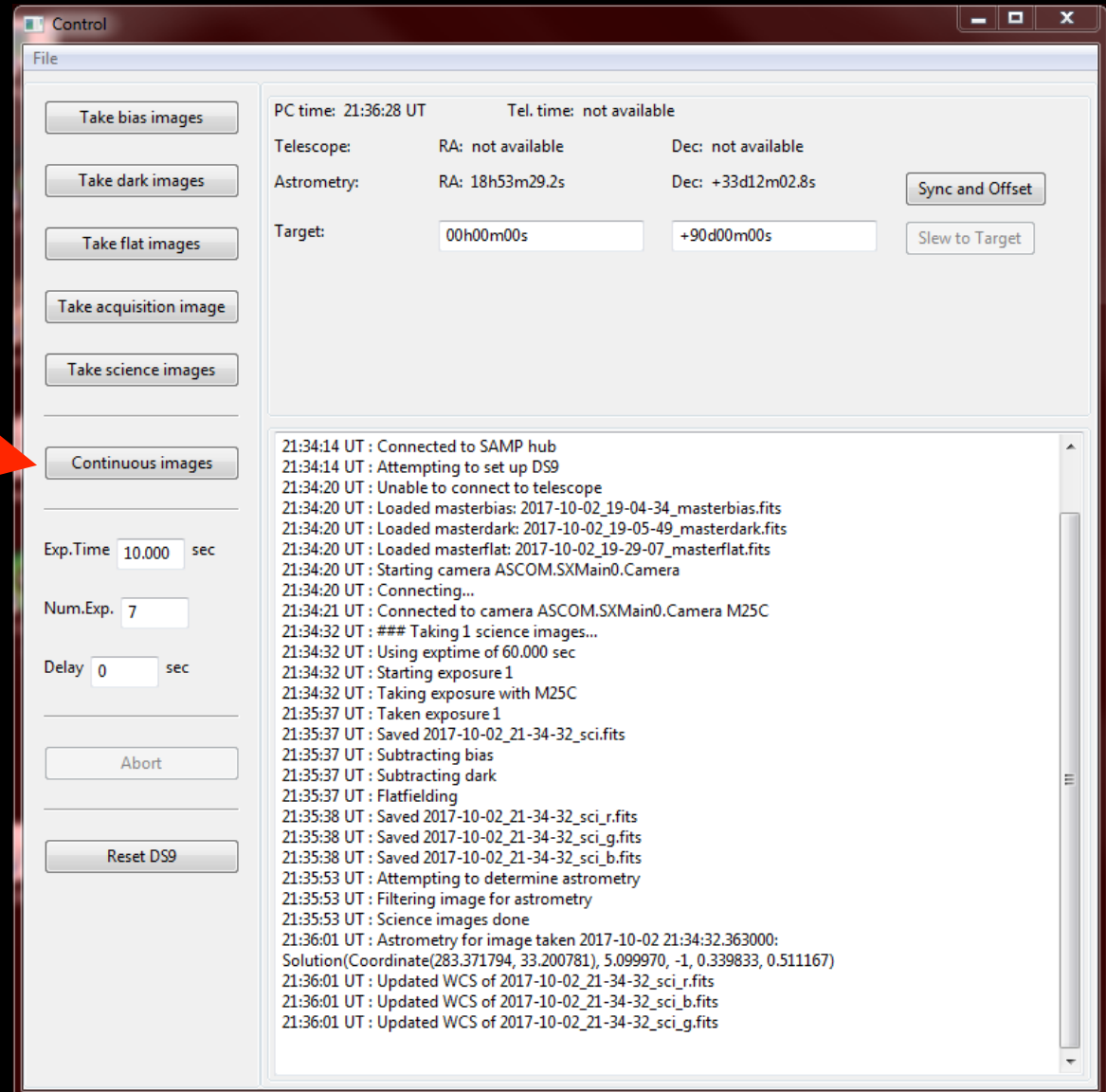
Using the camera

- Acquisition
 - convenience
 - one exposure
 - different name



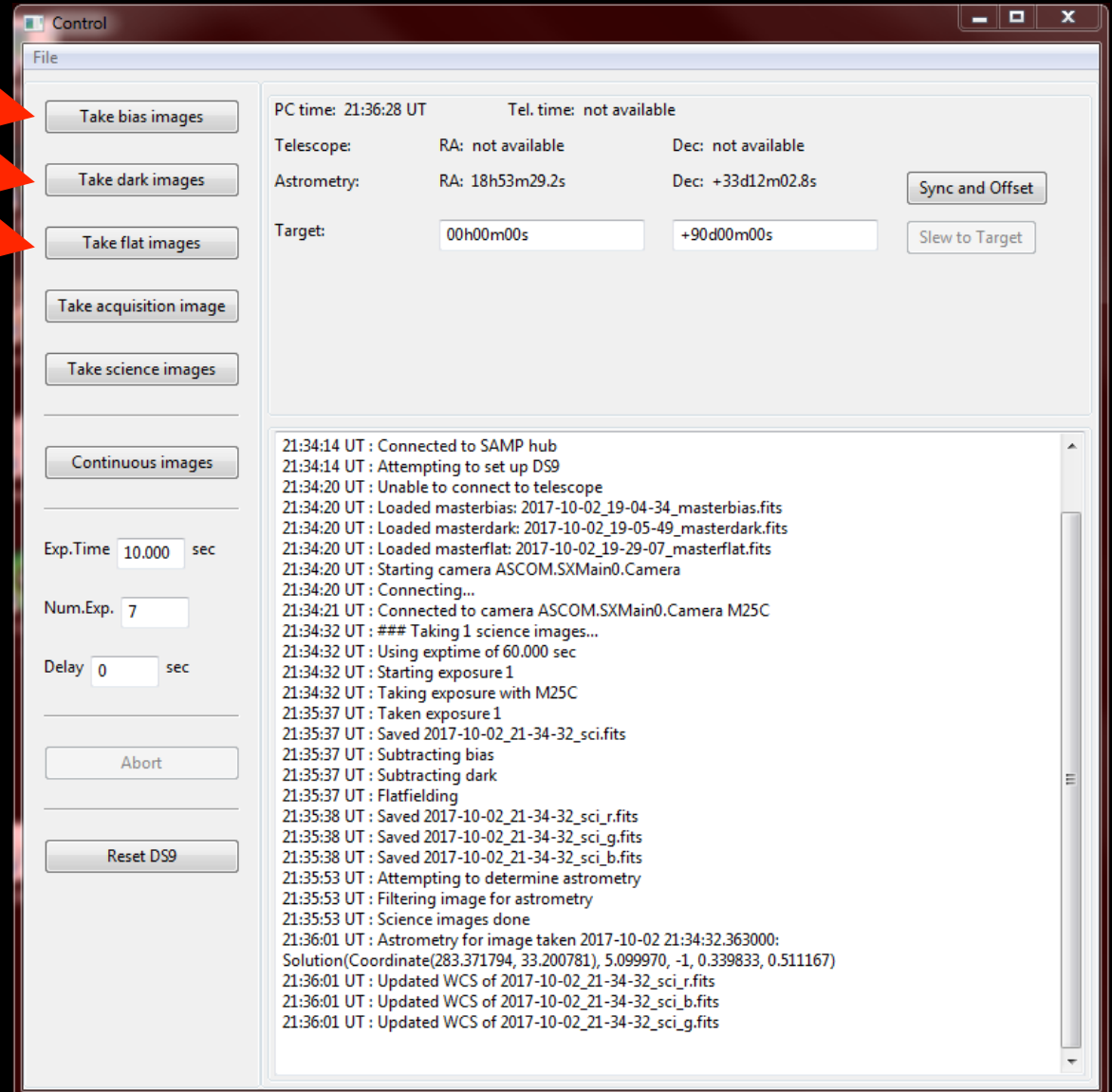
Using the camera

- Continuous images
 - useful for:
 - acquisition of bright targets
 - focusing
 - pointing calibration
- not saved to disk



Using the camera

- Calibrations
 - bias
 - dark
 - flats
- sensible defaults
 - can be overridden



Finishing observing

University of Nottingham – School of Physics and Astronomy – 3.5 metre Observatory

Telescope User Instructions

This document contains important information about using the astronomical observatory on the roof of the Physics Building. To use the observatory, you **must** have attended a safety briefing. By signing the briefing register you agree to abide by the safety rules and instructions in this document. Failure to do so will result in your access to the observatory being withdrawn.

