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Title of Proposed Observation:

Coordinated Hinode/XRT, SOT, and Ground-Based Observations of the Total Solar Eclipse of 9 March 2016

Main Objective:

We plan to observe solar jets during the 9 March 2016 total solar eclipse. Observations in white light will be taken from the ground at Ternate, Indonesia.

Scientific Justification:

The coronal intensity in white light is a strong function of density alone, while the coronal intensity seen from Hinode/XRT is dependent on temperature and density. We want to know whether XRT-observed coronal features such as X-ray jets have a propensity to occur in the densest plumes. We can address this by combining the ground-based and space-based observations during the eclipse. Our focus is on the study of coronal jets (e.g., Sterling et al. 2015, Nature, 523, 437), and their possible connection to plumes (e.g., Raouafi et al. 2008, ApJ, 682L, 137; also see Pasachoff et al. 2008, ApJ, 682, 638, and Pasachoff et al. 2015, ApJ, 800, 90). We also desire SOT and IRIS observations to address the connection between spicules and coronal jets (e.g. Sterling, Harra, & Moore 2010, ApJ, 722, 1644, Solar Phys., 260, 59; Curdt, Tian, & Kamio 2012, Solar Physics, 280, 417, and Pasachoff, Jacobson, & Sterling 2009).

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Dates: 8-9 March 2016

Time window:

Before, during, and after, the total solar eclipse of 9 March 2016. Mid-eclipse on the ground is at 00:53 UT. Other timing details provided in instrument plans, and in complementary Landi & Shabbal EIS-centric HOP.

Target(s) of interest:

There are three components to this plan: (1) XRT full-disk observations, for context and alignment; (2) XRT limb observations, to study coronal jets; and (3) SOT and IRIS limb observations, to study solar spicules).

A complementary EIS-centric HOP, led by Landi and Habbal, is being planned separately. This plan is meant to fit with theirs.

SOT requests:

SOT observations of spicules at the solar limb.

A Ca II sequence capable of observing spicules with medium cadence (~15---20 sec, 2x2

binning). To be run during limb polar coronal hole (PCH) pointing period. (If no PCH is available, this should be run on polar-region quiet Sun, after completion of the EIS HOP pointing requests.)

Pointing should be as close to limb as possible (15").

EIS requests:

None. (But see Landi & Habbal HOP.)

XRT requests:

- Full-disk observations:

We require two sets of full-Sun images within three hours on either side of totality. The objective is to have full-Sun XRT images to compare with the totally-eclipsed corona, before and after the times of ground-based totality. (The time of maximum total eclipse on the ground in Ternate is ~00:53 UT on 9 Mar 2016.) The images could be obtained with a typical XRT synoptic observation sequence, but as a minimum images in two filters, Al_poly and Al_mesh, are required. One of these sets of images should be obtained prior to the ground-based eclipse, and another after the ground-based eclipse, as allowed by the the EIS HOP observations. (So if there is a cavity, then the synoptic should run before and after the EIS cavity observations.)

If there is no cavity, then the synoptic should run before and after the EIS HOP's Streamer/AR observations.)

Images taken during typical synoptic sequences should be adequate for this program, but as a minimum we require images in Al_poly and Al_mesh filters; we have found this pair to be useful for determining diagnostics of XRT polar coronal hole features (Pucci et al. 2013, ApJ, 776, 16, Figure 5).

- Limb observations:

TARGET: First choice is a PCH. If no PCH is available, then target should be quiet-Sun polar region (see TIMING).

TIMING: Same as EIS request in EIS HOP. If no PCH is available, this observation should additionally run for >~ 1 hour on polar quiet Sun region, after the EIS-requested runs are completed.

FIELD OF VIEW: 512x512 desired (384x384 acceptable)

EXPOSURE TIME: Long exposure time (AEC setting = 2)

FILTERS: Al/poly, Al/mesh, and Ti/poly. (Again as a minimum, the filters used should include Al_poly and Al_mesh.)

CADENCE: About 30 seconds between images would be fine, but could be slower (~1 min) if required by planning constraints.

IRIS requests:

Spicule observations at the limb, as in HOP 280 ran on 14 Mar 2015.

Additional instrument coordination:

Ground-based total eclipse observations are planned from Ternate, Indonesia.

Previous HOP information:

HOP 280. Pasachoff & Carter, AAS/SPD/TESS Meeting 2015. Poster

Additional remarks: