Imaging with a Telescope - The Holy Grail of Eclipse Photography

As the focal length increases the challenges of imaging “close-up” starts to jump out at you. Namely, the sun is moving across your frame rather quickly. To counteract that motion, equipment is required. There are several options but a 400-700mm, f/5 to f/7 telescope riding on a tracking mount, with your camera snapping away, is primo.

Challenge # 1: The Sun’s Apparent Motion

* The sun occupies 1/2 degree of sky and will move its diameter on your image frame in 2 minutes

Size of sun on your sensor = focal length / 110

400mm / 110 = 3.6mm

Images to right at 400mm with APS Sensor
See images below for various focal lengths

A 35mm lens on an APS sensor will capture the entire eclipse within the frame.

Challenge # 2: Keeping the Sun Centered

* When shooting the eclipse from partial through total, important to recenter sun for each image
* Tracking mounts make this easier @ > 300mm
* At 300mm, image will blur if > 1/2 second exposure

Challenge # 3: Controlling Vibration

* Blurry images due to sun’s motion and vibrations from focusing or weak tripod are common
* Learn your setup - how long is “tamp down” time?
* Use mirror lock or Live View to allow tamp down

Focal Length

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Mount

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Not Required | Preferred | Mandatory

| 20 mm Sigma Lens | 90 mm 70-200 Canon | 135 mm 70-200 Canon | 200 mm 70-200 Canon | 400 mm AT 65 | 700 mm AT 106 |

All images taken with Canon Rebel XSi 450D, APS sensor (22.2 x 14.8mm), 12.2 megapixels.
Mounts

Mounts capable of tracking the sun come in two flavors:

- **Alt - Az Mounts**: track on both axes but exhibit field rotation over time.
- **Equatorial (EQ) Mounts**: track very precisely if properly aligned to the North Celestial Pole.

**Non-Tracking Alt-Az**
- *up to 300mm*
- *Alignment N/A*

**Tracker**
- *70 to 200mm*
- *Polar Alignment*

**Tracking Alt-Az**
- *70 to 400mm*
- *Semi-automatic Go To Alignment*

**Equatorial**
- *200 to 2000mm*
- *Polar Alignment*

**Astro-Tech Voyager SkyTracker Pro**
- *Vixen Polaris*

**iOptron SkyTracker Pro**
- *Vixen Polaris*

**iOptron AZ Mount Pro**
- *Celestron Nexstar*

**Orion Sirius & Atlas Skytracker HEQS & 6**

Sturdy mounts that can hold up to 400-600mm scopes for visual; slow motion controls are a big plus for centering sun; light, portable.

In my experience, 300mm is the max for untracked images: *Centering sun difficult; Exposures blur @ 1/2 sec; Vibration increasing.*

These small trackers are great for widefields of the Milky Way; can do up to 200mm but alignment and framing are a challenge at that focal length; both come with polar scopes to assist alignment; easy setup on sturdy tripod, ball head required to support camera.

These mounts have GPS built-in & set time/location; self-calibrating alignment but Go To requires additional procedure; often sold with 6" Schmidt-Cassegrain or Maksutov scopes with long focal length & f/10 or slower; light, easy to set up.

Many quality options on the market for all capacities & $$; Orion and Skywatcher are reliable low to mid capacity mounts; polar axis is aligned with celestial pole, about 1/2 from north star; smaller scopes & camera / lens can piggyback with rings & adapters; bulky.

Ideally, mounts are aligned the night before and left in place, but this is not feasible in most cases. You will need to rough align during the day. However, this should be sufficient since you only need to keep the sun still for shorter exposures. For EQs, set the altitude, level the mount, and point polar axis to true (not magnetic) north. Apps on your smartphone can help with the offset from the compass.

Telescopes

There are many quality telescopes available these days - some are better than others for eclipse photography.

- Match telescope size & weight to mount - exceeding will result in a shaky mount.
- Ideal telescope for eclipse is 400-600mm & f/5 to f/7; 600mm is the max to capture all of the sun's corona & Regulus in same frame.
- Longer focal lengths can image the sun's limb & solar prominences.

**Refractor**

6-8 inch can be mounted on EQ, larger ones on Dobs not ideal (no tracking); fast optics but long focal length (1500 - 2000mm).

**Catadioptric**

Schmidt-Cassegrains & Maksutovs have long focal lengths (1500-2000mm) and slower optics (f/10 or more); focal reducers available, requires heavier mount.

Many choices in ideal size range; many price points; light & easy to mount.

Accessories

- **T-Rings**: connects camera to scope - brand specific
- **Finderscopes/Sun Finders**: get the sun on your sensor
- **Mounting Plate/Rings**: secure scope to mount
- **Intervalometer**: allows you to program exposure sequence for unattended imaging

**Sun**

1/2°

Corona

2-4°

Consider the sun's corona when framing - 600mm is max to capture sun, corona & Regulus in a single frame.

See Alan Dyer's e-book for more information on imaging with scopes & the Scoopedawg Eclipse Landing Page for manufacturer links.