MATHEMATICAL MICROSCOPE IN THE ANALYSIS OF ACTION MECHANISMS OF BLACK HOLES

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The Mathematical Microscope (MM) in the point-by-point analysis of images of colliding galaxies containing Black Holes (BHs) in the X-ray and optical ranges made it possible to reveal the mechanisms of additional spinning of galaxies. A pointwise analysis of the interaction of relativistic gas with stellar matter is considered on the MM.

Ring Groups Around a Wandering BH

A "wandering" black hole has been found in the outer regions of a galaxy about 4.5 billion light years from Earth. These groups of rings represent an ideal case because there is no other BH nearby, see Fig. 1.

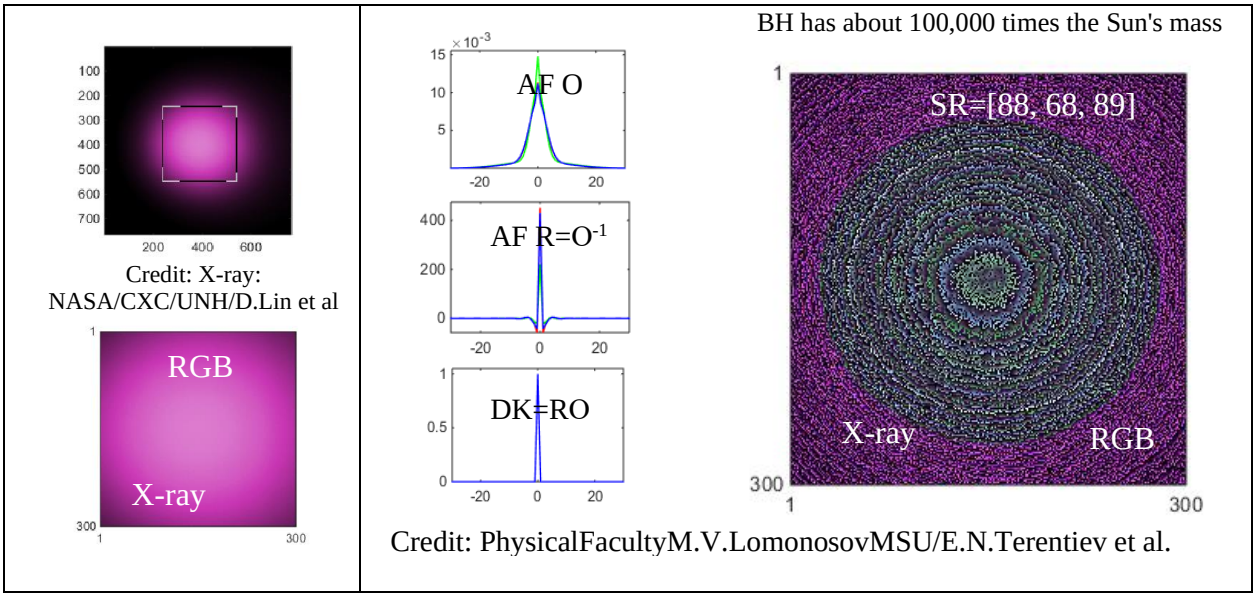

Fig. 1. An example of groups of rings around a wandering BH [2]

Pair Interactions of BHs in Constellation Sagittarius A*

Five large BHs are close to each other, so there are pair interactions of BHs through the mechanism of interaction between these groups of rings.

BHs A and B interact: there is a common light and green shell; BHs C and D do not interact - there is no common light shell; BHs D, E are close to interaction: there is a common light shell, and green shells have moved from BH E to BH D, see below Fig. 2-3.

The MM made it possible for the first time to consider the interaction of BH environments (marked with the letters A - E) and to distinguish the first three simple cases in the classification: BHs interact AB, do not interact CD, and are close to the interaction ED.

