

A possible pointing determination error between Dec. 18th, 2009 and June 15th, 2010

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1 Overview

We announce an error in the pointing determination for data taken between Dec. 18th, 2009 and June 15th, 2010. The inaccuracy in the pointing determination may be increased up to a factor of two along the direction of the DET-X axis. No change is expected along the direction of the DET-Y axis.

2 Attitude and Pointing

Since launch, the 3-axis attitude control using the Inertial Reference Unit (IRU) had been done with the combination of IRU-X/Z/S1. We then switched over from the IRU-S1 to S2 at 03:21 on 18th, December 2009. The IRU-S2 or S1 controls the attitude in the DET-X direction while the IRU-X controls the attitude in the DET-Y direction. Since the switch, we have found that the accuracy of the attitude control along the DET-X axis became worse than previous by roughly a factor of two, though it has been different from observation to observation (Figure 1). If worse, the attitude determination accuracy and the pointing accuracy (i.e., XRT image reconstruction accuracy) likely also got worse. Thus, XIS images may be seen to be elongated along the direction of the DET-X axis by 1 arcmin. An example of the elongated XIS image is shown in Figure 2.

If you have found elongated images in the XIS data (as seen in images plotted in detector coordinates), we encourage you to consider the following analysis steps.

1. Choose the extracted region of the spectrum to be as large as possible.
2. Apply the attitude correction tool “aeattcorr.sl”, as developed by Dr. M.A. Nowak.
This tool can be downloaded from <http://space.mit.edu/cxc/software/suzaku/aeatt.html>. It works to reduce the pointing determination error if the target is bright and point-like. The image can become sharper after this tool has been correctly applied.

At 10:10 on June 15th, 2010, we have activated another gyro, IRU-Y. The IRU-Y is more sensitive to the attitude of the DET-X direction than is the IRU-S2. We have decided to use the IRU-S2 for attitude control, and the IRU-Y for attitude determination. The pointing determination error will largely be improved to what it had been before Dec. 18th, 2009. The elongation of XIS images along the DET-X axis will no longer be expected to appear.

Acknowledgment

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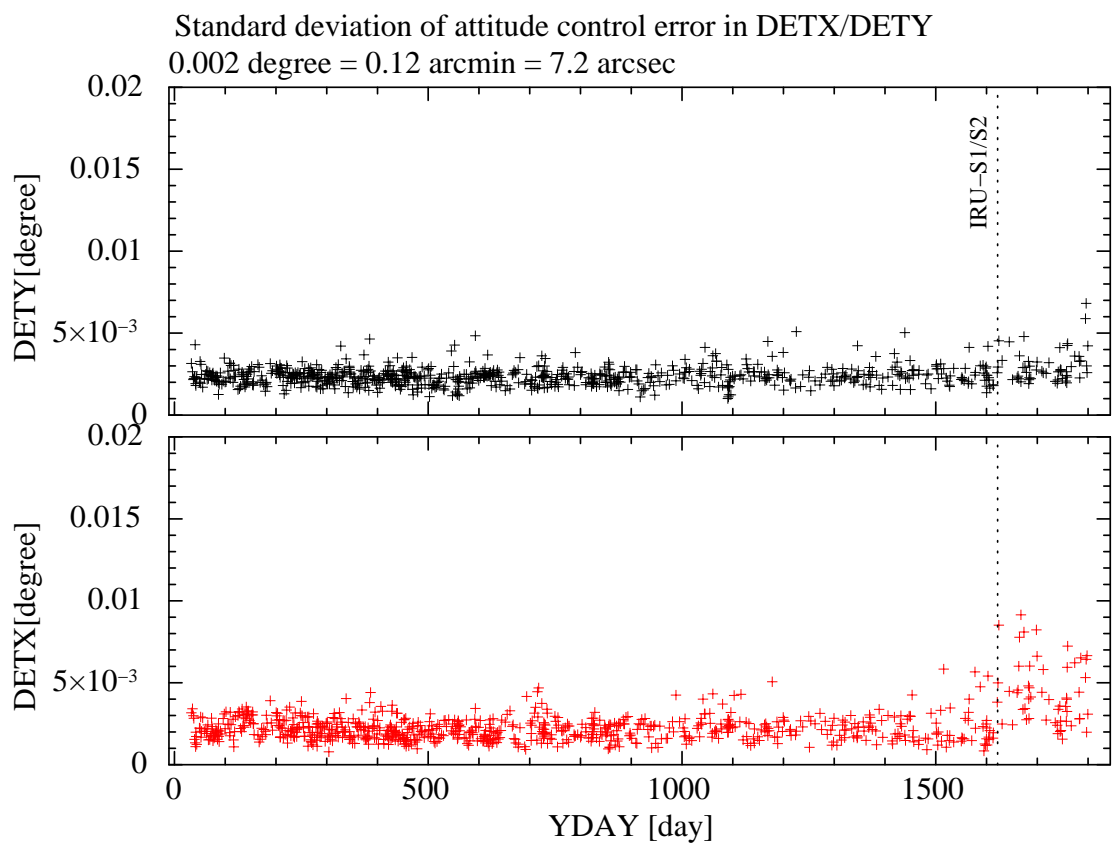


