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G166+4.3 SNR viewed through the electromagnetic spectrum

G166.0+4.3 (VRO 42.05.01) is a mixed-morphology supernova remnant having a different spatial distribution of emission viewed in radio and X-rays. A sharp edge-brightened circular shape of the shell and wing component is visible in radio wavelength. Whereas X-ray emission is dominated by a bright spot in the wing, without any edge-brightened structures. Observed shape of this SNR looking like a shock propagation through the medium of different densities can be a result of the shock encountering the density discontinuity in the interstellar medium which makes favorable condition for the particles acceleration up to very high energy. Thus, the G166+4.3 supernova remnant became a candidate for the investigation of particle acceleration in SNR shocks at high- and very high energies. At TeV energies, the SHALON telescopes discovered extended emission with the main contribution to the very-high-energy γ-ray fluxes given by the regions correlated with the shells visible in the radio energies. But the main contribution to the TeV gamma-ray flux gives the West part of SNR, where the maximum of X-ray emission is located. The origin of the very high energy gamma-ray emission from G166+4.3 SNR is explored. Active galactic nucleus (AGN) phenomenon and its impact on the host galaxy as well as a role of jets, powered by central black hole of AGN, in the feedback of the surroundings on the different scales is the matter of the detailed multiwavelength investigations. Also, the observations of AGNi are used to reveal the processes taking place in the very proximity to the supermassive black holes. To study mechanisms of jet formation, connecting with the AGN activity and their propagation from the very core of active galactic nuclei, the analysis of long-term observations is used. One of the approaches to such studies is to detect the launching of jet components viewed in radio range and then link it with flaring events detected at higher energy ranges. Tracking the jet-initiated variability events through the multiwavelength observations from radio frequencies up high energy gamma-rays allows first to resolve the nucleus structure by the determination of the dynamics of the features of the jet flow in the AGN core region. Whereas the cross-identification of the jet features through the wide energy range and revealing of the time dependence of these jet events evolution allows to locate the regions responsible for the generation of observable features which can lead to exploration of the mechanism of jet launching as well as the origin of emission in the Active Galactic Nucleus. Being the nearby and bright, NGC 1275 is one of the extensively studying AGNi. This object is very active in the timescales of decades. Multiwavelength long-term observations of NGC 1275 resulted in the detection of different timescale variability from this AGN. For the case of NGC 1275 the cross-correlation of the activity at radio, X-ray and very high energy gamma-rays is investigated. The time dependence of activity of NGC 1275 in the wide energy range was found which allow to localize the sites of the emission generation including one of the very high energies. These multiwavelength long-term studies are highly important for the further advance of the AGN's black hole research and investigations of mechanisms of jet formation.

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