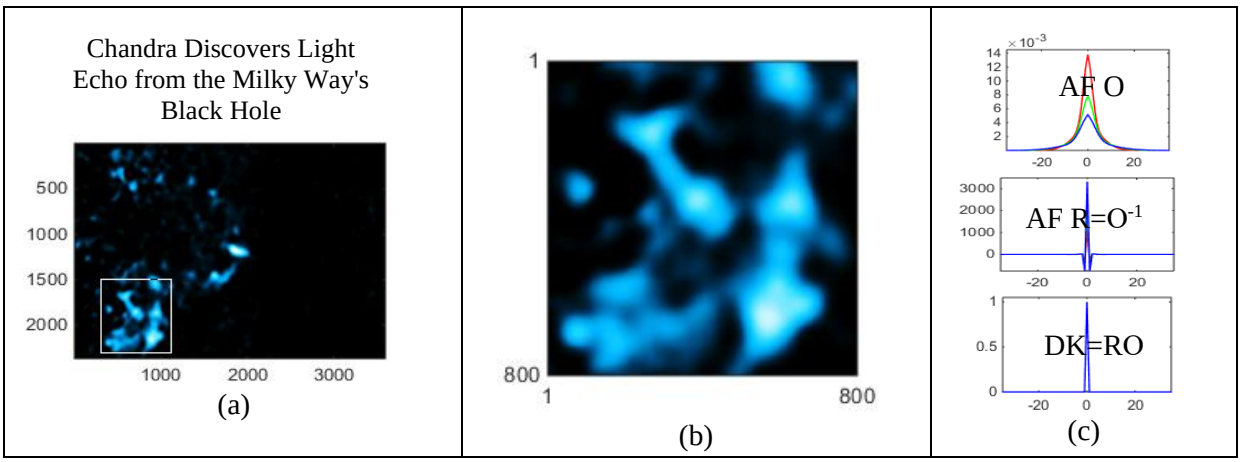

Fig. 2. (a-b) BHs in the light-X-ray echo near the constellation Sagittarius A* [3], (c) – sections AF O~A.

MM worked on data from Chandra with one-byte precision. The MM has implemented super-resolution SR in situations with "ordinary inversion" DK=R O, see Fig. 2 (c).

