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VARIABILITY STUDIES OF 3C 371

NASA Grant NAG8-523

IN-28945

Final Report

For the Period 1 April 1985 through 30 September 1986

Principal Investigator
Dr. Diana M. Worrall

October 1986

Prepared for:

National Aeronautics Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

Smithsonian Institution
Astrophysical Observatory
Cambridge, Massachusetts 02138

The Smithsonian Astrophysical Observatory
is a member of the
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The NASA Technical Officer for this grant is Dr. W.G. Johnson, Code ES01, NASA, George C. Marshall Space Flight Center, Marshall Space Flight Center, Alabama 35812.

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FINAL REPORT

The compact extragalactic radio source, 3C 371, was observed with the X-ray detectors of the EXOSAT satellite for 19.5 hours in 2 observing periods separated by 18 days. This resulted in the discovery of X-ray variability of the source on time scales between 8 hours and about 25 minutes and the confirmation of earlier reports of variability on longer time scales. The short time scale variability agrees remarkably well with earlier predictions based on fitting multifrequency data from the source to a relativistically beamed inhomogeneous synchrotron self-Compton (SSC) jet model. This SSC model is frequently applied to BL Lac objects and related sources, such as 3C 371. However, the number of free parameters in model fits tends to be large, and so independent support such as from this work is important. The X-ray spectral results for 3C 371 also may provide qualitative support for the SSC model in that the spectrum probably consists of two components, with the steeper one at low photon energies. In terms of the model, the low-energy spectrum would be dominated by synchrotron emission extending down to radio energies, whereas the higher energy X-rays would be dominated by Compton radiation.

A detailed report of the results of the project are given in Staubert, Brunner and Worrall (1986). The results were also presented within the broader subject of BL Lac Objects and Relativistic Beaming at a workshop in Tucson, and the paper appears in the workshop proceedings (Worrall 1986).

Staubert, R., Brunner, H. and Worrall, D.M., "EXOSAT Observations of 3C 371", 1986, The Astrophysical Journal, to appear in the November 15th issue.

Worrall, D.M., "BL Lac Objects and Relativistic Beaming", 1986, in "Continuum

Emission in Active Galactic Nuclei", proceedings of a workshop held in Tucson, Arizona, January 11-14, 1986, ed. M.L. Sitko (KPNO Publication), page 97.