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Modelling complex AGN media in full-3D with a new X-ray radiative transfer code

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Large amounts of gas and dust are found in the central regions of most active galaxies. These ambient media play a crucial role as they provide the accretion reservoir powering AGNs and reprocess the X-ray, UV and optical emission of the central engine. Yet, the detailed characteristics of these regions and the physics behind them remain unknown. Recent radiative transfer modelling suggests that circumnuclear media are complex with clumps and filaments, while MIR-observations hint towards polar extended structures of gas and dust, as opposed to the classical dusty torus paradigm. We present a new, high-performance Monte Carlo simulation code that can model X-ray radiation transport in arbitrary 3D geometries, which allows for intricate multi-phase media with complex distributions. Moreover, this code can self-consistently model SEDs over the full infrared to X-ray range. By exploiting the diagnostic power of reprocessed spectral X-ray features, we dissect the inner few parsecs of AGNs in unprecedented detail and differentiate between equatorial and polar extended geometries. Furthermore, we analyse the self-consistent model predictions for the combined infrared and X-ray bands and discuss their application to spectral fitting. Finally, we present mock observations demonstrating how geometry effects will appear in the fluorescent line shapes of current XMM-Newton and forthcoming XRISM and Athena observations.

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