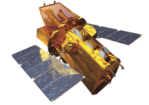




Review the Anti-Sun Pointing Operation of Swift

T. Sakamoto (CRESST/UMBC/GSFC) and N. Gehrels (GSFC)



Abstract

We review the Swift anti-Sun pointing operation. The Swift's pre-planned pointing has been weighted toward the anti-Sun directions to increase the number GRBs at the favorable location in the sky for the ground follow-up telescopes. We have been using this procedure since 2008. We present the Swift pointing history for five years of its operation. We also discuss the impact of this operational procedure on the redshift determination rate of the Swift GRBs.

Working definitions

- "Anti-Sun" pointing \rightarrow Sun hour angle pointing > 9 hr; - "Anti-Sun" GRB \rightarrow Sun hour angle of a GRB > 9 hr

1. Sun hour angle history of Swift's pointing

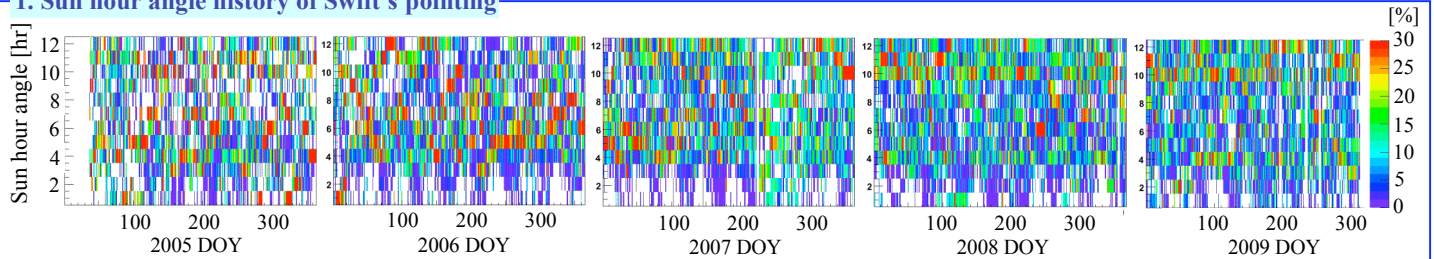


Fig. 1 Histograms of the percentage of the Sun hour angle of Swift's pointing as a function of time. The Sun hour angle of $>30\%$ is in the red histogram (the percentage goes lower in a blue histogram). The higher percentage of the anti-Sun pointing is visible after year 2008.

2. History of Swift's anti-Sun pointing

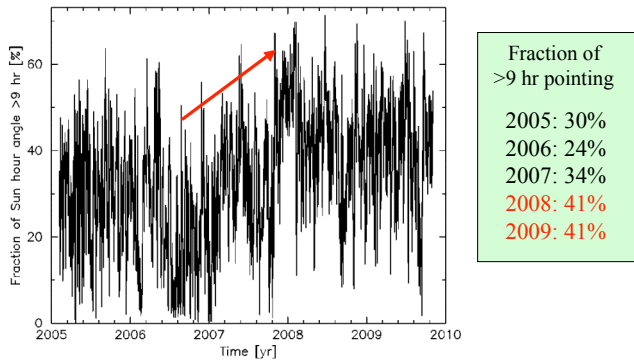


Fig. 2 Fraction of Sun hour angle >9 hr ("anti-Sun" pointing) as a function of time. The improvement of the anti-Sun pointing is seen after 2008.

3. GRB Sun hour angle distributions

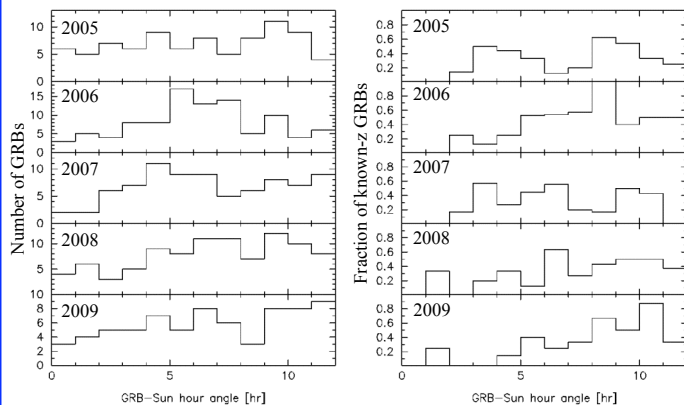


Fig. 3 [left] Distributions of the Sun hour angle of BAT GRBs from year 2005 (top) to year 2009 (bottom). [right] Distributions of the Sun hour angle of BAT GRBs by the fraction of known-z GRBs from year 2005 (top) to year 2009 (bottom). The redshift determination rates for the anti-Sun GRBs are $>40\%$.

4. Impact of Anti-Sun pointing to GRB Sun hour angles

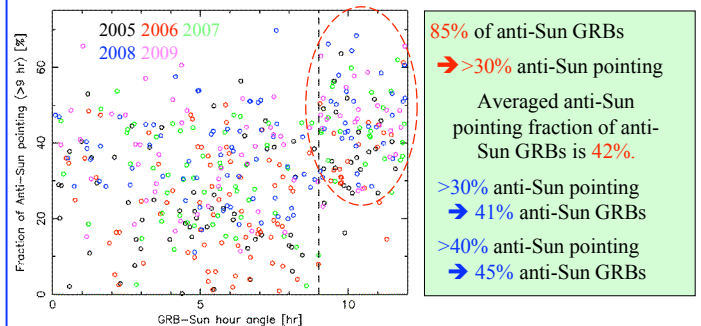


Fig. 4.1 Fraction of anti-Sun pointing (>9 hr) vs. Sun hour angle of BAT GRBs in year 2005 (black), 2006 (red), 2007 (green), 2008 (blue) and 2009 (magenta). Greater than 30% anti-Sun pointing is crucial to have anti-Sun GRBs.

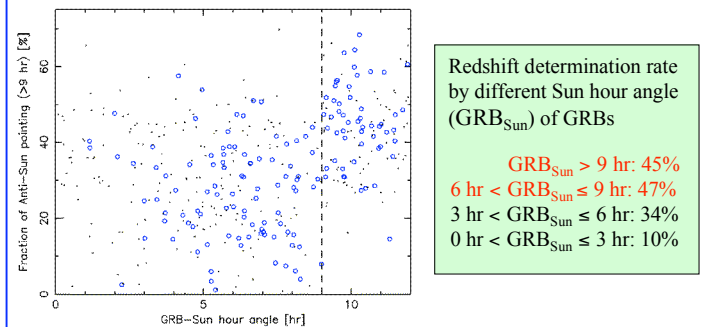


Fig. 4.2 Fraction of anti-Sun pointing (>9 hr) vs. Sun hour angle of BAT GRBs with known-z GRBs as blue circles and unknown-z GRBs as black dots. The redshift determination rate reaches close to 50% for the BAT GRBs with Sun hour angle >6 hr.

Summary

- Swift's anti-Sun pointing operation has been increasing the number of anti-Sun GRBs.
- $>30\%$ (ideally $>40\%$) of the Sun hour angle >9 hr pointing is crucial to have anti-Sun GRBs by BAT.