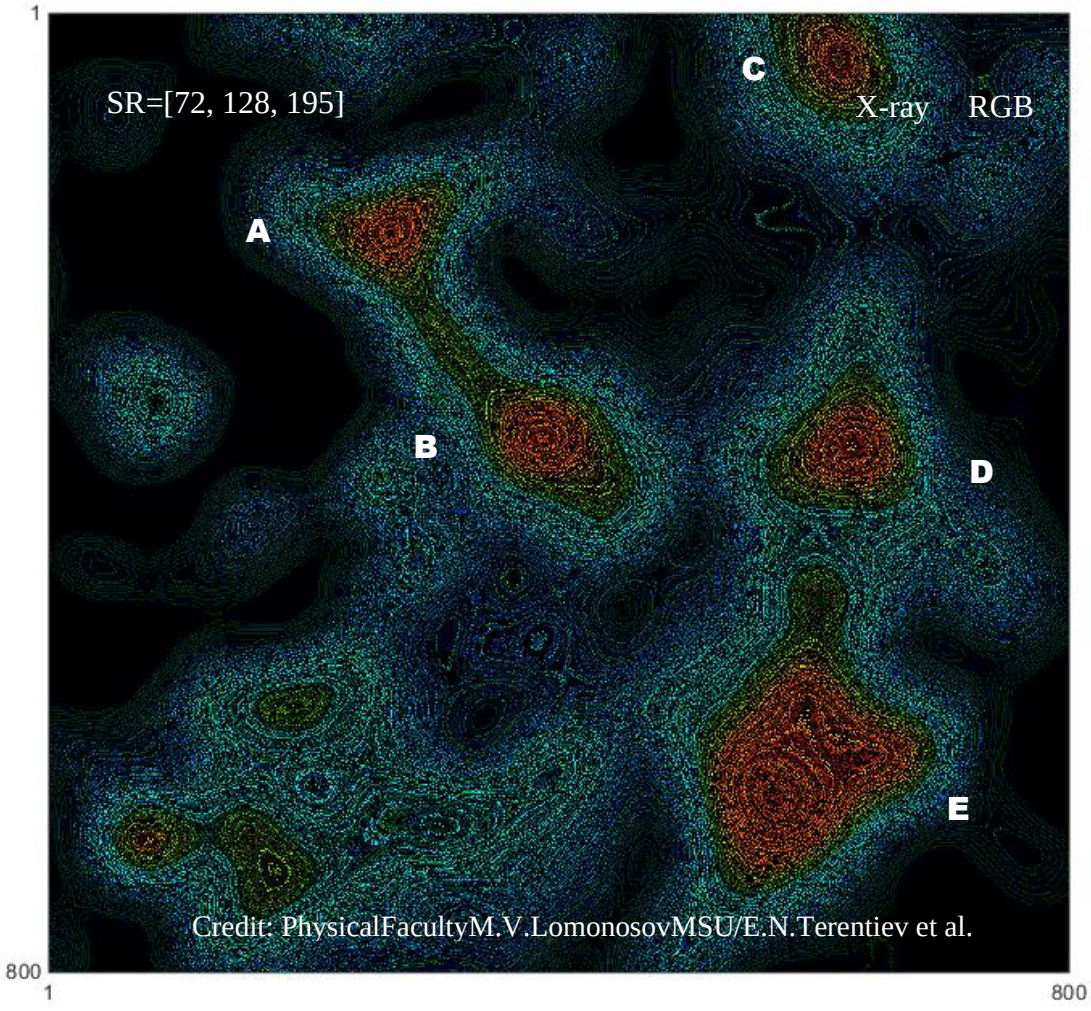

Fig. 3. An example of five BHs (labeled A, B, C, D, and E) and three pairs of BH environment ring interactions

Analysis of Colliding Galaxies in X-ray and Optical Ranges

In the examples shown in Fig. 4-5. the relativistic gas rings additionally "unwind" the galaxies. Thus, the MM helped us to see relativistic rings as a mechanism that provides additional spin-up of galaxies without involving arguments about dark matter.

