# X-ray source variability study of the M 31 central field using Chandra HRC-I

Florian Hofmann[*†1], Wolfgang Pietsch[1], Martin Henze[1,2], Frank Haberl[1], Richard Sturm[1], Massimo Della Valle[3,4], Dieter Hartmann[5], and Despina Hatzidimitriou[6,7]

[1]Max-Planck-Institut für extraterrestrische Physik – Germany
[2]European Space Astronomy Centre – Spain
[3]INAF-Napoli – Italy
[4]International Centre for Relativistic Astrophysics – Italy
[5]Clemson University – United States
[6]University of Athens – Greece
[7]Foundation for Research and Technology Hellas – Greece

## Abstract

The central field of the Andromeda galaxy (M 31) has been monitored, using the Chandra HRC-I detector during the years 2006 to 2012 with the main aim to detect X-rays from optical novae. We present a systematic analysis of all X-ray sources found in the 41 nova monitoring observations, along with 23 M 31 central field HRC-I observations available from the Chandra data archive starting in December 1999.

Based on these observations, we studied the X-ray long-term variability of the source population and especially of X-ray binaries in M 31.

We created a catalogue of sources, detected in the 64 available observations, which add up to a total exposure of about 1 Ms. To study the variability, we developed a processing pipeline to derive long-term Chandra HRC-I light curves for each source over the 13 years of observations. In the merged images we also searched for extended X-ray sources.

We present a point-source catalogue, containing 318 X-ray sources with detailed long-term variability information. 28 of which are published for the first time. The spatial and temporal resolution of the catalogue allows us to classify 115 X-ray binary candidates showing high X-ray variability or even outbursts in addition to 14 globular cluster X-ray binary candidates showing no significant variability. The analysis may suggest, that outburst sources are less frequent in globular clusters than in the field of M 31. We detected 7 supernova remnants, one of which is a new candidate and in addition resolved the first X-rays from a known radio supernova remnant. Besides 33 known optical nova/X-ray source correlations, we also discovered one previously unknown super-soft X-ray outburst and several new nova candidates.

The catalogue contains a large sample of detailed long-term X-ray light curves in the M 31 central field, which helps to understand the X-ray population of our neighbouring spiral galaxy M 31.

[*]Speaker
[†]Corresponding author: florian.hofmann@tum.de