Figure 1: Attitude determination error along the direction of the DET-Y (top) and DET-X (bottom), respectively.

Table 1: A brief history of the operation of the IRU

Date	Attitude control	Attitude determination
2005-08-12 – 2009-12-18	X/S1/Z	X/S1/Z
2009-12-18 – 2010-06-15	X/S2/Z	X/S2/Z
2010-06-15 – present	X/S2/Z	X/Y/Z

Five IRUs (X, Y, Z, S1, S2) are onboard the Suzaku satellite. The IRU-X, -Y and -Z are aligned along the direction of the three rectangular satellite-axes X, Y and Z, respectively. They are most sensitive to the attitude of the direction of DET-Y, DET-X and the rotation around the other orthogonal axis, respectively. The other two IRUs S1 and S2 are mounted in skew directions, which provide redundancy.

RX J1856.5-3754: XIS1 in SKYXY coordinate

Courtesy by Todoroki, S (Rikkyo Univ.)

Oct. 2009

March 2010

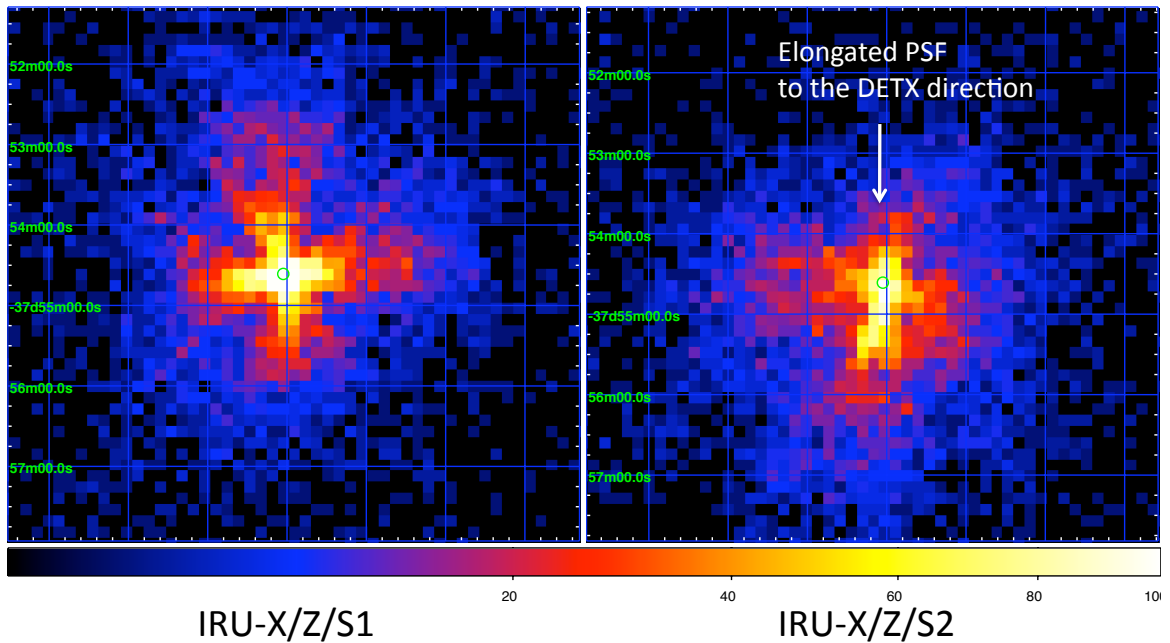


Figure 2: XIS images of RX J1856.5 – 3754 in sky coordinate. Left and right figures show the images before and after the IRU-S2 was activated. The elongated image to the DET-X direction is seen in the right image.