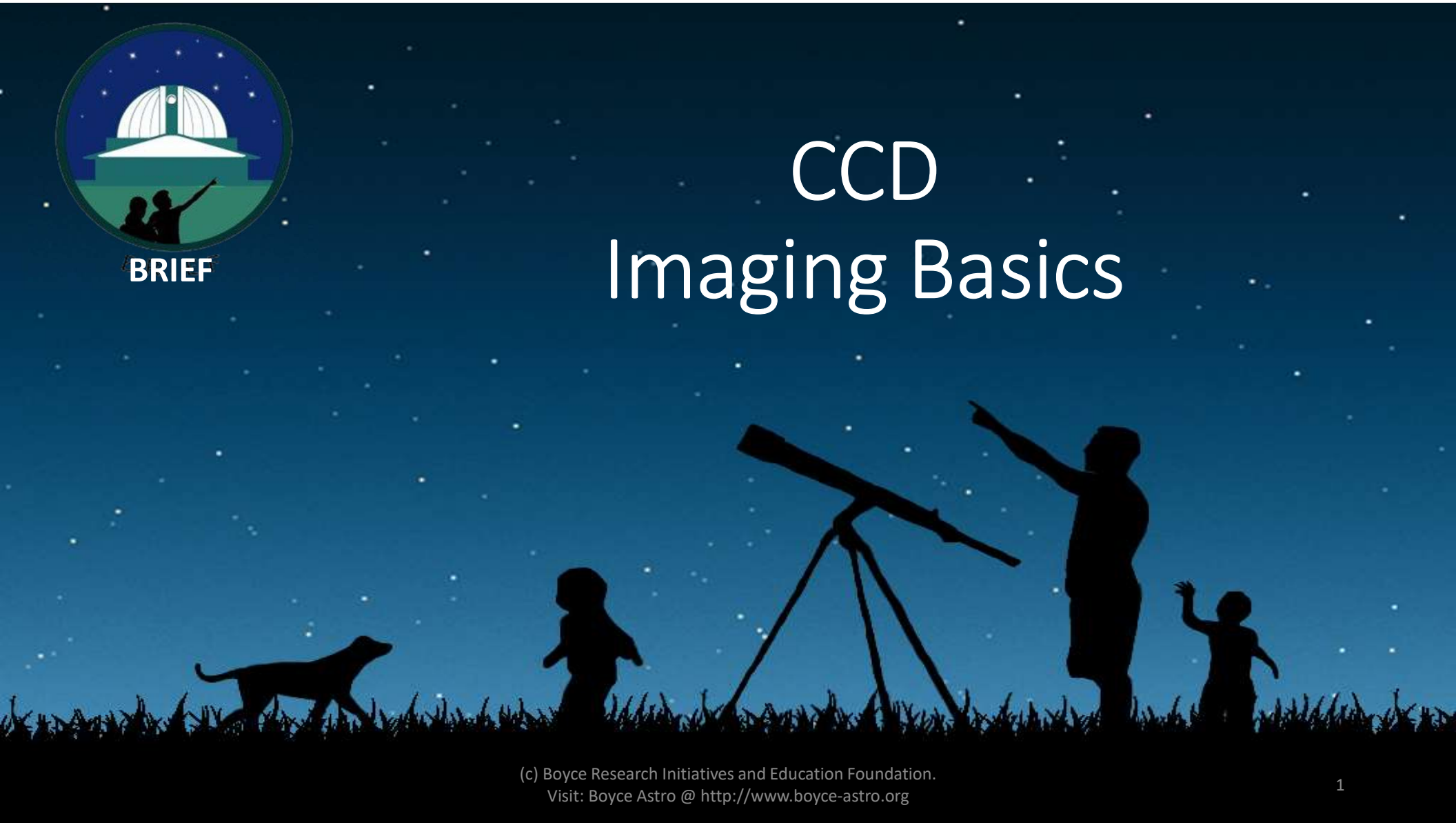
BRIEF

CCD Imaging Basics



Overview NOTE: This video lesson is essentially a checklist of best practices. It is recommended that you use it in this way.

The following outlines the basics involved in acquiring an image of the night sky, whether for pretty pictures or scientific purposes.

This lesson serves as an overview where other lessons will provide deeper instruction on the individual topics.

This lesson provides a deeper look into what is required to acquire images of scientific quality.

While most cameras these days make imaging almost “point and shoot”, astronomical imaging requires additional considerations and processes. This lesson will provide an introduction to those necessary steps.

Locate your Object and Prepare for Imaging:

1. Using software or a map, it is important to locate the image in the sky.
2. Check the local weather conditions at time of desired imaging (if applicable)
3. Note the RA and DEC of the target object.
4. Determine whether it is observable during the night for the particular time of year.
5. Use the Declination to help determine from where on Earth an image would be best taken.
6. Determine its time for rising (maybe it's already up at sunset) and it sets.
7. Determine the best time to image considering Airmass.
8. Determine the Exposure time/s
9. Determine what filters will be used.

After the Image is Acquired

1. Move all files (light frames and calibration files) to a separate directory
2. Copy the directory so you never work on the original files
3. View all the light files and look for bad images: Clouds, blurry, contrails, airplanes, satellites, etc
4. Create master reduction files: Master Darks, Master Bias, Master Flats
    1. NOTE: Some software programs, such as AIJ and the OSS Pipeline, will do this for you
5. Perform data reduction
6. Insert World Coordinate System (WCS) coordinates into each image
7. Process resulting light images through desired software:
    1. AIJ for exoplanets
    2. AIJ, Maxim, Mira for photometry and light curves
    3. Mira for Astrometry
    4. Etc……

Exposure Time

Goal is to maximize the SNR of the target star.

Factors to consider:

- Telescope aperture size
- Filters used
- Quantum Efficiency (QE) of the camera
- Star's position relative to the Meridian and the effects of Air Mass
- Seeing Conditions
- CCD Linearity

Calibration Images

Image calibration is the process of removing non–astrophysical signals from your images so they do not contaminate the data.

Software will allow you to average images together and apply your calibration frames to your data frames.

The reason behind calibration images is that they help standardize your data images without distorting the good signal in any way, making them more representative of the light received from the source without being modified by the response of your system.

The three types of Calibration Images are:

1. Bias
2. Darks
3. Flats

Summary

This lesson provides an overview of what is to be considered when imaging an astronomical target.

When acquiring images through a BRIEF sponsored system, many of these factors have been accounted for. It is important to realize that when imaging with other systems, you should account for all of these factors on your own.

Where the elements are accounted for by BRIEF, these have been noted throughout this video.

Questions?