Safety Rules

- Only individuals who have attended a safety briefing (and signed the register) are allowed to operate the telescope and access the observatory outside normal working hours. Others may only visit the observatory out of hours with the permission of the observatory director or other member of academic staff. In such cases, guests must be informed of these safety rules and remain under the supervision of an experienced observatory user.
- The observatory is a hazardous place, especially at night. To minimize risks to yourself and others you must:
 - Never work in the observatory alone – if you have an accident, there will be no-one to get help. Always work in pairs or small groups.
 - Carry a mobile phone with you – put the numbers below in your contacts.
 - In an emergency, call 0115 951 8888 (the campus equivalent to 999).
 - In less urgent cases, security may be contacted on 0115 951 13013.
 - Wear suitable warm clothing.
 - Be careful moving around in the dome. There are plenty of cables and objects to trip over, which is especially easy to do in the dark.
 - Take care when entering the observatory; there is a step and reduced door height.
 - Carry a torch and use it when necessary.
 - Don't get locked out on the roof! Make sure you take the roof door key with you.
 - Set the sign on the door to show that you are working in the dome. This is important for fire safety.
 - Do not go onto the roof beyond the railed area and the path to the railed area.
 - Be careful when climbing the steps to the raised area of the roof.
 - If you see an intruder in the building DO NOT confront them – contact security.
 - Comply with School rules for out-of-hours access to the building.
- The telescope, its mount and associated equipment are expensive and delicate. In order to protect them from damage and ensure continued access for all, you must:
 - Be aware whenever the telescope is moving to a new target. Ensure it does not collide with anything (including its own mount) or snag any cables. Pressing any arrow key on the handset will immediately stop the telescope.
 - Try to keep dust and damp off the telescope. Open the dome before you take the covers off the lenses, and put them back on before you close the dome. Leave the telescope covered up when the dome is closed (in case of leaks).
 - Do not open the dome in poor weather (wet or excessively windy) – close the dome if conditions deteriorate.
 - Do not leave the dome open unattended if there is a risk of rain.
 - Take care of the roof door and dome keys. Return them to the key safe when you have finished observing.
 - Fill in the observatory log with times, names of all attendees, and note objects observed and any problems encountered.
- Never point the telescope anywhere near the sun. Doing so will damage the telescope in a fraction of a second, and could cause irreversible damage to your eyesight.
- Make sure the building is locked and the alarm is set when leaving out of normal hours.
- You should also read and understand the School Emergency Procedures. These are distributed at briefings and displayed inside the observatory.

Telescope Shutdown Instructions

- **Backup** your images (if taken)
 - to a USB key, and/or
 - ensure WinSCP is **synchronising** the images folder
- **Close software** on the computer (if used)
 - but do not shut down the computer
- **Slew the telescope to its home position**
 - (Menu → Utilities → Home → Go To)
- **Hibernate the telescope mount**
 - (Menu → Utilities → Hibernate)
- **Turn off the telescope mount**
- **Put the dust caps back on**
 - both the main telescope and on the finderscope
- **Put the cover over the telescope**
- **Close the lower dome shutter**
- **Close the upper dome shutter**
 - ensure it overlaps the lower shutter
- **Turn off the dome rotation unit** (if in use)
- **Turn off the two sockets on the telescope pillar**
 - leave on the two sockets by the computer
- **Lock the dome and return the keys to the key safe**
- **Complete the observing log**

In case of problems, call/text/email the Observatory Director:

Dr Steven Bamford – 07812 028021 (before 11pm)

– steven.bamford@nottingham.ac.uk

Be very wary of attempting to fix issues yourself!

Finishing observing

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 - ensure WinSCP is synchronising the images folder
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Finishing observing

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Next

- You can now use the telescope!
- Any problems? Let me know!
- Night-time observing sessions being arranged by PhysSoc
- I will put you on mailing list and send a welcome email
- Your cards will work out-of-hours in a few days
- Join the Nottingham Telescope Facebook group

Done