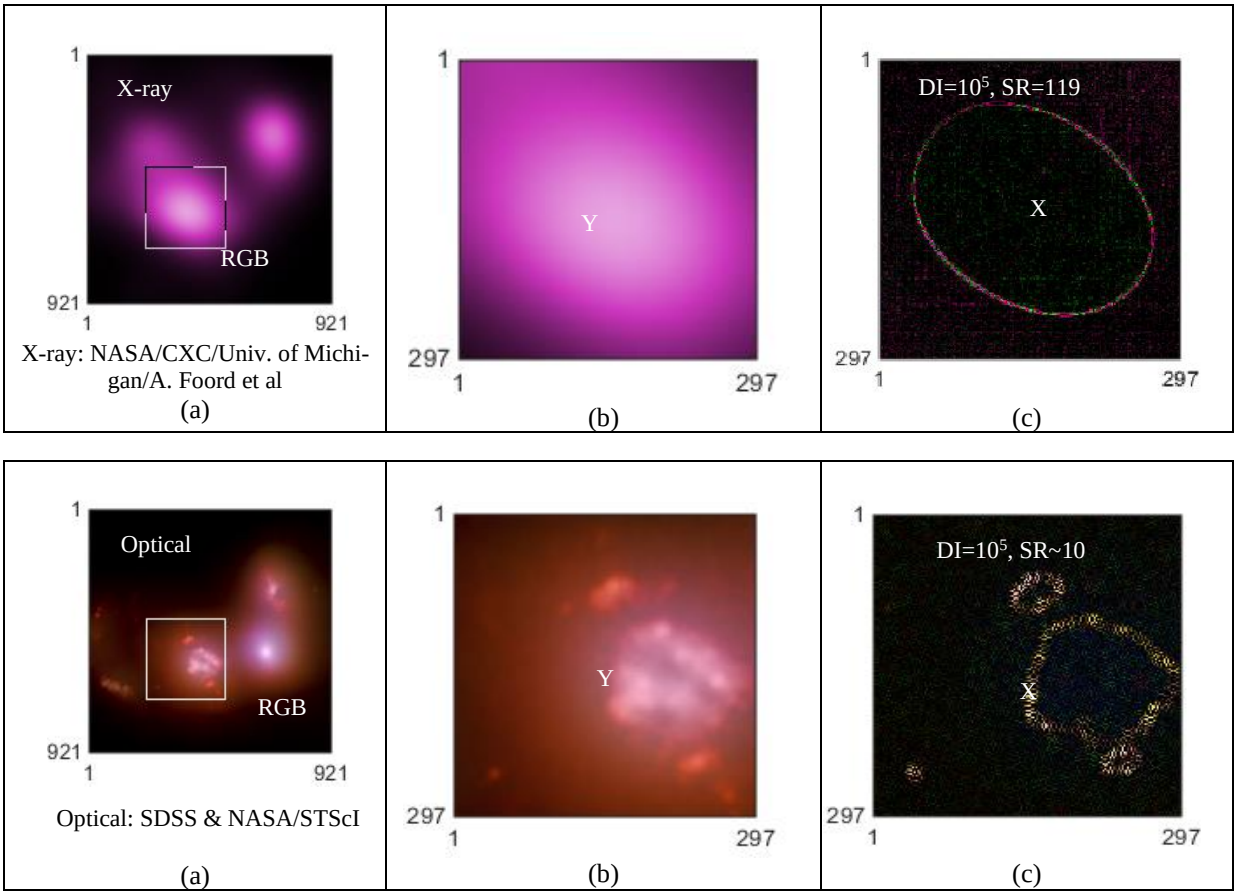

Fig. 4. The colliding galaxies in the X-ray and optical ranges - (a), fragment (b) and SR image (c).

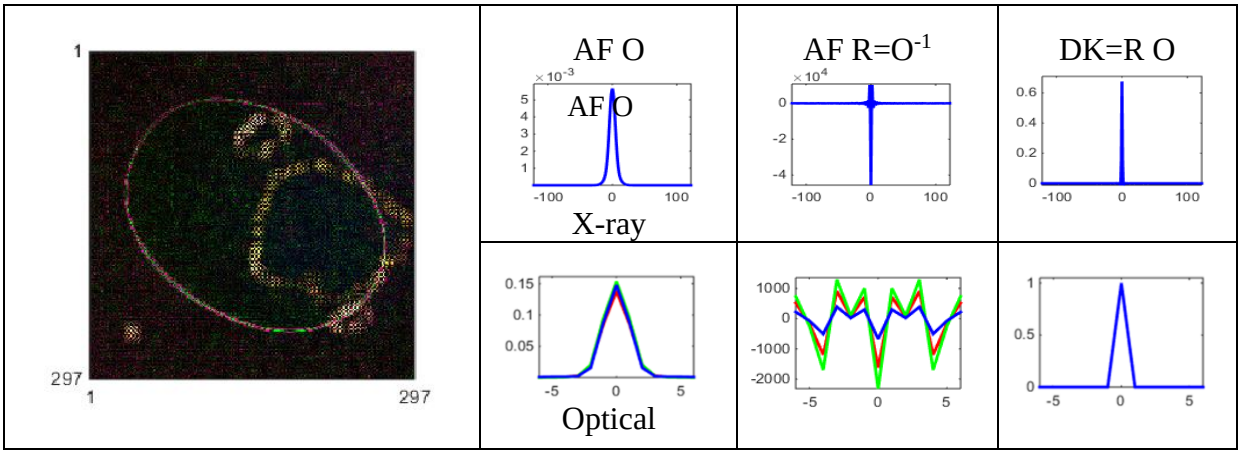

Fig. 5. AF O~A MM cross sections in the X-ray and Optical ranges.

Modifications of MM methods can still be implemented in electron microscopy, in new radar technologies, in synthetic aperture radars, CT, MRT, etc. We would like to apply the MM to the X-ray Spectrum RG observatory

REFERENCES

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